Final
January 2013

Remedial Investigation Report
Reservoir No. 2 Burning Ground

Former Plum Brook Ordnance Works
Sandusky, Ohio

FUDS Project No. G05OH001812

US Army Corps of Engineers
Nashville District

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Former Plum Brook Ordnance Works, Sandusky, Ohio

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G05OH001812

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Submittal of the Final Remedial Investigation Report for
Reservoir No. 2 Burning Ground
Former Plum Brook Ordnance Works, Sandusky, Ohio
Contract No. W912P5-12-D-0001: Shaw Project Number 146394

Dear Ms. Watts:

In accordance with the requirements of Task Order No. 002 of Contract No. W912P5-12-D-0001 Shaw is pleased to submit the Final Remedial Investigation Report for the Reservoir No. 2 Burning Ground at the Former Plum Brook Ordnance Works (PBOW) located in Sandusky, Ohio. This report represents the full compilation and summary for the DERP-FUDS project No. G05OH001812 Remedial Investigation. This report was prepared consistent with the following: the site characterization report, baseline human health risk assessment, and screening-level ecological risk assessment that were prepared and finalized for Reservoir No. 2 Burning Ground; the agreements among the PBOW project delivery team (PDT) members; and communications with the U.S. Army Corps of Engineers regarding the scope of this report. This Final RI report incorporates the comments of the Corps on the previously submitted October 5, 2012 draft.

Enclosed for your records are four hard copies of this report, and a complete electronic copy is attached to each hard copy on compact disk (CD). As agreed during the November 29, 2012 PDT meeting, the appendices to the RI Report are included on the CD only. Copies of this deliverable have also been sent to those on the distribution list as indicated for their records.

Should you have any questions or require additional information regarding this submittal, please do not hesitate to contact me at (865) 694-7496.

Sincerely,

Steven T. Downey, PE, PMP
Project Manager

Enclosures

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Remedial Investigation Report
Reservoir No. 2 Burning Ground

Former Plum Brook Ordnance Works,
Sandusky, Ohio

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List of Acronyms

2-ADNT	2-amino-4,6-dinitrotoluene
4-ADNT	4-amino-2,6-dinitrotoluene
amsl	above mean sea level
bgs	below ground surface
BHHRA	baseline human health risk assessment
BSC	background screening concentration
CD	compact disk
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CSEM	conceptual site exposure model
DERP	Army Defense Environmental Restoration Program
DNT	dinitroluene
DoD	U.S. Department of Defense
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FUDS	Formerly Used Defense Sites
HI	hazard index
HQ	hazard quotient
ICI	International Consultants Incorporated
ILCR	incremental lifetime cancer risk
IT	IT Corporation
Jacobs	Jacobs Engineering Group, Inc.
LRD	Great Lakes and Rivers Division
µg/L	micrograms per liter
mg/L	milligrams per liter
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	no-observed-adverse-effects level
NWI	National Wetland Inventory
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon

List of Acronyms *(Continued)*

PBOW	Plum Brook Ordnance Works
PBS	Plum Brook Station
PCB	polychlorinated biphenyl
ppm	parts per million
PRG	preliminary remediation goal
R2BG	Reservoir No. 2 Burning Ground
RBC	risk-based criteria
RfD	reference dose
RI	remedial investigation
SCR	site characterization report
SDWR	Secondary Drinking Water Regulations
Shaw	Shaw Environmental, Inc.
SI	site investigation
SLERA	screening-level ecological risk assessment
SSAP	site-specific sampling and analysis plan
SVOC	semivolatile organic compound
T&E	threatened or endangered
TAL	target analyte list
TCDD	tetrachlorodibenzodioxin
TDS	total dissolved solids
TEQ	toxicity equivalent
TNT	trinitrotoluene
TNTA	TNT Area A
TNTB	TNT Area B
TNTC	TNT Area C
TRV	toxicity reference value
USACE	U.S. Corps of Engineers
VOC	volatile organic compound

Executive Summary

A remedial investigation (RI) was conducted for the Reservoir No. 2 Burning Ground (R2BG). The results of the RI have been previously reported in the following three finalized documents:

- Jacobs Engineering Group, Inc. (Jacobs), 2010, ***Revised Final Baseline Human Health Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio***, February.

- Jacobs Engineering Group, Inc. (Jacobs), 2010, ***Revised Final Screening Level Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio***, February, as updated by October 3, 2011 replacement pages.

- Jacobs Engineering Group, Inc. (Jacobs), 2006, ***Final Site Characterization Report, Remedial Investigation Part 1 at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio***, January.

This RI summarizes the findings of these three reports, which are appended. No additional investigation results, evaluation, or information is included in this RI. However, recommendations are provided based on this previously provided information. Thus, the purposes of this RI report are to1) place all RI-related reports under a single cover, and 2) record a recommendation as to whether or not performance of a feasibility study (FS) is warranted.

Site Characterization Report. Soil trenching was performed to identify the lateral and vertical extent of a layer of burned material. This lateral extent of the burn layer defines the boundary of the Burn Area. The burn layer was typically found at a depth of approximately 1 foot below ground surface and was typically about 1 foot thick. Groundwater was also investigated. Piezometers were installed in the overburden/shale unit, but the Project Delivery Team agreed not to install monitoring wells in this unit due to a lack of water. Three wells were installed in the bedrock limestone groundwater unit.

The following samples were collected and sent for laboratory analysis:

- Surface soil – 26 samples (4 inside the Burn Area and 22 outside the Burn Area)
- Subsurface soil – 24 samples (8 inside the Burn Area and 16 outside the Burn Area)
- Limestone bedrock monitoring wells – One sample each from 3 wells
- Sediment – Three samples from adjacent drainage ditch to the north.

No surface water was present in the drainage ditch, so no surface water samples were collected.

Chemicals detected in soils at concentrations exceeding screening levels include nitrotoluenes, polychlorinated biphenyls, polychlorinated dibenzodioxins/furans, polycyclic aromatic hydrocarbons (PAH), lead, and other metals. The highest concentrations were typically found within the burn layer. The only chemicals detected in sediment that exceeded screening values were PAHs. The groundwater monitoring wells contained little water and could thus not be developed or purged. The samples had to be collected by bailer, as there was too little water to sample using low-flow methods. Consequently, the samples were highly turbid. Chemicals that exceeded screening values in groundwater included various metals, benzene, xylene, and PAHs. Benzene and xylene are naturally occurring petroleum hydrocarbon-related components in the limestone bedrock groundwater, and the metals and PAHs are evidently associated with entrained sediment that resulted from the low water volume and sampling technique required. Groundwater flow direction in the overburden/shale unit was found to be toward the north. Although adequate water level measurements could not be collected from the R2BG limestone bedrock wells, the flow direction in this unit through the R2BG area is interpreted as being toward the southeast, following a linear northeast-to-southwest linear feature in this area.

Baseline Human Health Risk Assessment. A baseline human health risk assessment (Jacobs, 2010a) was performed using the RI analytical results and the analytical results from soil samples during the previous site investigation. These data were used to evaluate the following human receptors (media evaluated in parentheses):

- Current/future groundskeeper (surface soil)
- Future indoor worker (surface soil and bedrock groundwater)
- Current/future construction worker (surface soil, subsurface soil, and sediment)
- Future resident (surface soil, subsurface soil, sediment, and bedrock groundwater)
- Current/future adult hunter (surface soil, including venison pathway)
- Current/future hunter's child (surface soil [venison pathway only]).

Exposure to soils from inside the Burn Area and outside the Burn Area was evaluated separately. Cancer risks are calculated as incremental lifetime cancer risk (ILCR) values, and noncancer hazards are calculated as hazard index (HI) values. The overall HI and ILCR values are summarized by environmental medium and receptor in the following bullets. Exceedances of the PBOW cancer risk goal (ILCR>1E-5) are shown in bold type, and exceedances of the noncancer hazard criterion (HI>1) or the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk management range (1E-6 to 1E-4) are shown in bold italics. Receptors with

neither an ILCR nor HI value that exceeds the PBOW cancer risk goal or the HI criterion for a given medium are not shown.

Inside the Burn Area – Surface Soil

- Current/future groundskeeper: **ILCR = 8E-5**; ***HI = 12***
- Future indoor worker: **ILCR = 4E-5; *HI = 6***
- Current/future construction worker: ILCR = 4E-6; ***HI = 33***
- Future resident: ***ILCR = 3E-4***; ***child HI = 140***; ***adult HI = 15***

Inside the Burn Area – Subsurface Soil

- Current/future construction worker: **ILCR = 2E-5**; ***HI = 154***
- Future resident: ***ILCR = 4E-3***; ***child HI = 651***; ***adult HI = 70***

Outside the Burn Area – Surface Soil

- Current/future groundskeeper: **ILCR = 3E-5**; HI = 1
- Current/future construction worker: ILCR = 2E-6; ***HI = 3***
- Future resident: **ILCR = 1E-4**; ***child HI = 15***; ***adult HI = 2***

Outside the Burn Area – Subsurface Soil

- Current/future construction worker: ILCR = 1E-6; HI = 1
- Future resident: **ILCR = 8E-5**; ***child HI = 5***; adult HI = 0.6

Groundwater

- Future indoor worker: ***ILCR = 2E-3; HI = 15***
- Future resident: ***ILCR = 8E-3***; ***child HI = 101***; ***adult HI = 44***

Sediment

- No receptor had an ILCR or HI value that exceeded the PBOW cancer risk goal or noncancer hazard criterion.

The site-related cancer risk-driving chemicals in Burn Area surface soil were as follows: trinitrotoluene (TNT), dinitrotoluene (DNT) mixture, 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalents (TEQ), and Aroclor 1260. TNT and lead were the noncancer hazard driving chemicals in Burn Area surface soil.

The site-related cancer risk driving chemicals in Burn Area subsurface soil were as follows: TNT, DNT mixture, 2,3,7,8-TCDD TEQ, Aroclor 1254, and Aroclor 1260. TNT, 2,4-DNT, 2,6-DNT, Aroclor 1254, and lead were the noncancer hazard-driving chemicals in subsurface soil inside the Burn Area.

The site-related cancer risk driving chemicals in surface soil outside of the Burn Area were as follows: TNT, DNT mixture, and Aroclor 1260. TNT and lead were the noncancer hazard-driving chemicals in surface soil outside of the Burn Area.

The cancer risks and noncancer hazards in subsurface soils outside of the Burn Area were driven by naturally occurring, non-site-related inorganic constituents. Site-related chemicals did not significantly contribute to cancer risks or noncancer hazards.

The risks and hazards associated with R2BG groundwater are regarded as implausible because exposure is unlikely due to low yield of the bedrock aquifer and the risk-driving chemicals in R2BG groundwater are naturally occurring inorganics and naturally occurring petroleum-related organic chemicals that are not associated with former PBOW activities.

The cancer risks for all receptors evaluated in the BHHRA for exposure to R2BG sediment are less than the PBOW cancer risk goal and are either within or less than the NCP risk management range. Noncancer hazards are regarded as negligible.

Screening-Level Ecological Risk Assessment. A screening level ecological risk assessment (SLERA) was performed using the RI analytical results for soil and sediment, and the soil sample results from the previous site investigation. Only soil samples collected from depth intervals ranging from 0 to 7.6 feet below ground surface were used in the SLERA.

Ecological reconnaissance surveys were conducted as part of the SLERA. Vegetative communities at the Burn Area and the study area immediately west of the Burn Area are upland old field, dominated by grasses and herbs. The old field area may be irregularly mowed. In the vicinity of the southern boundary of the Burn Area, the vegetation is classified as shrub thicket. Areas farther to the south, north, and east are successional woods. Vegetative stress attributable to chemical contamination was not observed at R2BG. No wetlands or significant aquatic habitat was observed, and no water was present in the east-west ditch in the northern part of R2BG during the ecological surveys or field sampling events. No threatened or endangered plant or animal species were observed during site reconnaissance.

The following terrestrial species were evaluated for exposure to contaminants in R2BG soil: deer mouse (small omnivorous mammal), short-tailed shrew (small insectivorous mammal), Eastern cottontail rabbit (medium-sized terrestrial herbivorous mammal), marsh wren (small insectivorous bird), raccoon (medium-sized omnivorous mammal), white-tailed deer (large herbivorous mammal), and red-tailed hawk (large carnivorous bird). These were evaluated for direct (e.g., ingestion of soil) and food web exposure pathways. With respect to aquatic exposure pathways, only direct exposure to aquatic sediment-dwelling organisms was evaluated in the SLERA because of limited aquatic habitat.

Ecological hazards in a SLERA are characterized by the derivation of a hazard quotient (HQ) value, HQs less than or equal to 1 represent no probable hazard. Although the Ohio Environmental Protection Agency considers all HQs above 1 to be potentially significant, the HQ values include much uncertainty and are highly conservative. Therefore, it should be understood that HQs greater than 1 do not mean that adverse ecological effects are occurring at the site or may occur in the future.

Inside the Burn Area, terrestrial receptors are predicted to incur elevated hazards from exposure to 2,3,7,8-TCDD TEQ, explosives, and two PAHs (acenapthene and naphthalene), based on the no-observed-adverse-effect-level (NOAEL)-based HQ approach. Several metals had elevated HQs, but the metals concentrations are within the range of naturally occurring background. Estimated HQs are above 1,000 for some receptors using the NOAEL-approach. However, the estimated HQs that are above 1,000 using the NOAEL-based approach are considered unrealistic and toxicologically impossible. The white-tailed deer and red-tailed hawk had no HQ exceedances greater than 10 outside of the Burn Area and only an HQ greater than 10 for 2,4-DNT inside 2BG.

Outside the Burn Area, terrestrial receptors are predicted to incur elevated hazards from exposure to explosives only with TNT being the greatest risk driver for the raccoon only. The white-tailed deer and red-tailed hawk had no HQ exceedance greater than 10.

Sediment-dwelling aquatic receptors are predicted to have potentially elevated hazards from exposure to 2,3,7,8-TCDD TEQ and PAHs based on a comparison of sediment data to RBSLs. However, given the limited to poor quality aquatic habitat at the site, the potential for adverse impacts to aquatic biota is considered negligible.

Recommendations. Based on the RI results, including the BHHRA and SLERA, the U.S. Army Corps of Engineers recommends that an FS be performed for R2BG soils. This includes surface and subsurface soils inside the Burn Area and surface soil outside of the Burn Area.

1.0 Introduction

The U.S. Army is conducting studies of environmental impacts attributable to releases associated with historical operations of a property previously owned by the U.S. Department of Defense (DoD), the former Plum Brook Ordnance Works (PBOW) in Sandusky, Erie County, Ohio. PBOW is an Army Defense Environmental Restoration Program (DERP) project under the Great Lakes and Rivers Division (LRD) Formerly Used Defense Sites (FUDS) program. The Louisville District Office of the U.S. Corps of Engineers (USACE) is the program management district for the LRD FUDS program. Management support for PBOW is provided by the USACE Huntington District Office, and technical oversight is provided by the USACE Nashville District Office.

This remedial investigation (RI) has been performed to determine if there have been any environmental impacts associated with former DoD that present an unacceptable risk to human health or the environment associated with the former Reservoir No. 2 Burning Ground (R2BG), which comprises DERP-FUDS Project No. G05OH001812.

This RI report was conducted under Delivery Order No. DX09 of Contract No. W912QR-08-D-0013. It summarizes the information presented previously in the following reports:

- Jacobs Engineering Group, Inc. (Jacobs), 2010a, ***Revised Final Baseline Human Health Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio***, February.

- Jacobs Engineering Group, Inc. (Jacobs), 2010b, ***Revised Final Screening Level Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio***, February, as updated by October 3, 2011 replacement pages.

- Jacobs Engineering Group, Inc. (Jacobs), 2006, ***Final Site Characterization Report, Remedial Investigation Part 1 at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio***, January.

It should be noted that this RI report generally presents and summarizes information directly as it was conveyed in these final approved reports performed by Jacobs. No new data is presented in this RI. It is noted that Section 2.4 includes an updated evaluation of groundwater quality based on more recent PBOW documents (e.g., Shaw Environmental, Inc. [Shaw], 2008; 2012).

1.1 Report Organization

As part of the RI effort, the R2BG site was previously investigated and evaluated in a site characterization report (SCR), baseline human health risk assessment (BHHRA), and screening-level ecological risk assessment (SLERA). This RI report summarizes these three reports and presents recommendations based on their findings. The SCR, BHHRA, and SLERA are appended to this report in their entirety (Appendices A through C) in electronic format on compact disk (CD).

The remainder of this chapter provides a description and history of the PBOW facility and of the former R2BG. This description of R2BG discusses its relationship to the PBOW remedial activities and briefly describes the history and current associated conditions. More specific information is included in the respective SCR, BHHRA, and SLERA that are appended to this RI report. Chapter 2.0 of this report summarizes the physical setting of PBOW and R2BG. This discussion of physical setting includes the geography, topography, drainage, and geology, including hydrogeology and natural groundwater quality.

Chapter 3.0 summarizes the SCR, Chapter 4.0 summarizes the BHHRA, and Chapter 5.0 summarizes the SLERA results and conclusions. Chapter 6.0 presents site-specific recommendations for site management decisions. These recommendations primarily discuss whether or not a remedial action is warranted. These recommendations do not identify a specific technological approach, but are provided to help site managers form a basis for determining whether a feasibility study (FS) is required, or for proceeding directly to a no-action proposed plan. References used in the RI are listed in Chapter 7.0.

Additional details pertaining to the SCR, BHHRA, and SLERA for each of these four sites are provided in the three previously submitted final reports, which are included on CD as Appendices A through C.

1.2 Facility Location and Description

The former 9,000-acre PBOW facility was used for the manufacture of nitroaromatics during World War II. The National Aeronautics and Space Administration (NASA) operates and maintains the site as the Plum Brook Station (PBS), which is a satellite facility of the John H. Glenn Research Center, located at Lewis Field in Cleveland, Ohio. PBOW is located approximately 4 miles south of Sandusky, Ohio, and 59 miles west of Cleveland. Although primarily in Perkins and Oxford Townships, the eastern edge of PBOW extends into Huron and Milan Townships. PBOW is bounded on the north by Bogart Road, on the south by Mason Road, on the west by Patten Tract Road, and on the east by U.S Highway 250. The areas surrounding PBOW are mostly

agricultural and residential. Public access is prohibited at PBOW except during the annual deer hunting season, which is by permit only. Figure 1-1 shows the geographical location of the former PBOW site.

1.3 Facility History and Background

The PBOW facility was constructed on property comprising 9,009 acres in early 1941 as a manufacturing plant for 2,4,6-trinitrotoluene (TNT), 2,4-dinitroluene (DNT), and pentolite (International Consultants Incorporated [ICI], 1995). Production of explosives at PBOW began in December 1941 and continued until 1945. It is estimated that more than 1 billion pounds of nitroaromatic explosives were manufactured during the 4-year operating period. The three explosive manufacturing areas were designated TNT Area A (TNTA), TNT Area B (TNTB), and TNT Area C (TNTC). Twelve process lines were used in the manufacture of TNT: four lines at TNTA, three lines at TNTB, and five lines at TNTC.

After plant operations ceased, the manufacturing process lines were decontaminated by the Army in late 1945. During decontamination, all structures, equipment, and manufacturing debris were either removed and salvaged or removed and burned. After the property was certified as decontaminated, 3,230 acres of the property were initially transferred to the Ordnance Department, then to the War Assets Administration on September 6, 1946. In 1949, PBOW was transferred to the General Services Administration. This transfer did not include the Plum Brook Depot area, which consists of 2,800 acres. The Department of the Army reacquired the 3,230 acres in 1954. In 1955, the Army completed further decontamination of the manufacturing process lines. This effort included removal of contaminated surface and subsurface soil around the buildings and wooden and ceramic waste disposal lines containing TNT. Thousands of pounds of TNT were discovered in catch basins; this TNT was removed and burned at the burning grounds. The Army continued cleanup efforts until 1963.

Two property use agreements were entered into by the Army and the National Advisory Committee of Aeronautics, the predecessor of NASA, in 1956 and 1958, respectively. Accountability and custody for the entire portion of the former PBOW property (6,030 acres) that had been under the accountability and custody of the Department of the Army were transferred to NASA on March 15, 1963. NASA performed further decontamination efforts during 1964. The NASA decontamination process included removing contaminated surface soil above the drain tiles, flumes, etc.; destruction of all buildings by fire; then removal of all soil, debris, sumps, and above-grade portions of concrete foundations. Portions of the concrete foundations located below grade were left buried, and some that had been previously slightly

above grade were covered with fill material. All materials, including the soil in those areas, were flashed; the area was then rough-graded. The decontamination process was also to have included the burning of excavated nitroaromatic-filled pipelines (Dames & Moore, Inc., 1997a).

NASA has operated and maintained the former PBOW property since 1963, and the facility is currently the PBS, which supports the NASA John H. Glenn Research Center at Lewis Field, Cleveland, Ohio as a satellite operation. Most of the aerospace testing facilities built in the 1960s at PBOW are currently on standby or inactive status. However, NASA has constructed newer research facilities on site since the 1960s. On April 18, 1978, NASA declared approximately 2,152 acres of PBOW as excess. This excess included former buffer areas that had not been used by the Army and were thus not subject to decontamination efforts. The Perkins Township Board of Education acquired 46 acres of the excess acreage and uses this area as a bus transportation area. The General Services Administration retains ownership of the remaining excess acreage and currently has a use agreement with the Ohio National Guard for 604 acres of this land. The details of land transactions are listed in the site management plan (ICI, 1995).

1.4 Reservoir No. 2 Burning Ground Description and History

R2BG is one of five known burning grounds at PBOW. It is located in the northwestern portion of PBOW, approximately 400 feet south of Reservoir No. 2, between Ransom Road and Campbell Road (Figure 1-2). R2BG was used for destruction of process wastes (off-specification TNT, explosives, acids, solvents, asbestos, and waste oil) process wastes generated during explosives manufacturing operations. It is not known when the site was first used for burning; however, a 1950 aerial photograph clearly shows the site, and there is documentation showing ongoing operations up to 1962 (Jacobs, 2006). The quantity of waste destroyed at the burn grounds is unknown (Science Applications International Corporation, 1991). No building structures were present at R2BG.

Site restoration was performed in 1963, when the area was cleared of debris and the ground restored to proper grade. The R2BG site is currently a grass-covered open field with young hardwood trees and brush surrounding the area (Jacobs, 2006).

2.0 Physical Setting

2.1 Physiography and Topography

PBOW is located within the Eastern Lake section of the Central Lowland Province near the southwestern shore of Lake Erie. The region is characterized by lake plains, outwash plains, and till plains with occasional small hills produced during the retreat of the Wisconsinan ice sheet. Approximately two thirds of Erie County was once covered by a glacial lake. Processes associated with the lake produced features such as beach ridges and wave-cut cliffs.

The area was originally a flat lake bottom resulting from glacial melt waters. Across PBOW, the topography is relatively flat with a gentle north-northeast slope towards Lake Erie. The land surface at R2BG is flat. Elevations at the site range from 638.9 to 640.6 feet above mean sea level (amsl).

The R2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern end of the field. A paved service road is adjacent to the east side of the site. The ground surface is relatively flat, with minimal slope toward the north and northwest. Elevations at the site range from 639 to 641 feet amsl. The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are wooded.

Geophysical surveys conducted during the 1996 site investigation (SI) (IT Corporation [IT], 1997a) indicated that debris remains in the subsurface; this was confirmed by the excavation of metallic debris during exploratory trenching. Excavated debris included piping, strapping, and plates. Additional soil descriptions recorded during trenching include reference to black cinder, ash, metal objects, broken tiles, tile fragments, and broken ceramics. The soil descriptions indicate the presence of a burn layer defined as black cinder and ash, ranging from 0.9 to 1.4 feet below ground surface (bgs) with thicknesses ranging from 0.5 to 1.2 feet. The soil descriptions for the overlying surface material indicate that the burning ground was covered with backfill material of unknown origin.

2.2 Geology

2.2.1 PBOW Geology

Most of the Erie County soil was formed from either glacial till or glacial melt water deposits. The dominant soil materials are derived from glacial till, outwash (gravel and sand), and

lacustrine (very fine sand, silt, and clay) deposits. Other soil types have been formed from more recent deposits of alluvium and weathering of parent rock. Within PBOW, the soil origins are listed as lacustrine. The glacial drift is less than 20 feet thick on average, with bedrock exposed in many places.

The bedrock formations in northern Ohio consist of Devonian and Silurian carbonates (limestone and dolomite) and clastics (shale, siltstone, and sandstone). The regional dip is to the southeast at approximately 35 feet per mile, with younger rocks subcropping to the east. The Silurian and Devonian Formations unconformably overlie sedimentary sequences of Ordovician and Cambrian age, which in turn unconformably overlie the Pre-Cambrian crystalline Greenville Basement.

At PBOW, four Devonian formations subcrop beneath glacial drift cover (Shaw, 2003). Form oldest to youngest these formations are Delaware Limestone, Plum Brook Shale, Prout Limestone, and the Huron Shale member of the Ohio Shale. Further details of PBOW-specific geology are presented in the SCR (Appendix A).

2.2.2 R2BG Geology

Overburden thicknesses at R2BG range from 20 to 23.5 feet, with greater thicknesses toward the north. The overburden is characterized as clay or silty clay with a fairly continuous layer of silt or clayey silt near the surface. The Plum Brook Shale subcrops beneath the unconsolidated deposits over R2BG. The thickness of this shale ranges from 1.8 to 11 feet, with thicknesses decreasing in the north and northwest. The Delaware Limestone underlies the Plum Brook Shale.

2.3 Hydrogeology

2.3.1 PBOW Groundwater

Groundwater at PBOW includes the shallow overburden/shale and the limestone bedrock aquifers. PBOW is located within a transition between the two aquifers; the shale is absent to the northeast. Both aquifers are overlain by a veneer of glacial drift, generally less than 20 feet thick, that is considered a poor source of groundwater. Flow in the overburden/shale is toward the local surface drainages, with a generally northerly trend. Groundwater flow in the Delaware Limestone is generally toward the north but is influenced by major fracture zones (Shaw, 2003).

2.3.2 R2BG Groundwater

Groundwater underlying R2BG includes both the overburden/shale and the limestone bedrock aquifers. Groundwater elevations in the overburden/shale unit range from 634.4 to 637.4 feet amsl. Depths to the shallow groundwater ranged from 2.4 to 6.2 feet bgs. Because of limited water encountered during piezometer installation, no monitoring wells were installed in the overburden/shale unit. The shallow groundwater underlying R2BG flows to the north, toward the drainage ditches. Adequate water level data could not be collected in the limestone unit to confirm flow directions. However, it is likely that limestone groundwater underlying R2BG flows in a southeastern direction toward a nearby northeast-southwest fracture.

2.4 Groundwater Quality and Use

2.4.1 Groundwater Quality

Two groundwater aquifer systems are utilized for drinking water in the region: a carbonate aquifer to the west and a shale aquifer to the east (Shaw, 2005). PBOW is located within the transition of the two systems. The limestone unit typically yields an adequate volume of groundwater for a drinking water source but is regionally regarded by the Ohio Department of Natural Resources (ODNR) (1962) as being of low quality because of high mineral content.

The two main water-bearing zones underlying the PBOW facility are located in the overburden/shale unit and the limestone bedrock and are thus called the overburden/shale and bedrock water-bearing zones. The overburden and shale groundwater units exhibit similar water levels, suggesting substantial vertical communication, and are considered one hydrogeologic unit.

Overburden/Shale Groundwater. Groundwater in the overburden is in discontinuous pockets during dry time periods (Shaw, 2005; IT, 1997b, 1999, 2001a). Also, the shallow overburden generally has low yields over most of PBOW due to the high percentage of silt and clay. Because of these conditions, the overburden/shale groundwater yields insufficient volume for potable use in many areas of the underlying PBOW. Particularly at R2BG, where overburden/shale groundwater was encountered at such an insufficient volume, no shallow wells could be installed (Jacobs, 2006). Additionally, groundwater from background wells in competent shale bedrock was found to have elevated concentrations of chloride, sulfate, iron, manganese, and total dissolved solids (TDS) (Shaw, 2006). Some of these concentrations, especially those of sulfate and TDS, were found at levels that far exceed the respective U.S. Environmental Protection Agency (EPA) Office of Groundwater Secondary Drinking Water

Regulations (SDWR) or health advisories (EPA, 2012). The SDWRs are nonenforceable levels that are based on aesthetic properties (e.g., taste, odor, or color) or cosmetic effects (e.g., skin or tooth discoloration). The following bulleted items compare concentrations of these analytes in samples from off-site upgradient background shale unit groundwater wells to the respective Office of Drinking Water SDWRs or health advisories.

- ***Chloride*** – 50 percent of the background wells exceeded the chloride SDWR of 250 milligrams per liter (mg/L) or parts per million (ppm). The maximum background concentration (3,540 ppm) was 14 times higher than the SDWR.
- ***Sulfate*** – 11 percent of the background wells exceeded the sulfate SDWR of 250 ppm. The maximum background concentration (514 ppm) was approximately twice the SDWR.
- ***Iron*** – 32 percent of the background wells exceeded the iron SDWR of 0.3 ppm. The maximum background concentration (1.55 ppm) was approximately 5 times higher than the SDWR.
- ***Manganese*** – 61 percent of the background wells exceeded the manganese SDWR of 0.05 ppm. The maximum background concentration (0.728 ppm) was over 14 times higher than the SDWR.
- ***Sodium*** – 100 percent of the background wells exceeded the sodium health advisory level of 20 ppm. The maximum background concentration (1,390 ppm) was approximately 70 times higher than the sodium health advisory level. (Note that no SDWR exists for sodium.)
- ***TDS*** – 82 percent of the background wells exceeded the TDS SDWR of 500 ppm. The maximum background concentration (6,850 ppm) was nearly 14 times higher than the SDWR.

Based on naturally occurring high TDS and other analytes as described in the preceding list, this groundwater unit is consistent with the EPA guidelines for Class III nonpotable groundwater. Therefore, overburden/shale groundwater is generally not a suitable drinking water source, based on both low yield and naturally poor quality.

This low yield in the overburden/shale groundwater generally found underlying much of PBOW was observed in the vicinity of R2BG. Five temporary piezometers were installed around the perimeter of R2BG and seven measurements were collected over a period of 2 months from May 22 through July 20, 2004. Shallow groundwater levels at the site ranged from 2.4 to 6.2 feet bgs during this period. Piezometer hydrographs show water levels reached a high point during mid-June, following a very rainy period during the month of May and first half of June. Water levels

then dropped an average of 2.2 feet from June 15 through July 20, 2004, which coincides with a relatively dry period (Jacobs, 2006).

Limestone Bedrock Groundwater. The limestone bedrock water-bearing zone yields groundwater year round, although specific locations may not produce water or produce water at a minimal flow rate due to limited or tight bedrock fractures in some areas. During periods of low precipitation, only limited migration of contaminants would occur in the overburden due to reduced infiltration. Limestone bedrock groundwater underlying most of PBOW is of poor natural quality, largely due to naturally occurring petroleum hydrocarbons and hydrogen sulfide gas emissions.

The presence of natural petroleum-derived hydrocarbon seeps are common along the walls of area quarries (Shaw, 2005). Petroleum hydrocarbons were observed at depth during the drilling of bedrock well 2BG-BEDGW-002. 2BG-BEDGW-002 was noted in the monitoring well borelog as petroliferous (petroliferous meaning bedrock exhibited hydrocarbon staining and a hydrocarbon odor). Due to tight fractures and the associated slow and reduced groundwater recharge rates, an incomplete suite of groundwater samples was collected from the bedrock wells without any purge prior to sample collection (Jacobs, 2006). These observations provide evidence that petroleum hydrocarbons are naturally occurring in this general area of PBOW. Consistent with the findings of naturally occurring petroleum hydrocarbons in the limestone wells, benzene was detected in two of the three wells at R2BG. Limestone bedrock groundwater samples had benzene concentrations of 2,460 and 1,510 micrograms per liter (µg/L), and both exceed the promulgated Safe Drinking Water Act maximum contaminant level of 5 µg/L for benzene (EPA, 2012).

The TDS concentrations in groundwater from both limestone monitoring wells sampled (3,310 and 2,870 mg/L) exceeded the Safe Drinking Water Act SDWR for TDS of 500 mg/L. The predominant components of TDS are common salts; very small particulates; ionic forms of common elements such as calcium, magnesium, sodium, iron, sulfate, and strontium; and elevated TDS (Ohio Environmental Protection Agency [OEPA], 2009). The elevated TDS within the limestone bedrock that underlies PBOW likely results from the reducing conditions that mobilize metals. In addition, naturally occurring long-chained petroleum hydrocarbon molecules may also contribute to TDS in PBOW bedrock groundwater.

In summary, the limestone unit generally provides an adequate quantity of groundwater for hypothetical potable use. However, the natural quality of this water would fail drinking water

standards with respect to naturally occurring benzene that consistently exceeds the maximum contaminant level and TDS limit. The elevated benzene is related to naturally occurring petroleum hydrocarbons, and the high TDS is likely associated with naturally occurring reducing conditions.

2.4.2 Groundwater Use

Upwards of 170 private drinking water wells permitted by the Erie County Health Department are located within 4 miles of PBOW. USACE conducted a private well survey for the area within 1 mile of the downgradient PBOW boundary. Only five private wells were identified within the 1-mile radius. Two of these were identified as being used for the irrigation of lawns and gardens and washing cars, and the other three were not used at all (Appendix A of Shaw [2006]). Groundwater is not used within the PBOW facility.

2.5 Surface Water

2.5.1 PBOW Surface Water

PBOW lies in the eastern region of the Pickeral Creek – Pipe Creek Basin, which in turn, lies within the St. Lawrence River drainage basin. The Huron River Basin lies approximately 3.5 miles east of PBOW. Sandusky Bay and Lake Erie are approximately 4.5 miles north of the site.

Eleven streams pass through or originate within PBOW and are a part of four drainage areas: 1) Sawmill Creek (southern PBOW); 2) Plum Brook (central (PBOW); 3) Pipe Creek (western PBOW); and 4) Storrs-Hemminger Ditch. All streams flow north or northeasterly into Sandusky Bay. Numerous ponds lie within and around PBOW.

The Erie County Health Department does not permit the use of surface water for private drinking water supply, and no surface water within PBOW is used as a drinking water supply.

2.5.2 R2BG Surface Water

The only surface water feature within the R2BG site is a drainage ditch that runs east to west and forms the north edge of the site. The drainage ditch is located 200 to 300 feet north of the former Burn Area and drains to the west across the site, then northwest to Pipe Creek. This drainage feature is approximately 4 feet wide and 6 to 7 feet deep. Elevations in the ditch range from 635 feet amsl upstream of the site to 633 feet amsl downstream. A less pronounced drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is ephemeral and flows only during the wet

season and following precipitation events, remaining essentially dry during the summer months. Flowing water was observed during a site reconnaissance in November 2003 and during the soil investigation in May 2004. Flow in the ditch began to dissipate in mid-June, with only small, disconnected pools observed at this time. By late June 2004, this stream channel was dry, and it remained so during investigation activities in late July 2004.

Reservoir No. 2 lies approximately 400 feet north of this drainage ditch. This reservoir is circular, has a surface area of less than 1 acre, and has an embankment approximately 5 feet above the natural ground surface (Jacobs, 2006).

3.0 Site Characterization and Evaluation

This chapter provides a summary of the sampling, analyses, results, and evaluation of the environmental media (i.e., soil, limestone bedrock groundwater, and sediment) associated with R2BG based chiefly on samples collected during the RI field activities. This information has been presented in the R2BG SCR (Jacobs, 2006), which is attached to this report as Appendix A. No overburden/shale monitoring well or surface water analytical data are available. Overburden/shale wells were not installed because of low yield, and surface water was not present during RI activities.

This chapter also includes references to the samples collected as part of the 1996 SI, as these data were also reviewed and evaluated with the RI data in the text of the SCR. These are briefly summarized in Section 3.1. Identification of the samples and the recommendations from the SI present a context for the performance of the RI and for some of the specific sampling locations selected and analyses performed in the RI.

Please note that this chapter provides no data or other information that have not been previously presented in the R2BG SCR (Appendix A).

3.1 Previous Investigation and Evaluation

Prior to the RI, a preliminary site assessment was conducted at R2BG confirming that the area was used as a burning ground (Science Applications International Corporation, 1991). In 1996, an SI was conducted by IT, which included a geophysical survey and excavation of four trenches to identify subsurface anomalies. To identify lithology, eight soil borings were drilled and the following soil samples were collected:

- Nine surface soil samples (0 to 0.5 foot), including one quality control sample
- Eighteen subsurface soil samples (2 to 3 and 6 to 7 feet), including two quality control samples.

Surface and subsurface soil samples were analyzed for nitroaromatics, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), polychlorinated biphenyls (PCB), target analyte list (TAL) metals, and cyanide.

The analytical results were compared to risk-based criteria (RBC) derived from EPA Region 3 (EPA, 1996) as described in the SI (IT, 1997b). Based on this screening evaluation, an SVOC

(benzo[a]pyrene), metals, the PCB Aroclor 1260, and nitroaromatic compounds (one as great as 910,000 µg/kg) were present in shallow soils at concentrations greater than RBCs. Subsurface soils also exhibited nitroaromatics, metals, and the PCB Aroclor 1260 at concentrations greater than RBCs. Based upon analytical conclusions, further soil sampling was recommended. The SI results are summarized in the SCR (Appendix A) and were further evaluated in the BHHRA (Chapter 4.0 and Appendix B) and SLERA (Chapter 5.0 and Appendix C). The SI results are presented in Tables 4-7, 4-8, 4-19, and 4-20 of the attached SCR.

3.2 Remedial Investigation Characterization and Evaluation

This section summarizes the 2004 through 2005 RI sampling of environmental media at R2BG, the analytical results, and an evaluation of these results as presented in the SCR (Jacobs, 2006). Additional details are provided in the SCR, which is included as Appendix A.

3.2.1 Samples and Analyses

The RI samples were collected consistent with the sitewide sampling and analysis plan (Jacobs, 2004a), site-specific sampling and analysis plan (SSAP) (Jacobs, 2004b), and work plan addendum (Jacobs, 2005) for R2BG. Trench excavation and soil, groundwater, and sediment sampling locations are shown on Figure 3-1.

A total of 65 surface and subsurface soil samples were collected as part of the RI for screening analysis of the full analytical suite (VOCs, polycyclic aromatic hydrocarbons [PAH], PCBs, nitroaromatics, metals, polychlorinated dibenzodioxin/furans, and lead). This includes 26 surface soil, 24 subsurface soil, and 15 trench soil samples. Generally, surface soil is defined as samples collected from within the interval of 0 to 1 foot bgs, and subsurface soil is defined as samples collected from depths greater than 1 foot bgs. The objective of the soil sampling was to delineate the extent of the burn layer and to define the extent of the soil contamination outside of the Burn Area (Jacobs, 2006).

Five piezometers were installed following the guidelines listed in the SSAP (Jacobs, 2004b) to determine the depth, gradient, and seasonal variability of the shallow groundwater. No overburden/shale monitoring wells were installed due to insufficient shallow groundwater encountered during piezometer installation (Jacobs, 2006).

Three limestone bedrock monitoring wells (2BG-BEDMW-001, 2BG-BEDW-M002, and 2BG-BEDMW-003) were installed at R2BG according to the SSAP (Jacobs, 2004b). The work plan

was designed to include upgradient, on-site, and downgradient groundwater locations. According to Jacobs (2006), the bedrock wells were placed in upgradient, source area, and downgradient locations based upon other nearby bedrock wells and the 2002 Delaware Limestone groundwater flow map from the *2002 Groundwater Data Summary and Evaluation Report* (Shaw, 2003).

The collection of three collocated surface water and sediment samples had been planned at locations within the drainage ditches north and east of R2BG. However, surface water was not present in the ditches except immediately following rainfall events. Surface water samples were not collected from the ditches during these wet time periods because the water would not have been representative of R2BG. Therefore, no surface water samples were collected (Jacobs, 2006).

The following list summarizes the samples and analyses collected for the RI:

- Surface soil – 26 samples
  - Within Burn Area (four samples)
    - Three analyzed for VOCs, PAHs, PCBs, nitroaromatics, and metals
    - One sample analyzed for VOCs, PAHs, PCBs, nitroaromatics, metals, and dioxin/furans.
  - Outside Burn Area (22 samples)
    - Three analyzed for VOCs, PAHs, PCBs, nitroaromatics, metals, and dioxin/furans
    - Nine analyzed for VOCs, PAHs, PCBs, nitroaromatics, and metals
    - Ten analyzed for PAHs, PCBs, nitroaromatics, and lead.
- Subsurface soil – 24 samples (12 sampled 3 to 5 feet bgs and 12 sampled 8 to 10 feet bgs)
  - Within Burn Area (eight samples)
    - Eight (four sampled 3 to 5 feet bgs and four sampled 8 to 10 feet bgs) analyzed for VOCs, PAHs, PCBs, nitroaromatics, and metals.
  - Outside Burn Area (16 samples)
    - Eight (3 to 5 feet bgs) analyzed for VOCs, PAHs, PCBs, nitroaromatics, and metals
    - Eight (8 to 10 feet bgs) analyzed for VOCs, PAHs, nitroaromatics, and metals.
- Limestone bedrock monitoring wells – One sampling event for a total of three groundwater samples were collected during the wet season in January 2005.
  - 2BG-BEDMW-001 - Analyzed for nitroaromatics, TAL metals (unfiltered), PCBs, and VOCs

  - 2BG-BEDWM-002 - Analyzed for nitroaromatics, TAL metals (filtered and unfiltered), PCBs, VOCs, PAHs, cyanide, anions, hardness, turbidity/alkalinity, and TDS/total suspended solids.

  - 2BG-BEDMW-003 - Analyzed for nitroaromatics, TAL metals (filtered and unfiltered), PCBs, VOCs, cyanide, anions, hardness, turbidity/alkalinity, and TDS/total suspended solids.

- Sediment – Three samples were collected and analyzed for VOCs, dioxins/furans, PAHs, and metals.

All analytical data from these samples were reviewed for accuracy and completeness. One hundred percent of the data analyzed were subjected to data validation following the guidelines in the EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999) and EPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 1994a) and is sampling and analysis plans (Jacobs, 2004a,b). Data were evaluated against specific criteria to verify the achievement of precision, accuracy, representativeness, completeness, and comparability goals established to meet the project data quality objectives (DQO). The criteria for blank evaluation were based on those detailed in *Region 3 Modifications to National Functional Guidelines for Evaluating Organic Analyses* (EPA, 1994b) and *Region 3 Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (EPA, 1993a). Additional information on data evaluation, data validation, and data quality are provided in the SCR (Appendix A).

3.2.2 Characterization of R2BG

3.2.2.1 Local Soils

At many PBOW sites, following closure and removal of the manufacturing structures, tanks, and equipment, a local fill sand was brought to the areas to cover the remaining concrete building foundations and demolition scars and provide a natural landscape appearance. Based on drilling and sampling logs, no fill sand is documented to be present at R2BG, consistent with the lack of aboveground structures and buildings. Within the burning ground area are remnants of the former burning ground. This material consists of a black clay with cinders, ash, gravel, and burned debris (glass fragments and metal pieces). The burn layer is approximately 1 to 2 feet in thickness. Soil immediately below the burned layer is typically a discolored (dark brown to black), firm, low-plasticity clay. A silt with clay layer was encountered at a depth of approximately 6 to 8 feet below the discolored clay. The silt/clay layer was light brown in color, soft, and wet. Below the silt with clay layer is a clay layer with variable amounts of silt. At a

depth of approximately 8 feet bgs, a firm, soft, light gray clay was encountered until refusal (refusal at 22.5 feet in boring 2BG-BEDGW-002).

Outside but near the former burning ground, a dark brown clay was encountered over burn debris (cinders) in two borings (BH09 and BH10) between depths of 1.3 to 1.6 and 2 to 2.5 feet, respectively. The grading of the former berm is also suspected to be evident in these two borings. In other borings away from the Burn Area, native surface soil also consists of dark brown, soft, low-plasticity clay. Clay with variable silt content to bedrock is the main constituent in all R2BG borings. Signs of a glacial till (angular sand and gravel) are seen in some borings (BH10 and BH11) at a depth of 9.5 to 10 feet bgs. The main description of the clay below 10 feet in most of the borings varies in a gray color, is soft to firm, and ranges from low to high plasticity. Angular sand, gravel, and rock fragments are typically seen at depth as the borings near bedrock.

3.2.2.2 Local Geology

Bedrock units in the R2BG consist of the Plum Brook Shale (member of the Olentangy Shale) and the underlying Delaware Limestone, both of Devonian age. The Plum Brook Shale at R2BG was encountered at an average depth of 22.5 feet bgs. In general, the shale was light gray in color, weathered, friable, and soft. Thickness of the shale in the three bedrock monitoring well locations averaged 7 feet. Below the shale, the Delaware Limestone was encountered. It was found at depths ranging from 25.3 feet (614.4 feet amsl) in bedrock well 2BG-BEDGW-001 to 30.6 feet bgs (610.3 feet amsl) in well 2BG-BEDGW-003. The limestone was typically light gray in color, massive, fossiliferous, and hard. Hydrocarbon was noted on the borelog in boring 2BG-BEDGW-002 at a depth of 67 to 71.5 feet bgs (569.4 to 579.9 feet amsl).

3.2.2.3 Local Hydrogeology

Overburden/shale groundwater at R2BG was encountered at depths ranging from 6 feet bgs (PZ-01, PZ-02, and PZ-03) to 7.8 feet bgs (PZ-05) in May 2004 (wet season) during soil boring drilling/piezometer installation. During bedrock monitoring well installation conducted in June 2004 (wet season), overburden/shale groundwater was encountered at depths of 7 feet bgs (2BG-BEDGW-001) to 8 feet bgs (2BG-BEDGW -003). As shown by the June 2004 overburden/shale groundwater elevation contour map based on piezometer elevations and surface water (when present) elevations in the drainage ditch, groundwater flow is in a northerly direction (Figure 3-2). Overburden/shale groundwater flow depicted on this contour map indicates that groundwater flow generally mimics the surface topography.

Three bedrock wells were installed at R2BG in June 2004 during the RI. Depth of water-producing bedrock fractures in the borings could not be determined due to minimal water located during drilling. Groundwater recharge was also limited in each of the bedrock wells (2BG-BEDGW-001, 2BG-BEDGW-002, and 2BG-BEDGW-003) and did not allow a complete well development. Although adequate water level data could not be collected from the three R2BG wells to confirm flow direction, the groundwater flow direction in the limestone water unit was interpreted to be toward the southeast in the vicinity of R2BG. This flow direction is based on the presence of a linear northeast-to-southwest feature that may represent a fracture system and/or karst development.

3.2.2.4 Summary of Analytical Results

The analytical results of the RI samples, described in Section 3.2.1, are summarized in this section. As part of this evaluation, analytes detected in the respective environmental media were compared to PRG and background screening concentrations (BSC) as points of reference only. Analytes detected in R2BG RI soil samples are presented in Tables 4-1 through 4-6 and Tables 4-9 through 4-16 of the SCR (Appendix A). Tables 4-21 through 4-23 of the SCR present the analytes detected in limestone bedrock groundwater. Analytes detected in sediment are presented in Tables 6-1 through 6-4 of the SCR. The respective PRG values are included in these tables. PRGs do not infer a regulatory limit or mandated cleanup level, nor is the identification of an exceedance intended to indicate an unacceptable human health risk or a need for remedial action. A formal evaluation of human health risks was performed in the BHHRA (Appendix B), which includes further information on PRGs.

The evaluation of the analytical results of the samples and analyses (Section 3.2.1), as presented in the SCR, are summarized below for each medium.

Soil Within Burn Area (1996, 2004, and 2005)

Surface Soil (0 to 1 foot):

A total of seven surface soil samples have been collected inside of the Burn Area. Analytical results of detected chemicals are included in SCR Tables 4-1 through 4-8 (Appendix A). One of the surface soil samples collected during the 2004 investigation included analysis for dioxin/furans (BH-17). Distributions and concentrations of contaminants exceeding the PRGs in the surface soil are presented on Figure 3-3. Specific compounds exceeding the EPA Region 9 October 1994 residential preliminary remediation goals (PRG) (EPA, 2004) and established background values for inorganics include the following (Jacobs, 2006):

- 2,3,7,8-Tetrachlorodibenzo-p-dioxin - one location
- PCB-1260 (Aroclor 1260) - six locations
- TNT - five locations
- Benzo(a)pyrene - two locations
- Lead - seven locations.

Burn Layer Soil (1 to 2 feet):

A total of 10 samples were collected from the burn layer material, five of which were analyzed for dioxins/furans only. Analytical results of detected chemicals are shown in SCR Tables 4-9 through 4-14 (Appendix A). Distributions and concentrations of compounds exceeding the PRGs and the established background values for inorganics in burn layer material are presented on Figure 3-4. Specific compounds exceeding the EPA Region 9 residential PRGs (October 2004) and established background values for inorganics include the following (Jacobs, 2006):

- PCB-1254 (Aroclor 1254) - two of five locations
- PCB-1260 (Aroclor 1260) - four of five locations
- 2,4 -Dinitrotoluene - all five locations
- 2,6-Dinitrotoluene - four of five locations
- TNT - all five locations
- 2-Nitrotoluene - two of five locations
- 1,3-Dinitrobenzene - one of five locations
- Benzo(a)pyrene - one of five locations
- Dibenz(a,h)anthracene - one of five locations
- Napthalene - three of five locations
- Lead - all five locations
- Thallium - all five locations
- Barium - one of five locations
- Copper - one of five locations.

Concentrations of TNT at trench locations TR05, TR07, TR08, and TR09 are two to three orders of magnitude higher than the PRGs. Concentrations of DNT compounds at trench locations TR08 and TR09 are one to two orders of magnitude higher than the PRGs. Based on these concentrations, the burn layer material sampled from trenches TR08 and TR09 is composed of 3.6 to 4.5 percent explosives (Jacobs, 2006).

Subsurface Soil (2 to 10 feet):

A total of 17 subsurface soil samples were collected from beneath the burn layer. Analytical results of detected chemicals are included in SCR Tables 4-15 through 4-20 (Appendix A). Six samples collected during the 1996 SI were collected from three locations at two intervals: 2 to 3 and 6 to 7 feet bgs. The 1996 SI sample collected from the 2 to 3 feet interval at location

2BGSO-03 included material from the burn layer, which may account for the high explosives concentrations (Figure 3-5). The burn layer at this location was encountered from 2.0 to 2.5 ft bgs. Three samples collected during the 2004 trenching program were analyzed for dioxins/furans only and represent the only locations where soil beneath the burn layer was analyzed for dioxins/furans. Eight samples collected during the 2004 DPT investigation were collected from four locations at two intervals: 3 to 5 and 8 to 10 feet bgs. Distributions and concentrations of compounds exceeding the PRGs in soil beneath the burn layer are presented on Figure 3-5. Specific compounds exceeding the October 2004 EPA Region 9 residential PRGs (EPA, 2004) include the following (Jacobs, 2006):

- 2,4,6-TNT - two locations
- 2,4-DNT - three locations
- 2,6 -DNT - one location
- PCB-1260 (Aroclor 1260) - one location
- Thallium - five locations
- Aluminum - four locations.

Soil Outside Burn Area

Surface Soil (0 to 1 foot):

A total of 27 surface soil samples were collected outside of the Burn Area. Analytical results of detected chemicals are included in SCR Tables 4-1 through 4-8 (Appendix A). Three of the surface soil samples collected during the 2004 investigation included analysis for dioxin/furans (BH-09, BH-10, and BH-11). Distributions and concentrations of compounds exceeding the PRGs in surface soil are presented on Figure 3-3. Specific compounds exceeding the October 2004 EPA Region 9 Residential PRGs (EPA, 2004) and established background values for inorganics include the following (Jacobs, 2006):

- 2,3,7,8-Tetrachlorodibenzo-p-dioxin - one of three locations sampled
- PCB-1260 (Aroclor 1260) - 11 of 27 locations
- 2,4,6-Trinitrotoluene - 5 of 27 locations
- Benzo(a)pyrene - 11 of 27 locations
- Dibenz(a,h)anthracene - 1 of 27 locations
- Benzo(b)fluoranthene - 1 of 27 locations
- Lead - 20 of 27 locations.

Half of the additional surface soil locations sampled in April 2005 had PRG exceedances for one or more compounds.

Subsurface Soil (2 to 10 feet):

A total of 28 subsurface soil samples have been collected outside of the Burn Area. Analytical results of detected chemicals are included in SCR Tables 4-15 through 4-20 (Appendix A). Ten samples collected during the 1996 SI were collected from five locations at two intervals: 2 to 3 and 6 to 7 feet bgs. Two samples collected during the 2004 trenching program were analyzed for dioxins/furans only and represent the only locations where subsurface soil outside of the Burn Area was analyzed for dioxins/furans. Sixteen samples collected during the 2004 DPT investigation were collected from eight locations at two intervals: 3 to 5 and 8 to 10 feet bgs. Compounds exceeding the October 2004 EPA Region 9 Residential PRGs (EPA, 2004) and established background values for inorganics are limited to metals. Distributions and concentrations of compounds exceeding the PRGs in subsurface soil are presented on Figure 3-5 (Jacobs, 2006).

Piezometer Overburden/Shale Groundwater Summary:

Five temporary piezometers were installed from May 20 through 25, 2004 around the perimeter of R2BG to determine the depth, gradient, and seasonal variability of the shallow overburden groundwater. No overburden/shale groundwater samples were collected (Jacobs, 2006).

Monitoring Well Overburden/Shale Groundwater Sample Summary:

Shallow overburden monitoring wells were not installed due to insufficient permeable material in the subsurface. OEPA and the USACE Nashville District geologist concurred with this decision (Jacobs, 2006).

Bedrock Groundwater Sample Summary:

Due to low porosity and associated low recharge rates, only one round of groundwater samples was collected from bedrock monitoring wells. Groundwater samples were collected in January 2005 (wet season) using a disposable bailer and without purging the well prior to sample collection. Since wells exhibited limited volumes of water, no groundwater water quality measurements were recorded.

Contaminants detected include PAHs, metals, and VOCs. The analytical results of detected chemicals are shown in SCR Tables 4-21 through 4-23.

The distribution of detections that exceed the PRGs are shown on Figure 3-6. Specific compounds exceeding the October 2004 EPA Region 9 Residential PRGs (EPA, 2004) and established background values (Shaw, 2005) for inorganics include the following (Jacobs, 2006):

- Acenaphthene - one well (PAH analysis performed for one well only)
- Benzo(a)anthracene - one well (PAH analysis performed for one well only)
- Napthalene - one well (PAH analysis performed for one well only)
- Arsenic - all three wells
- Iron - two of three wells
- Manganese - one of three wells
- Benzene - two of three wells
- Xylene - all three wells.

Sediment Summary

Three sediment samples were collected and analyzed for VOCs, PAHs, PCBs, nitroaromatics, metals, and dioxin/furans. Contaminants detected include dioxins, furans, PAHs, metals, and VOCs. Analytical results of chemicals detected in sediment are shown in SCR Tables 6-1 through 6-4 (Appendix A). The distribution of detections that exceed the PRGs is shown on Figure 3-7. Specific compounds exceeding the October 2004 EPA Region 9 residential PRGs (EPA, 2004) include the following (Jacobs, 2006):

- Benzo(a)pyrene - all locations
- Benzo(a)anthracene - upstream location only
- Benzo(b)fluoranthene - upstream location only
- Indeno(1,2,3-c,d)pyrene - upstream location only.

4.0 Baseline Human Health Risk Assessment

This chapter provides a summary of the R2BG BHHRA report (Jacobs, 2010a), which is included as Appendix B. It is important to note that this site-specific risk assessment, including the evaluation of future land use and groundwater use, was performed to satisfy administrative requirements. This chapter provides no data or other information that has not been previously presented in the full BHHRA or SCR (Appendix A) reports.

The BHHRA evaluates potential human health risks associated with exposure to soil, bedrock groundwater, and sediment associated with R2BG at the former PBOW. Environmental media evaluated in the BHHRA include surface soil, subsurface soil, limestone bedrock groundwater, and sediment. Because of a lack of water, no groundwater samples could be collected from the overburden unit, and representative surface water was not present in the adjacent drainage ditches from which sediment samples were collected. Human health risks associated with soil inside of the Burn Area and outside of the Burn Area were evaluated separately.

This summary identifies the chemicals of potential concern (COPC); summarizes the receptors, media, and exposure pathways evaluated; summarizes the risk characterization; and presents the BHHRA conclusions. The BHHRA was performed consistent with EPA guidance and with the procedures established in the BHHRA for TNTA and TNTC soil (IT, 2001b), the BHHRA for groundwater at PBOW (Shaw, 2006) and, most specifically, the R2BG BHHRA work plan (Jacobs, 2008).

4.1 Identification of Chemicals of Potential Concern

A screening procedure was conducted on the RI and SI (IT, 1997b) analytical data from each R2BG environmental medium. This screening process is used to identify COPCs, which are the detected chemical analytes carried through the full risk assessment process. The objectives of COPC screening are to focus the risk assessment on those chemicals that may contribute significantly to overall risk and to remove from quantification those chemicals whose contribution is clearly inconsequential. COPC screening includes a risk-based screen which also considers status as a human nutrient, a frequency-of-detection evaluation, and a background screen.

The COPC screening process resulted in the generation of a data summary table that includes each medium quantitatively evaluated in the BHHRA. This table generated during the BHHRA

is included as Table 4-1 of this RI report. Table 4-1 includes the following information for each chemical detected in surface soil inside the Burn Area, subsurface soil inside of the Burn Area, surface soil outside of the Burn Area, subsurface soil outside of the Burn Area, limestone bedrock groundwater, and sediment:

- Chemical name
- Frequency of detection
- Range of detected concentrations
- Range of detection limits
- Arithmetic mean of site concentrations
- Appropriate risk-based screening concentration
- Appropriate BSC
- Selection/exclusion of chemical as a COPC.

Additional details of this data summary, including the estimation of the upper confidence limit values and exposure point concentrations for COPCs, are discussed in the BHHRA (Appendix B).

- ***Inside the Burn Area Surface Soil*** – 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalent (TEQ), TNT, 2,4-DNT, 2,6-DNT, 2-amino-4,6-dinitrotoluene (2-ADNT), 4-amino-2,6-dinitrotoluene (4-ADNT), lead, thallium, acenaphthylene, benzo(a)pyrene, benzo(g,h,i)perylene, naphthalene, phenanthrene, and Aroclor 1260

- ***Inside the Burn Area Subsurface Soil*** –TCDD TEQ, 1,3-dinitrobenzene, TNT, 2,4-DNT, 2,6-DNT, 2-ADNT, 4-ADNT, 2-nitrotoluene, aluminum, barium, chromium, copper, lead, thallium, acenaphthylene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, naphthalene, phenanthrene, Aroclor 1254, Aroclor 1260

- ***Outside the Burn Area Surface Soil*** – TNT, 2,4-DNT, 2,6-DNT, 2-ADNT, 4-ADNT, 2-nitrotoluene, cadmium, copper, lead, acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, phenanthrene, 2-methylnaphthalene, Aroclor 1260

- ***Outside the Burn Area Subsurface Soil*** –2,4-DNT, TNT, 4-ADNT, cadmium, chromium, cobalt, copper, lead, manganese, thallium, vanadium, acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-c,d)pyrene, phenanthrene

- ***Bedrock Groundwater*** – Aluminum, antimony, arsenic, iron, manganese, thallium, vanadium, cyanide, acenaphthene, benzo(a)anthracene, naphthalene, benzene, carbon disulfide, chloromethane, xylenes.

- ***Sediment*** – TCDD TEQ, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, naphthalene, phenanthrene.

4.2 Exposure Assessment

Exposure is the contact of a receptor with a chemical or physical agent. An exposure assessment estimates the type and magnitude of potential exposure of a receptor to COPCs found at or migrating from a site (EPA, 1989). The R2BG BHHRA characterizes potential exposures to COPCs in WWTP1 environmental media as portrayed by the conceptual site exposure model (CSEM). These environmental media include soil, sediment, and groundwater.

The CSEM provides the basis for identifying and evaluating the potential risks to human health in the BHHRA. The CSEM, graphically depicted on Figure 4-1, includes the receptors appropriate to all plausible site-use scenarios and the potential exposure pathways. This presentation of all possible pathways by which a potential receptor may be exposed, including all sources, release and transport pathways, and exposure routes; facilitates consistent and comprehensive evaluation of risk to human health; and helps to ensure that potential pathways are not overlooked. The elements of a CSEM include the following:

- Source
- Source media (i.e., initially contaminated environmental media)
- Contaminant release mechanisms
- Contaminant transport pathways
- Intermediate or transport media
- Exposure media
- Receptors
- Routes of exposure.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact with a contaminated source medium (e.g., ingestion or dermal contact).

The receptors and pathways on Figure 4-1 reflect scenarios developed from information regarding site background and history, topography, climate, and demographics as presented by Dames and Moore, Inc. (1997b) and the sitewide groundwater investigation (IT, 1997b). No current or future exposure by off-site residents is evaluated. Most of the off-site residents are serviced by municipal water from surface water sources. Although there are numerous private groundwater wells in the vicinity, including several within 1 mile of the facility boundary, none of these is used as a potable source. Based on the investigations of other PBOW sites, natural hydrocarbons and hydrogen sulfide are known to be present within the bedrock limestone, and shale formation groundwater generally provides low yields and is of low quality (Shaw, 2008); however, the groundwater underlying R2BG was not summarily excluded for consideration as a tap water source based on natural water quality parameters or general assumptions concerning

yield. Therefore, given the presence of numerous off-site wells and the assumption of unrestricted future land use on the site, the development of groundwater for on-site residential (or on-site worker) use as tap water was evaluated for purposes of this BHHRA. Groundwater quality and use are discussed further in Section 2.4.

Exposure associated with the COPCs were evaluated using the following receptors. The media that were quantitatively evaluated for each receptor are listed in parentheses:

- Current/future groundskeeper (surface soil)
- Future indoor worker (surface soil, bedrock groundwater)
- Current/future construction worker (surface soil, subsurface soil, sediment)
- Future resident (surface soil, subsurface soil, sediment, bedrock groundwater)
- Current/future adult hunter (surface soil, including venison pathway)
- Current/future hunter's child (surface soil [venison pathway only]).

The resident was evaluated for noncancer hazards separately for the young child (ages 1 through 6 years) and adult life stages, and the noncancer hazard results are presented separately for the child and adult residents. Cancer risk results for the child and adult resident were evaluated separately but are combined in this report to present cancer risks associated with the 30-year residential child/adult exposure duration.

Based on the groundwater investigation (Jacobs, 2006), the limestone bedrock groundwater unit underlying R2BG would not provide an adequate quantity of groundwater, and the quality of this water would fail drinking water standards due to the presence of naturally occurring compounds that are unrelated to former site activities. Also, the bedrock groundwater wells installed at R2BG (and other areas of PBOW) emit notable amounts of naturally occurring hydrogen sulfide gas, which may result in nuisance odors and, at elevated levels, potential health concerns. The presence of hydrogen sulfide gas, which has direct and indirect corrosive effects, results in the rapid deterioration of metal components of well materials, pumps, and plumbing. Therefore, groundwater from the limestone unit underlying the R2BG is regarded as nonpotable, despite the assumption made in the BHHRA that it may be developed as a drinking water source. The assumption of potability for the limestone bedrock groundwater was made in the BHHRA because OEPA maintained that this assumption should initially be made under baseline conditions where no prior use restrictions are in place. Overburden groundwater monitoring wells were not installed because of a lack of groundwater in this unit underlying R2BG. Therefore, the overburden/shale groundwater could not be evaluated with respect to potential exposure, but its paucity indicates that exposure to groundwater from this unit is not plausible.

The equations for the calculations of intake values for each exposure pathway, exposure assumptions, and the calculation of EPCs of COPCs for modeled pathways (e.g., venison, airborne concentrations) are presented in the BHHRA (Appendix B).

4.3 Risk Characterization

Risk characterization is the process of applying numerical methods and professional judgment to determine the potential for adverse human health effects to result from the presence of site-specific chemicals. This is done by combining the intake rates estimated during the exposure assessment with the appropriate toxicity information identified in the toxicity assessment (see Chapter 4.0 of the BHHRA in Appendix B). Noncancer hazards and cancer risks are characterized separately, including COPCs that induce both types of effects.

Quantitative expressions are calculated during risk characterization that describe the probability of developing cancer (i.e., incremental lifetime cancer risk [ILCR]), or the nonprobabilistic comparison of estimated dose with an reference dose (RfD) for noncancer effects (i.e., hazard quotients [HQ] and hazard index [HI]). Quantitative estimates are developed for individual chemicals, exposure pathways, and exposure media for each receptor. These quantitative risk characterization expressions, in combination with qualitative information, are used to guide risk management decisions. Risk characterization is applied only to COPCs.

4.3.1 Cancer Risk

The risk from exposure to potential chemical carcinogens is estimated as the probability of an individual developing cancer over a lifetime and is called the ILCR. Equations for calculating the ILCR are presented in the BHHRA (Appendix B).

Total ILCRs in the range of 1E-6 to 1E-4 are regarded as acceptable (EPA, 1990); this range is referred to as the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk management range. Risks less than this range are regarded as negligible. A target cancer risk goal of 1E-5 is used by OEPA and was selected by the PBOW Project Delivery Team as a basis to consider remedial action. Use of this 1E-5 goal represents a departure from the Army's practice of generally using a cancer risk exceeding a value of 1E-4 (the upper end of the NCP risk management range) to trigger remedial action considerations.

4.3.2 Noncancer Effects of Chemicals

The hazards associated with noncancer effects of chemicals are evaluated by comparing an exposure level or intake with an RfD. The HQ, defined as the ratio of intake to RfD, is estimated by dividing the intake of a chemical by the RfD as described in the BHHRA (Appendix B). Chemical noncancer hazards are evaluated using chronic RfD values. An HQ of unity indicates that the estimated intake equals the RfD. If the HQ is greater than unity, there may be concern for potential adverse health effects. In the case of simultaneous exposure of a receptor to multiple chemicals, or to a given chemical by multiple pathways, an HI is calculated as the sum of the HQs.

A total HI is calculated as the sum of all HI values, including all media and all COPCs, for a given receptor. Calculating a total HI as the sum of HQ values is based on the assumption that the potential for noncancer effects is additive. EPA (1989), however, acknowledges that the assumption of additivity is probably appropriate only for chemicals that induce adverse effects by the same mechanism. Therefore, if the total HI for a receptor exceeds 1, individual HI values may be calculated for each target organ, as described in Appendix B.

4.3.3 Risk Characterization Results

Cancer and noncancer risk characterization results were evaluated in the BHHRA for each environmental medium and each receptor scenario using the methods summarized in Sections 4.3.1 and 4.3.2 and described in Appendix B. The cancer risks and noncancer hazards are presented for each receptor exposed to R2BG media inside the Burn Area are shown in Table 4-2, and those for receptors exposed to media outside the Burn Area are shown in Table 4-3.

The overall HI and ILCR values are summarized by environmental medium and receptor in the following bullets. Exceedances of the PBOW cancer risk goal (ILCR>1E-5) are shown in bold type, and exceedances of the noncancer hazard criterion (HI>1) or the NCP risk management range (1E-6 to 1E-4) are shown in bold italics:

Inside the Burn Area – Surface Soil

- Current/future groundskeeper: **ILCR = 8E-5**; ***HI = 12***
- Future indoor worker: **ILCR = 4E-5; *HI = 6***
- Current/future construction worker: ILCR = 4E-6; ***HI = 33***
- Future resident: ***ILCR = 3E-4***; ***child HI = 140***; ***adult HI = 15***
- Current/future hunter: ILCR = 6E-6; HI = 0.7
- Current/future hunter's child: ILCR = 5E-10; HI = 0.0002.

Inside the Burn Area – Subsurface Soil

- Current/future construction worker: **ILCR = 2E-5**; ***HI = 154***
- Future resident: ***ILCR = 4E-3***; ***child HI = 651***; ***adult HI = 70***

Outside the Burn Area – Surface Soil

- Current/future groundskeeper: **ILCR = 3E-5**; HI = 1
- Future indoor worker: ILCR = 1E-5; HI = 0.6
- Current/future construction worker: ILCR = 2E-6; ***HI = 3***
- Future resident: **ILCR = 1E-4**; ***child HI = 15***; ***adult HI = 2***
- Current/future hunter: ILCR = 2E-6; HI = 0.1
- Current/future hunter's child: ILCR = 4E-10; HI = 0.0002.

Outside the Burn Area – Subsurface Soil

- Current/future construction worker: ILCR = 1E-6; HI = 1
- Future resident: **ILCR = 8E-5**; ***child HI = 5***; adult HI = 0.6

Groundwater

- Future indoor worker: ***ILCR = 2E-3; HI = 15***
- Future resident : ***ILCR = 8E-3***; ***child HI = 101***; ***adult HI = 44***

Sediment

- Current/future construction worker: ILCR = 2E-7; HI is negligible
- Future resident: ILCR = 3E-6; child and adult are negligible.

4.3.4 BHHRA Conclusions

The conclusions are presented separately in this section for receptors exposed to soil inside the Burn Area and outside the Burn Area.

Inside the Burn Area – Surface Soil. Among the current potential receptors evaluated for exposure to R2BG inside the Burn Area surface soil (i.e., groundskeeper, construction worker, hunter, and hunter's child), the PBOW cancer risk goal is exceeded only for the groundskeeper. None of these potential current receptors have a surface soil ILCR that exceeds the NCP risk management range. However, both the groundskeeper and construction worker have HI values that exceed the HI criterion of 1, indicating that adverse noncancer health effects cannot be regarded as unlikely under these scenarios. Please note that there are no current or planned construction activities at R2BG, and no groundskeeping activities are known or apparent based on current site conditions but may occur infrequently. Thus, the current groundskeeper scenario,

which assumes a full-time, 25-year employee who works exclusively at R2BG for 8 hours per day, 250 days per year (refer to Chapter 3.0 in Appendix B), appears to greatly overestimate the exposure levels of any current on-site worker or other current receptor. Therefore, it is doubtful that any individual is currently exposed to R2BG Burn Area surface soil at a level that may result in adverse noncancer health effects.

Under potential future surface soil exposure scenarios (i.e., resident, indoor worker, groundskeeper, construction worker, hunter, and hunter's child), the future resident has an ILCR that exceeds both PBOW ILCR goal and the NCP risk management range, and both the indoor worker and groundskeeper have surface soil ILCR values that exceed the PBOW cancer risk goal, but not the NCP risk management range. The following potential future receptors have HI values that exceed the HI criterion of 1: resident, indoor worker, construction worker, and groundskeeper.

The following site-related cancer risk-driving chemicals in Burn Area surface soil were identified in the BHHRA: TNT, DNT mixture, 2,3,7,8-TCDD TEQ, and Aroclor 1260. TNT and lead were the noncancer hazard-driving chemicals in surface soil inside the Burn Area.

Inside the Burn Area – Subsurface Soil. Both of the receptors evaluated in the BHHRA for exposure to subsurface soil (i.e., future resident and future/current construction worker) were found to have associated ILCR values that exceed the PBOW cancer risk goal. Only the resident had an ILCR that exceeds the NCP risk management range. Both of these receptors had HI values that exceed the HI criterion of 1. As stated above with respect to surface soil, there is currently no construction ongoing or planned at R2BG, so there is currently no exposure to subsurface soil within R2BG.

The following site-related cancer risk-driving chemicals in Burn Area subsurface soil were identified in the BHHRA: TNT, DNT mixture, 2,3,7,8-TCDD TEQ, Aroclor 1254, and Aroclor 1260. TNT, 2,4-DNT, 2,6-DNT, Aroclor 1254, and lead were the noncancer hazard-driving chemicals in subsurface soil inside the Burn Area.

Outside the Burn Area – Surface Soil. Among the current potential receptors evaluated for exposure to R2BG outside the Burn Area surface soil (i.e., groundskeeper, construction worker, hunter, and hunter's child), the PBOW cancer risk goal is exceeded only for the groundskeeper. None of these potential current receptors have a surface soil ILCR that exceeds the NCP risk management range. Only the construction worker has an HI value that exceeds the HI criterion

of 1, indicating that adverse noncancer health effects cannot be regarded as unlikely under this scenario. Please note that there are no current or planned construction activities at R2BG.Therefore, it is doubtful that any individual is currently exposed to R2BG surface soil outside of the Burn Area at a level that may result in adverse noncancer health effects.

Under potential future subsurface soil exposure scenarios (i.e., resident, indoor worker, groundskeeper, construction worker, hunter, and hunter's child), only the groundskeeper and future resident have a ILCR values that exceed the PBOW ILCR goal. None of these receptors has an ILCR value that exceeds the NCP risk management range. Only the construction worker and resident have HI values associated with exposure to soil outside of the Burn Area that exceed the HI criterion of 1, indicating that adverse noncancer health effects cannot be regarded as unlikely under these two scenario.

The following site-related cancer risk-driving chemicals in surface soil outside of the Burn Area were identified in the BHHRA: TNT, DNT mixture, and Aroclor 1260. TNT and lead were the noncancer hazard-driving chemicals in surface soil outside of the Burn Area.

Outside the Burn Area – Subsurface Soil. The cancer risk associated with subsurface soil outside of the Burn Area exceeded the PBOW cancer risk goal, but not the NCP risk management range, only for the resident. Similarly, residential exposure yields an HI value for the child resident only that exceeds the PBOW noncancer hazard criterion of 1. However, the cancer risks and noncancer hazards were driven by naturally occurring, non-site-related inorganic constituents (i.e., aluminum, arsenic, and iron). Site-related chemicals did not significantly contribute to cancer risks or noncancer hazards associated outside of the Burn Area.

Groundwater. The PBOW cancer risk goal and the NCP risk management range were exceeded by the ILCR values associated with R2BG bedrock groundwater for each of the receptors evaluated (i.e., future resident and future indoor worker) in the BHHRA. Similarly, the HI values exceeded the HI criterion for each receptor. However, the risks and hazards associated with R2BG groundwater are regarded as implausible because exposure is unlikely due to low yield of the bedrock aquifer. In addition, the data quality of the samples was low due to high turbidity associated with the bailer sampling method, which had to be used due to low water yield. The risk-driving chemicals in R2BG groundwater are naturally occurring metals (i.e., arsenic, iron, and thallium) and naturally occurring petroleum-related organic chemicals (i.e., benzene) that are not associated with former PBOW activities. In summary, exposure is regarded as implausible and, regardless, the risk-driving analytes are not related to former site activities.

Sediment. The cancer risks for all receptors evaluated in the BHHRA for exposure to R2BG sediment (i.e., current/future construction worker and future resident) are less than the PBOW cancer risk goal and are either within or less than the NCP risk management range. Noncancer hazards are regarded as negligible, as no COPCs were identified based on noncancer effects.

5.0 Screening-Level Ecological Risk Assessment

This chapter provides a summary of the SLERA report (Jacobs, 2010b), which is included as Appendix C. It is important to note that this site-specific ecological risk assessment was performed to satisfy administrative requirements. This chapter provides no data or other information that has not been previously presented in the full SLERA or SCR (Appendix A) report.

The SLERA was performed to evaluate and provide an estimate of current and future ecological hazard associated with exposure to potential releases to soil, groundwater, and sediment associated with R2BG. This SLERA summary provides an ecological site description, identifies chemicals of potential ecological concern (COPEC), identifies ecological receptors, characterizes exposure, characterizes ecological risks, and presents the conclusions of the SLERA.

The SLERA is consistent with EPA guidance and with the procedures established in the SLERA for TNTA and TNTC soil (IT, 2001c) and, most specifically, the R2BG SLERA work plan (Jacobs, 2008).

5.1 Ecological Site Description

This ecological site description includes a general discussion of site background and the area of concern, surface water resources, wetlands, and vegetative communities; a species inventory; and a discussion of threatened and endangered species. Ecological characterization of the study area was based on a compilation of existing ecological information and site reconnaissance activities discussed in Sections 5.1.1 and 5.1.2. Information was obtained on the presence of state- and federally listed, threatened, and endangered species; species of special concern; and wildlife and fisheries resources. A botanist searched for threatened and endangered plant species during the reconnaissance visits. A checklist of biological species present at the site was developed using existing SI reports, environmental data sources, and information gathered during the site reconnaissance. Information on unique and special-concern habitats, preserves, wildlife refuge parks, and natural areas within the general vicinity was also obtained.

5.1.1 Site Background

PBOW is part of the Lake Plains region. Across PBOW, the land slopes gently to the north-northeast towards Lake Erie. The Lake Plains region itself is over 69 percent cropland, 2.7 percent pasture land, and 10.5 percent forest (ODNR, 1985). However, since the U.S. Army

acquired the site in 1941 and removed the land from agricultural production, undeveloped portions of the former PBOW have become second generation forest and open fields. This has resulted in PBOW becoming an island of forest and open fields within the greater context of primarily agricultural land in north-central Ohio.

R2BG is approximately 2 acres in size, and approximately 0.5 acre of this comprises the Burn Area. The ground surface is relatively flat, with minimal slope to the north and northwest. The majority of the site is an open field, and an east-west, ephemeral drainage ditch is at the northern boundary of the R2BG. This ditch, which contained no water during the RI sampling event, eventually flows to Pipe Creek. Areas to the south and west that are now wooded appear on historical photographs as being void of trees (Appendix A).

5.1.2 Site Reconnaissance

Jacobs ecological scientists performed site reconnaissance visits to R2BG in the spring and fall of 2008. These visits were performed at different times of year to identify early- and late-blooming plant species (especially threatened and endangered species) and to identify migrating and nesting bird species. These site visits were also used to compile lists of other fauna observed at the site. No federally or state-listed species were observed. A full species list is presented in the SLERA (Appendix C).

Prior to arrival at PBOW, site personnel obtained maps and other relevant site information and determined the locations of potential ecological units such as streams, creeks, ponds, grasslands, forest, and wetlands on or near the site. Additionally, the biological inventory performed in 1994 at PBOW (ODNR, 1995) that identifies and indicates the locations of threatened and endangered species at the installation was reviewed. The locations of known or potential contaminant sources affecting the site and the probable gradient of the pathway by which contaminants may be released from the site to the surrounding environment were identified. Reconnaissance personnel used the site visit to evaluate the site for more subtle clues of potential effects from contaminant release. Information obtained during the reconnaissance trips was used to select representative receptors, refine exposure scenarios for the risk assessment, and identify protected species or habitats of special concern in the study area. General habitat maps showing the types and extent of vegetation communities present within the immediate vicinity of the site were prepared based on information collected during the site reconnaissance.

5.1.3 Surface Water

No surface water was encountered in the ephemeral east-west ditch in the northern portion of R2BG.

5.1.4 Wetlands

No wetlands or significant aquatic habitats were observed during the spring and fall ecological surveys. According to the National Wetland Inventory (NWI) maps for the area (U.S. Fish and Wildlife Service, 1977), there are no designated wetlands at the R2BG site. It should be noted that the accuracy of NWI maps is limited, especially in relatively flat landscapes (such as PBOW), because minor depressions often contain isolated wetlands not easily identified through aerial photograph interpretation (the process used by the U.S. Fish and Wildlife Service in preparing NWI maps). NASA is currently performing a wetland delineation study at PBOW that will better identify locations and extent of sensitive wetland habitat throughout the installation.

5.1.5 Vegetative Communities

Vegetative communities at the site were classified during spring and fall 2008 site reconnaissance trips. The vegetation community map shown on Figure 5-1 was generated based on information obtained during these reconnaissance visits. Plant species identified are listed in Table 2-1 of the SLERA (Appendix C). The Burn Area and the study area immediately west of the Burn Area are upland old field, dominated by grasses and herbs. In the vicinity of the southern boundary of the Burn Area, the vegetation is classified as shrub thicket, dominated by gray dogwood (*Cornus racemosa*). Areas farther to the south, north, and east are successional woods, composed primarily of green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), and cottonwood (*Populus deltoids).*

Vegetative stress attributable to chemical contamination was not observed at R2BG. Based on site reconnaissance information, the northern portion of R2BG consists of a “pocket” of old field and dense shrub thicket dominated by gray dogwood surrounded by successional woods. The old field area may be irregularly mowed. The southern portion of R2BG is covered by successional woods.

5.1.6 Species Inventory

Based on information from ODNR (1995) and collected during the site reconnaissance, species lists were prepared for plants, mammals, birds, reptiles, amphibians, and fish. Note that no reptiles, amphibians, or fish were observed during reconnaissance at R2BG; the ditches at R2BG

are only occasionally inundated and are not expected to contain fish. These species lists are included in the SLERA.

A total of 85 plant species were documented at R2BG during the early summer and fall vegetation surveys. This comprises approximately 20 percent of the total number of species documented at PBOW either during the 1994 biological inventory (ODNR, 1995) or during vegetation surveys at other sites at the former PBOW.

Signs of 2 of the 43 species of mammals that may be found in the region based on species range maps were observed at R2BG during site visits, including raccoon and white-tailed deer. It is likely that other species are present but were not observed due to the short duration of the field visits.

A total of 130 species of birds are likely to be found in the region based on species range maps and field observations, and 105 species have been recorded at the former PBOW by the ODNR during their multiyear studies. During the 2008 spring and fall site reconnaissance, 23 bird species were documented at R2BG.

No threatened or endangered (T&E) plant or animal species were observed during site reconnaissance. Further, based on the habitat present at R2BG and/or lack of sightings in the vicinity of PBOW, no T&E bird species are expected to be found at R2BG. Likewise, the only T&E mammal (Ohio endangered) historically documented at PBOW, the Indiana bat, has widespread sightings throughout Ohio, but R2BG does not provide the preferred habitat (caves or trees with exfoliated bark)

5.2 Identification of Chemicals of Potential Ecological Concern

A screening process was performed on the analytical data from the RI and SI to identify COPECs that may pose a threat to ecological receptors. These data include all soil samples collected to a depth of 5 feet and sediment samples. Groundwater was excluded because exposure to this R2BG medium is considered to be an incomplete pathway for ecological receptors. Sample locations are presented on Figure 3-1.

The COPEC selection process was performed to develop a subset of chemicals detected at the site that are not naturally occurring or are associated with non-site-related sources. These chemicals are also present at sufficient frequencies, concentrations, and spatial areas to possibly pose a potential risk to ecological receptors. Examples of screening criteria that were used

include the following: analytical detection limit, frequency of detection less than 5 percent, comparability with background, status as a nutrient, and comparison with risk-based screening ecotoxicity values. This selection process and the screening values used for COPEC selection are described in the SLERA (Appendix C).

The results of the COPEC screening as presented in the SLERA (Appendix C) are presented in Table 5-1. Results for soil inside and outside the Burn Area are presented separately. The table presents the following information:

- Chemical name
- Frequency of detection
- Range of detected concentrations
- Range of detection limits
- Arithmetic mean (average) of site concentrations
- Distribution type
- Upper confidence limit of the mean of the concentration (only for chemicals selected as COPECs)
- Appropriate ecological screening value
- BSC
- COPEC selection conclusion: NO (with rationale for exclusion) or YES (selected)
- 95th percent upper confidence limit on the arithmetic mean concentration.

Chemicals identified as COPECs were quantitatively evaluated in the predictive SLERA, summarized in Sections 5.3 through 5.6.

5.3 Selection of Ecological Receptors

Ecological assessment receptors were selected in the SLERA to focus the exposure characterization on species, groups of species, or functional groups that are directly related to the following assessment endpoints: the protection of long-term survival and reproductive capabilities for terrestrial invertebrates, herbivorous mammals, omnivorous mammals, insectivorous mammals and birds, and carnivorous birds.

As part of this receptor selection process, site biota were organized into major functional groups. For terrestrial communities, the major groups are plants and wildlife, including terrestrial invertebrates, mammals, and birds. Because the intermittent surface water drainage on the northern and eastern sides of the site is typically dry, the drainage is considered poor aquatic habitat. Thus, aquatic and/or wetland communities or functional groups are not present at R2BG and were not evaluated.

Seven representative terrestrial receptor species that are expected or possible in the area of R2BG (based on the ecological description of the site presented in Section 5.1) were selected as indicator species for the potential effects of COPECs. These indicator species represent two classes of vertebrate wildlife (mammals and birds) and a range of both body size and food habits and include herbivores, omnivores, and carnivores. The seven species selected include the deer mouse (small omnivorous mammal), short-tailed shrew (small insectivorous mammal), Eastern cottontail rabbit (medium-sized terrestrial herbivorous mammal), marsh wren (small insectivorous bird), raccoon (medium-sized omnivorous mammal), white-tailed deer (large herbivorous mammal), and red-tailed hawk (large carnivorous bird).

A terrestrial food web is presented on Figure 5-2. Many of the species evaluated, particularly the deer mouse, cottontail rabbit, short-tailed shrew, and marsh wren, have limited home ranges which make them particularly vulnerable to exposure from site contaminants. The species selected to represent the various foraging guilds present at R2BG have the following desirable characteristics:

- Potential high abundance and wide distribution at the site.
- Sufficient toxicological information (with the exception of some bird species) is available in the literature for comparative and interpretive purposes.
- Importance with respect to the stability of the local ecological food chain and biotic community.
- Readily available exposure data, as summarized in the *Wildlife Exposure Factors Handbook* (EPA, 1993b).

5.4 Exposure Characterization

A description of the nature, extent, and magnitude of potential exposure of assessment receptors to COPECs that are present at or migrating from the site is presented in this section, considering both current and reasonably plausible future use of the site. Exposure characterization is critical

in further evaluating the risk of chemicals identified as COPECs during the screening process. The exposure assessment links the magnitude (concentration) and distribution (locations) of the contaminants detected in the media sampled during the investigation, evaluating pathways by which chemicals may be transported through the environment, and determining the points at which organisms found in the study area may contact contaminants.

Ecological routes of exposure for biota may be direct (bioconcentration) or through the food web via the consumption of contaminated organisms (biomagnification). Direct exposure routes include dermal contact, absorption, inhalation, and ingestion. Examples of direct exposure include animals incidentally ingesting contaminated soil or sediment (e.g., during burrowing or dust-bathing activities), animals ingesting surface water, plants absorbing contaminants by uptake from contaminated sediment or soil, and dermal contact of aquatic organisms with contaminated surface water or sediment. Given the scarcity of available data for wildlife dermal and inhalation exposure pathways, potential risk from these pathways is not estimated in the SLERA. In addition, these pathways are generally considered to be incidental for most species, with the possible exceptions of burrowing animals and dust-bathing birds. Food web exposure can occur when terrestrial or aquatic fauna consume contaminated biota. Examples of food web exposure include animals at higher trophic levels consuming plants or animals that bioaccumulate contaminants.

Daily doses of COPECs for vertebrate receptors were calculated using standard exposure algorithms. These algorithms incorporate species-specific natural history parameters (i.e., feeding rates, water ingestion rates, dietary composition, etc.) as well as site-specific area use factors. These algorithms are presented and described in the SLERA (Appendix C).

Exposure to soil and sediment is discussed in the following paragraphs. Surface water was not present in the drainage adjacent to the site, and groundwater is not a medium of concern for ecological receptors at this site.

Soil Exposure Pathway. Soil exposure pathways are potentially important for terrestrial plants and animals at the site. A depth of 0 to 5 feet bgs was evaluated to account for potential effects on deep-rooted plants and burrowing animals such as the shrew. Although the shrew itself may not actually burrow to a depth of 5 feet, there may be other mammals that burrow this deep. Also, for herbivores that feed on deep-rooted plants the evaluation of exposure to soil from a depth of 0 to 5 feet bgs is appropriate because most feeder roots are located within this depth,

and contaminants may be translocated to parts of the plants eaten by animals (e.g., main roots and leaves).

Sediment Exposure Pathway. Potential contaminant sources for sediment include over-ground transport from the R2BG and contaminated surface water, groundwater, and soil. The release mechanisms include surface water runoff, groundwater discharge, and airborne deposition. Potential receptors of chemicals in contaminated sediment include aquatic flora and fauna. Direct exposure routes for contaminated sediment include contact by benthic-dwelling organisms such as amphipod invertebrates, uptake by aquatic flora, and ingestion by aquatic fauna. Indirect exposure pathways from sediment include consumption of bioaccumulated contaminants by consumers in the food chain. Only direct exposure to aquatic sediment-dwelling organisms was evaluated in the SLERA due to limited aquatic habitat.

5.5 Risk Characterization

The risk characterization phase integrates information on exposure, exposure-effects relationships, and defined or presumed target populations. The result is a determination of the likelihood, severity, and characteristics of adverse effects to environmental stressors present at a site. Qualitative and semiquantitative approaches were used to estimate the likelihood of adverse effects occurring as a result of exposure of the selected site receptors to COPECs.

Food chain modeling was used to estimate exposure rates for the representative assessment receptors. These exposure rates were compared with toxicity reference values (TRV) to calculate HQs (Wentsel, et al., 1996). Only conservative TRVs based on a no-observed-adverse-effects level (NOAEL) were used in the food chain model. HQs are calculated by summing intake doses across all exposure pathways for each chemical for a given receptor and dividing by the TRV. HQs less than or equal to 1 represent no probable hazard. Although OEPA considers all HQs above 1 to be potentially significant, the following uncertainties regarding HQ interpretation are noted:

- HQs are not measures of risk.
- HQs are not population based.
- HQs are not linearly scaled.
- HQs are often produced that are unrealistically high and toxicologically impossible (e.g., estimated HQs greater than 1,000; it is noted that several chemicals had calculated HQs greater than 1,000 at the R2BG).

- Trace soil concentrations of inorganic chemicals (including concentrations well below background levels) can lead to HQ threshold exceedances.

Therefore, it should be understood that HQs greater than 1 do not mean that adverse ecological effects are occurring at the site or may occur in the future.

Tables 5-2 and 5-3 summarize the NOAEL-based HQs for the seven evaluated assessment receptors inside the Burn Area and outside the Burn Area, respectively, as presented in Section 5.3 of the SLERA (Appendix C).

Inside the Burn Area (Table 5-2), terrestrial receptors are predicted to incur elevated hazards from exposure to 2,3,7,8-TCDD, explosives, and two PAHs (acenaphthene and naphthalene), based on the NOAEL-based HQ approach. Several metals had elevated HQs, but the metals concentrations are within the range of naturally occurring background. Estimated HQs are above 1,000 for some receptors using the NOAEL-approach. However, the estimated HQs that are above 1,000 using the NOAEL-based approach are considered unrealistic and toxicologically impossible. The white-tailed deer and red-tailed hawk had no HQ exceedances greater than 10 outside of the Burn Area and only an HQ greater than 10 for 2,4-DNT inside 2BG.

Outside the Burn Area (Table 5-3), terrestrial receptors are predicted to incur elevated hazards from exposure to explosives only, with 2,4,6-TNT the greatest risk driver for the raccoon only. The white-tailed deer and red-tailed hawk had no HQ exceedance greater than 10.

Sediment-dwelling aquatic receptors are predicted to have potentially elevated hazards from exposure to 2,3,7,8-TCDD and PAHs based on a comparison of sediment data to RBSLs. However, given the limited to poor quality aquatic habitat at the site, the potential for adverse impacts to aquatic biota is considered negligible.

5.6 SLERA Conclusions

The SLERA evaluated exposure to contaminants inside and outside the Burn Area separately. No federal threatened or endangered species have been observed on site. The results of the SLERA indicate that several contaminants associated with former site operations may have adverse effects on ecological receptors exposed to site soils. Within the Burn Area (Table 5-2), HQ values exceeding 10 were observed for 2,4-DNT (shrew, deer, wren, mouse, rabbit, hawk, and raccoon), 2,6-DNT (shrew, wren, mouse, rabbit, and raccoon), 2,3,7,8-TCDD TEQ (shrew,

mouse, and raccoon), acenaphthene (shrew, mouse, and raccoon), naphthalene (shrew, mouse, and raccoon), and 2,4,6-TNT (shrew, wren, mouse, rabbit, and raccoon). HQ values inside the Burn Area were as high as 19,000 (2,4-DNT for the mouse). HQs outside the Burn Area (Table 5-3) were substantially lower, with only 2,4-DNT (shrew, mouse, rabbit, and raccoon), 2,6-DNT (shrew, mouse, and rabbit), and TNT (shrew, wren, mouse, rabbit, and raccoon) having HQ values above 10. The highest HQ value for outside the Burn Area was 420.

6.0 DERP-FUDS Project No. G05OH001812 (R2BG) Recommendations

The purpose of the RI is to gather information concerning the site characteristics so that appropriate remedial alternatives may be developed in the FS. However, it is unnecessary to perform an FS if the BHHRA indicates that the human health risk goals are met under baseline conditions and the ecological risk assessment indicates a lack of adverse ecological effects (DoD, 2004; 2012).

Based on the RI results, including the BHHRA and SLERA, the U.S. Army Corps of Engineers recommends that an FS be performed for R2BG soils. This includes surface and subsurface soils inside the Burn Area and surface soil outside of the Burn Area. The results of the BHHRA indicate that exposure to each of these media would result in elevated cancer risks or elevated noncancer hazards that are associated with U.S. Department of Defense-related contaminants.

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TABLES

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
Inside the Burn Area												
Surface Soil												
DIO	2,3,7,8-TCDD TEQ	1	1	100	ng/Kg		127	127	127			YES
HE	1,3,5-Trinitrobenzene	7	2	29	ug/Kg	125 - 50000	686	5640	5,707		180,000	
HE	2,4,6-Trinitrotoluene	7	7	100	ug/Kg		4,750	3,120,000	603,477		16,000	YES
HE	2,4-Dinitrotoluene	7	5	71	ug/Kg	5000 - 50000	993	18,750	8,929		12,000	YES
HE	2,6-Dinitrotoluene	7	2	29	ug/Kg	125 - 50000	352	977	7,243		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	4	2	50	ug/Kg	125 - 125	2,960	28,900	7,996			YES
HE	4-Amino-2,6-Dinitrotoluene	7	3	43	ug/Kg	625 - 250000	2,180	4,170	26,275			YES
INO	Aluminum	7	7	100	mg/Kg		6,780	9,750	8,783	15,500	7,600	
INO	Antimony	7	1	14	mg/Kg	0.41 - 7.7	0.963	0.963	1.84	9.3	3.1	
INO	Arsenic	7	7	100	mg/Kg		4.91	9.10	6.48	36.5	0.39	
INO	Barium	7	7	100	mg/Kg		73.4	314	174	828	540	
INO	Beryllium	7	5	71	mg/Kg	0.63 - 0.64	0.548	0.665	0.519	1	15	
INO	Cadmium	7	4	57	mg/Kg	0.61 - 0.64	0.279	0.611	0.409		3.7	
INO	Calcium	7	7	100	mg/Kg		5,830	13,205	8,608	52,300		
INO	Chromium	7	7	100	mg/Kg		11.8	26.6	18.8	29		
INO	Cobalt	7	6	86	mg/Kg	6.3 - 6.3	6.23	10.6	7.52	116	90	
INO	Copper	7	7	100	mg/Kg		23.1	99.0	58.7	56.2	310	
INO	Iron	7	7	100	mg/Kg		15,000	23,170	17,761	234,000	2,300	
INO	Lead	7	7	100	mg/Kg		155	778	486	48.6	40	YES
INO	Magnesium	7	7	100	mg/Kg		2,300	6,600	4,706	10,400		
INO	Manganese	7	7	100	mg/Kg		183	319	266	3,506	180	
INO	Mercury	7	7	100	mg/Kg		0.0780	0.409	0.246	0.1	2.3	
INO	Moisture, Percent	7	7	100	PERCENT		18.4	30.0	21.9			
INO	Nickel	7	7	100	mg/Kg		16.4	56.3	32.0	55.1	160	
INO	Potassium	7	6	86	mg/Kg	626 - 626	985	1540	1,150	3,390		
INO	Selenium	7	7	100	mg/Kg		0.680	1.75	1.19	2	39	
INO	Silver	7	4	57	mg/Kg	0.108 - 1.3	0.132	1.20	0.460	11.1	39	
INO	Sodium	7	4	57	mg/Kg	610 - 639	64.7	250	228			
INO	Thallium	7	4	57	mg/Kg	1.19 - 1.26	1.30	1.95	1.20	1.3	0.52	YES
INO	Tin	3	1	33	mg/Kg	0.467 - 0.472	5.31	5.31	1.93		4,700	
INO	Vanadium	7	7	100	mg/Kg		18.4	25.9	23.0	40.9	7.8	
INO	Zinc	7	7	100	mg/Kg		75.0	489	249	322	2,300	
PAH	Acenaphthene	7	4	57	ug/Kg	400 - 420	772	11,000	2,021		370,000	
PAH	Acenaphthylene	7	4	57	ug/Kg	400 - 420	614	4,140	1,276			YES
PAH	Anthracene	7	4	57	ug/Kg	35.9 - 410	21.4	55.0	78.0		2,200,000	
PAH	Benzo(a)anthracene	7	3	43	ug/Kg	63.5 - 420	31.3	83.8	119		620	
PAH	Benzo(a)pyrene	7	3	43	ug/Kg	78.3 - 420	61.3	108	127		62	YES
PAH	Benzo(b)fluoranthene	7	4	57	ug/Kg	400 - 420	75.9	140	145		620	
PAH	Benzo(g,h,i)perylene	7	3	43	ug/Kg	113 - 420	47.4	103	131			YES
PAH	Benzo(k)fluoranthene	7	3	43	ug/Kg	29.4 - 420	75.5	209	150		6,200	
PAH	Chrysene	7	5	71	ug/Kg	400 - 410	38.9	193	117		62,000	
PAH	Fluoranthene	7	6	86	ug/Kg	400 - 400	56.0	192	138		230,000	

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Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Fluorene	7	1	14	ug/Kg	44.9 - 420	66.3	66.3	118		270,000	
PAH	Indeno(1,2,3-cd)pyrene	7	3	43	ug/Kg	27.8 - 420	33.9	58.7	109		620	
PAH	Naphthalene	7	4	57	ug/Kg	400 - 420	835	9,930	2,399		5,600	YES
PAH	Phenanthrene	7	4	57	ug/Kg	400 - 420	68.8	404	177			YES
PAH	Pyrene	7	4	57	ug/Kg	58.7 - 400	44.0	203	104		230,000	
PCB	PCB-1260 (Aroclor 1260)	7	6	86	ug/Kg	1260 - 1260	1,950	11,600	5,909		220	YES
VOC	1,1,1-Trichloroethane	7	1	14	ug/Kg	0.52 - 6.4	1.70	1.70	1.71		200,000	
VOC	1,1-Dichloroethene	7	1	14	ug/Kg	0.508 - 6.4	0.660	0.660	1.56		12,000	
VOC	Acetone	7	2	29	ug/Kg	3.58 - 26	8.90	17.8	9.74		1,400,000	
VOC	Benzene	7	3	43	ug/Kg	0.457 - 6.4	1.70	20.6	5.88		640	
VOC	Chloroform	7	1	14	ug/Kg	0.528 - 6.4	2.00	2.00	1.76		220	
VOC	Methylcyclohexane	1	1	100	ug/Kg		1.90	1.90	1.90		260,000	
VOC	Toluene	7	2	29	ug/Kg	0.345 - 6.4	3.50	1,570	226		66,000	
Subsurface Soil												
DIO	2,3,7,8-TCDD TEQ	13	13	100	ng/Kg		0.699	1,187	132			YES
HE	1,3,5-Trinitrobenzene	19	3	16	ug/Kg	125 - 12500	46,100	85,400	10,599		180,000	
HE	1,3-Dinitrobenzene	19	1	5	ug/Kg	125 - 12500	3,545	3,545	1,323		610	YES
HE	2,4,6-Trinitrotoluene	19	13	68	ug/Kg	125 - 250	394	35,400,000	3,941,819		16,000	YES
HE	2,4-Dinitrotoluene	19	11	58	ug/Kg	125 - 250	370	9,700,000	917,202		12,000	YES
HE	2,6-Dinitrotoluene	19	5	26	ug/Kg	125 - 12500	10,800	1,400,000	102,611		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	13	5	38	ug/Kg	125 - 125	4,980	342,000	42,614			YES
HE	2-Nitrotoluene	19	3	16	ug/Kg	125 - 12500	782	7,040	1,760		880	YES
HE	3-Nitrotoluene	19	1	5	ug/Kg	125 - 12500	777	777	1,178		73,000	
HE	4-Amino-2,6-Dinitrotoluene	19	1	5	ug/Kg	125 - 58000	10,600	10,600	3,019			YES
HE	4-Nitrotoluene	13	3	23	ug/Kg	125 - 12500	444	6,670	1,849		12,000	
INO	Aluminum	19	19	100	mg/Kg		4,640	17,390	11,959	15500	7,600	YES
INO	Antimony	19	6	32	mg/Kg	0.404 - 7.6	0.724	5.55	1.96	9.3	3.1	
INO	Arsenic	19	19	100	mg/Kg		4.70	27.8	11.8	36.5	0.39	
INO	Barium	19	19	100	mg/Kg		55.1	3965	438	826	540	YES
INO	Beryllium	19	18	95	mg/Kg	0.59 - 0.59	0.569	1.27	0.724	1	15	
INO	Cadmium	19	14	74	mg/Kg	0.59 - 0.63	0.0657	2.04	0.505		3.7	
INO	Calcium	19	19	100	mg/Kg		2,945	55,790	16,729	52300		
INO	Chromium	19	19	100	mg/Kg		8.86	81.5	23.4	29		YES
INO	Cobalt	19	19	100	mg/Kg		7.26	25.2	12.5	116	90	
INO	Copper	19	19	100	mg/Kg		9.82	1580	146	56.2	310	YES
INO	Iron	19	19	100	mg/Kg		13,130	37,300	26,693	234000	2,300	
INO	Lead	19	19	100	mg/Kg		8.94	8,220	757	48.6	40	YES
INO	Magnesium	19	19	100	mg/Kg		2550	18,310	7,173	10400		
INO	Manganese	19	19	100	mg/Kg		152	1,360	467	3506	180	
INO	Mercury	19	14	74	mg/Kg	0.039 - 0.042	0.0143	0.207	0.0547	0.1	2.3	
INO	Moisture, Percent	19	19	100	PERCENT		15.6	28.4	19.7			
INO	Nickel	19	19	100	mg/Kg		17.1	103	41.7	55.1	160	
INO	Potassium	19	19	100	mg/Kg		928	3,440	2,235	3390		YES
INO	Selenium	19	16	84	mg/Kg	0.59 - 0.63	0.267	4.57	1.72	2	39	

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Silver	19	11	58	mg/Kg	0.108 - 1.3	0.190	1.30	0.520	11.1	39	
INO	Sodium	19	13	68	mg/Kg	592 - 632	75.0	1,390	408			
INO	Thallium	19	13	68	mg/Kg	1.18 - 1.21	1.63	3.32	1.78	1.3	0.52	YES
INO	Vanadium	19	19	100	mg/Kg		10.5	40.8	27.9	40.9	7.8	
INO	Zinc	19	19	100	mg/Kg		48.6	1,540	241	322	2,300	
PAH	Acenaphthene	19	7	37	ug/Kg	68.8 - 420	90.9	67,400	7,194		370,000	
PAH	Acenaphthylene	19	10	53	ug/Kg	39.9 - 420	42.2	131,000	14,362			YES
PAH	Anthracene	19	5	26	ug/Kg	4.55 - 420	4.69	73.2	80.8		2,200,000	
PAH	Benzo(a)anthracene	19	6	32	ug/Kg	7.56 - 420	9.70	501	120		620	
PAH	Benzo(a)pyrene	19	5	26	ug/Kg	9.65 - 420	12.4	108	98.8		62	YES
PAH	Benzo(b)fluoranthene	19	10	53	ug/Kg	3.82 - 420	4.00	212	97.3		620	
PAH	Benzo(g,h,i)perylene	19	4	21	ug/Kg	13.9 - 601	35.7	70.9	112			YES
PAH	Benzo(k)fluoranthene	19	10	53	ug/Kg	13.8 - 420	41.7	469	136		6,200	
PAH	Chrysene	19	9	47	ug/Kg	5.68 - 420	13.9	928	154		62,000	
PAH	Dibenz(a,h)anthracene	19	3	16	ug/Kg	8.09 - 420	16.1	302	105		62	YES
PAH	Fluoranthene	19	6	32	ug/Kg	22.5 - 973	37.0	720	209		230,000	
PAH	Fluorene	19	4	21	ug/Kg	23.2 - 1040	25.6	317	160		270,000	
PAH	Indeno(1,2,3-cd)pyrene	19	5	26	ug/Kg	3.43 - 420	9.59	151	83.7		620	
PAH	Naphthalene	19	10	53	ug/Kg	26 - 420	37.9	51,300	5,070		5,600	YES
PAH	Phenanthrene	19	10	53	ug/Kg	19.2 - 420	24.2	1,550	328			YES
PAH	Pyrene	19	1	5	ug/Kg	25.7 - 1150	96.2	96.2	142		230,000	
PCB	PCB-1254 (Aroclor 1254)	19	2	11	ug/Kg	40 - 14200	1,660	3,670	845		220	YES
PCB	PCB-1260 (Aroclor 1260)	19	7	37	ug/Kg	39 - 8620	53.0	4,010	789		220	YES
SV	bis(2-Ethylhexyl)phthalate	6	1	17	ug/Kg	390 - 420	60.0	60.0	178		35,000	
VOC	1,1,1-Trichloroethane	19	2	11	ug/Kg	0.463 - 31	1.085	140	9.89		200,000	
VOC	1,1-Dichloroethane	19	2	11	ug/Kg	0.411 - 31	1.60	10.1	3.06		51,000	
VOC	1,1-Dichloroethene	19	9	47	ug/Kg	0.47 - 31	0.580	2.55	3.03		12,000	
VOC	2-Butanone (Methyl ethyl ketone)	19	3	16	ug/Kg	3.27 - 120	3.60	54.0	13.0		2,200,000	
VOC	Acetone	19	7	37	ug/Kg	3.07 - 120	8.70	300	40.0		1,400,000	
VOC	Benzene	19	4	21	ug/Kg	0.393 - 31	1.40	2.80	2.85		640	
VOC	Cyclohexane	13	7	54	ug/Kg	0.419 - 1.05	0.630	24.9	4.80		280,000	
VOC	Ethylbenzene	19	1	5	ug/Kg	0.332 - 31	2.30	2.30	2.55		190,000	
VOC	Isopropylbenzene (Cumene)	13	1	8	ug/Kg	0.393 - 1.11	1.30	1.30	0.366		57,000	
VOC	Methylcyclohexane	13	3	23	ug/Kg	0.445 - 1.12	1.10	23.9	2.25		260,000	
VOC	Methylene Chloride	19	1	5	ug/Kg	1.18 - 31	1.90	1.90	2.96		9100	
VOC	Tetrachloroethene (PCE)	19	1	5	ug/Kg	0.332 - 31	0.870	0.870	2.48		480	
VOC	Toluene	19	5	26	ug/Kg	0.297 - 31	0.990	79.5	6.75		66,000	
VOC	Xylenes, Total	19	2	11	ug/Kg	0.341 - 31	0.780	12.5	3.11		27,000	
Outside the Burn Area												
Surface Soil												
HE	1,3,5-Trinitrobenzene	42	13	31	ug/Kg	87 - 5000	210	15,000	728		180,000	
HE	1,3-Dinitrobenzene	42	3	7	ug/Kg	83 - 12000	120	220	272		610	
HE	2,4,6-Trinitrotoluene	42	31	74	ug/Kg	87 - 250	140	2,270,000	65,461		16,000	YES

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
HE	2,4-Dinitrotoluene	42	23	55	ug/Kg	110 - 250	240	200,000	6,892		12,000	YES
HE	2,6-Dinitrotoluene	42	14	33	ug/Kg	110 - 12000	152	78,000	2,458		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	37	16	43	ug/Kg	125 - 625	150	26,000	1,296			YES
HE	2-Nitrotoluene	42	6	14	ug/Kg	87 - 12000	110	2,000	324		880	YES
HE	4-Amino-2,6-Dinitrotoluene	42	16	38	ug/Kg	87 - 110000	130	27,000	2,759			YES
HE	4-Nitrotoluene	37	1	3	ug/Kg	87 - 625	260	260	70.5		12,000	
HE	HMX	42	4	10	ug/Kg	87 - 25000	150	820	514		310,000	
HE	Nitrobenzene	47	1	2	ug/Kg	92 - 12000	180	180	262		2,000	
HE	RDX	42	2	5	ug/Kg	87 - 25000	270	540	503		4,400	
INO	Aluminum	32	32	100	mg/Kg		8,840	14,900	10,749	15,500	7,600	
INO	Antimony	32	3	9	mg/Kg	0.421 - 7.8	0.534	0.782	1.32	9.3	3.1	
INO	Arsenic	32	32	100	mg/Kg		5.13	11.1	7.45	36.5	0.39	
INO	Barium	32	32	100	mg/Kg		47.1	212	104	826	540	
INO	Beryllium	32	29	91	mg/Kg	0.61 - 0.65	0.515	0.851	0.606	1	15	
INO	Cadmium	32	28	87	mg/Kg	0.26 - 0.65	0.0771	0.78	0.425		3.7	YES
INO	Calcium	32	32	100	mg/Kg		2,320	35,800	7,559	52,300		
INO	Chromium	32	32	100	mg/Kg		10.7	26.7	16.9	29		
INO	Cobalt	32	32	100	mg/Kg		4.02	16.4	6.95	116	90	
INO	Copper	32	32	100	mg/Kg		13.0	534	55.9	56.2	310	YES
INO	Iron	32	32	100	mg/Kg		11,550	29,960	18,522	234,000	2,300	
INO	Lead	42	42	100	mg/Kg		21.1	603	184	48.6	40	YES
INO	Magnesium	32	32	100	mg/Kg		993	6,370	2,993	10,400		
INO	Manganese	32	32	100	mg/Kg		147	600	282	3,506	180	
INO	Mercury	32	32	100	mg/Kg		0.0308	0.518	0.133	0.1	2.3	
INO	Moisture, Percent	17	17	100	PERCENT		17.7	35.7	23.7			YES
INO	Nickel	32	32	100	mg/Kg		11.6	35.7	20.7	55.1	160	
INO	Potassium	32	32	100	mg/Kg		598	2,520	1,421	3,390		
INO	Selenium	32	13	41	mg/Kg	0.202 - 0.83	0.546	2.06	0.641	2	39	
INO	Silver	32	5	16	mg/Kg	0.111 - 1.3	0.138	0.471	0.204	11.1	39	
INO	Sodium	32	13	41	mg/Kg	245 - 646	45.9	402	147			YES
INO	Thallium	32	4	12	mg/Kg	0.31 - 1.42	1.20	1.44	0.503	1.3	0.52	
INO	Tin	4	1	25	mg/Kg	0.474 - 0.486	3.78	3.78	1.12		4700	
INO	Vanadium	32	32	100	mg/Kg		20.3	31.3	25.1	40.9	7.8	
INO	Zinc	32	32	100	mg/Kg		35.7	498	144	322	2,300	
INX	Cyanide	20	12	60	mg/Kg	0.15 - 0.65	0.170	1.00	0.280		120	
PAH	Acenaphthene	42	11	26	ug/Kg	24 - 430	34.2	697	101		370,000	
PAH	Acenaphthylene	42	11	26	ug/Kg	16.7 - 430	26.8	1,960	190			YES
PAH	Anthracene	42	13	31	ug/Kg	4.93 - 430	2.74	55.0	34.1		2,200,000	
PAH	Benzo(a)anthracene	42	21	50	ug/Kg	8.72 - 430	4.08	186	58.7		620	
PAH	Benzo(a)pyrene	42	21	50	ug/Kg	24 - 430	12.5	360	77.7		62	YES
PAH	Benzo(b)fluoranthene	42	21	50	ug/Kg	24 - 430	12.1	820	107		620	YES
PAH	Benzo(g,h,i)perylene	42	18	43	ug/Kg	5.65 - 430	13.1	270	61.5			YES
PAH	Benzo(k)fluoranthene	42	20	48	ug/Kg	24 - 430	30.9	430	93.9		6,200	
PAH	Chrysene	42	25	60	ug/Kg	6.33 - 430	8.30	297	78.4		62,000	

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Dibenz(a,h)anthracene	42	5	12	ug/Kg	3.33 - 430	10.4	124	38.9		62	YES
PAH	Fluoranthene	42	28	67	ug/Kg	24 - 430	21.3	350	98.2		230,000	
PAH	Fluorene	42	9	21	ug/Kg	9.79 - 430	10.7	91.3	41.4		270,000	
PAH	Indeno(1,2,3-cd)pyrene	42	17	40	ug/Kg	1.4 - 430	8.20	230	55.4		620	
PAH	Naphthalene	42	11	26	ug/Kg	24 - 430	23.4	1,738	111		5,600	
PAH	Phenanthrene	42	25	60	ug/Kg	8.03 - 430	12.8	190	67.0			YES
PAH	Pyrene	42	25	60	ug/Kg	11.5 - 430	13.0	295	83.8		230,000	
PCB	PCB-1260 (Aroclor 1260)	42	33	79	ug/Kg	40 - 13300	13.0	44,400	2,066		220	YES
SV	1,4-Dichlorobenzene	17	1	6	ug/Kg	0.349 - 430	0.420	0.420	60.7		3,400	
SV	2-Methylnaphthalene	30	4	13	ug/Kg	24 - 430	36.0	110	52.1			YES
SV	bis(2-Ethylhexyl)phthalate	5	1	20	ug/Kg	400 - 430	61.0	61.0	176.2		35,000	
VOC	1,1,1-Trichloroethane	17	1	6	ug/Kg	0.5 - 32	1.70	1.70	4.12		200,000	
VOC	1,1-Dichloroethene	17	4	24	ug/Kg	0.472 - 32	0.570	0.750	4.11		12,000	
VOC	Acetone	17	3	18	ug/Kg	3.32 - 130	4.60	15.5	17.8		1,400,000	
VOC	Cyclohexane	12	1	8	ug/Kg	0.453 - 0.586	0.720	0.720	0.296		280,000	
VOC	Tetrachloroethene (PCE)	17	4	24	ug/Kg	0.385 - 32	0.390	3.40	4.22		480	
Subsurface Soil												
HE	2,4,6-Trinitrotoluene	26	5	19	ug/Kg	125 - 250	229	817	167		16,000	YES
HE	2,4-Dinitrotoluene	26	4	15	ug/Kg	125 - 250	417	755	166		12,000	YES
HE	4-Amino-2,6-Dinitrotoluene	26	1	4	ug/Kg	125 - 610	1,500	1,500	146			YES
INO	Aluminum	26	26	100	mg/Kg		6,225	233,600	20,972	15,500	7,600	YES
INO	Antimony	26	2	8	mg/Kg	0.401 - 8.35	0.413	0.519	1.69271	9.3	3.1	
INO	Arsenic	26	26	100	mg/Kg		4.10	131	14.5	36.5	0.39	
INO	Barium	26	26	100	mg/Kg		40.7	798	110	826	540	
INO	Beryllium	26	20	77	mg/Kg	0.59 - 0.63	0.388	11.4	1.00	1	15	
INO	Cadmium	26	15	58	mg/Kg	0.0572 - 0.64	0.0779	8.64	0.650		3.7	YES
INO	Calcium	26	26	100	mg/Kg		3,030	1,173,000	74,271	52,300		
INO	Chromium	26	26	100	mg/Kg		10.8	367	32.2	29		YES
INO	Cobalt	26	26	100	mg/Kg		6.30	166	16.8	116	90	YES
INO	Copper	26	26	100	mg/Kg		17.6	504	46.0	56.2	310	YES
INO	Iron	26	26	100	mg/Kg		17,650	412,600	38,804	234,000	2300	
INO	Lead	26	26	100	mg/Kg		7.88	227	21.2	48.6	40	YES
INO	Magnesium	26	26	100	mg/Kg		3,340	363,100	24,747	10,400		
INO	Manganese	26	26	100	mg/Kg		205	8230	905	3,506	180	YES
INO	Mercury	26	17	65	mg/Kg	0.038 - 0.042	0.0137	0.0580	0.0225	0.1	2.3	
INO	Moisture, Percent	25	25	100	PERCENT		12.2	22.4	17.8			YES
INO	Nickel	26	26	100	mg/Kg		17.6	475	46.8	55.1	160	
INO	Potassium	26	26	100	mg/Kg		1,250	58,210	4,397	3,390		
INO	Selenium	26	16	62	mg/Kg	0.57 - 0.64	0.527	51.8	3.39	2	39	YES
INO	Silver	26	6	23	mg/Kg	0.104 - 1.3	0.160	3.21	0.451	11.1	39	
INO	Sodium	26	16	62	mg/Kg	569 - 637	68	3,690	334			
INO	Thallium	26	6	23	mg/Kg	1.15 - 24.3	1.30	2.10	1.71	1.3	0.52	YES
INO	Vanadium	26	26	100	mg/Kg		20.2	536	49.4	40.9	7.8	YES
INO	Zinc	26	26	100	mg/Kg		47.6	1,140	103	322	2,300	

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Acenaphthene	25	1	4	ug/Kg	26.9 - 420	169	169	107		370,000	
PAH	Acenaphthylene	25	6	24	ug/Kg	14.7 - 420	59.3	408	122			YES
PAH	Anthracene	25	7	28	ug/Kg	1.67 - 420	4.93	22.8	83.9		2,200,000	
PAH	Benzo(a)pyrene	25	10	40	ug/Kg	3.65 - 420	10.6	28.6	87.3		62	YES
PAH	Benzo(b)fluoranthene	25	9	36	ug/Kg	1.44 - 420	5.13	27.3	86.0		620	YES
PAH	Benzo(g,h,i)perylene	25	1	4	ug/Kg	5.25 - 420	51.9	51.9	85.9			YES
PAH	Benzo(k)fluoranthene	25	13	52	ug/Kg	1.37 - 420	30.9	191	133		6,200	
PAH	Chrysene	25	7	28	ug/Kg	2.15 - 420	12.8	30.5	86.5		62,000	
PAH	Fluoranthene	25	8	32	ug/Kg	8.51 - 420	25.7	298	123		230,000	
PAH	Fluorene	25	1	4	ug/Kg	9.1 - 420	50.1	50.1	88.8		270,000	
PAH	Indeno(1,2,3-cd)pyrene	25	8	32	ug/Kg	1.3 - 420	9.89	23.1	85.3		620	
PAH	Naphthalene	25	6	24	ug/Kg	9.84 - 420	51.2	256	108		5,600	
PAH	Phenanthrene	25	7	28	ug/Kg	7.06 - 420	22.6	175	107			YES
VOC	1,1,1-Trichloroethane	26	6	23	ug/Kg	0.353 - 32	0.770	15.3	3.21		200,000	
VOC	1,1-Dichloroethane	26	4	15	ug/Kg	0.313 - 32	0.660	1.70	1.90		51,000	
VOC	1,1-Dichloroethene	26	9	35	ug/Kg	0.411 - 32	0.480	2.10	2.03		12,000	
VOC	Acetone	26	9	35	ug/Kg	2.89 - 25	6.40	290	24.6		1,400,000	
VOC	Cyclohexane	16	1	6	ug/Kg	0.319 - 0.477	3.90	3.90	0.443		280,000	
VOC	Styrene	26	1	4	ug/Kg	0.259 - 32	1.00	1	1.80		440,000	
VOC	Tetrachloroethene (PCE)	26	3	12	ug/Kg	0.253 - 32	1.20	2.95	1.99		480	
VOC	Toluene	26	4	15	ug/Kg	0.226 - 6.3	1.50	20.0	1.75		66,000	
VOC	Xylenes, Total	26	1	4	ug/Kg	0.259 - 6.3	11.0	11.0	1.57		27,000	
Sediment												
DIO	2,3,7,8-TCDD TEQ	3	3	100	ng/Kg		0.120	6.91	3.45			YES
INO	Aluminum	3	3	100	mg/Kg		7,790	9,980	9,077	15,500	7,600	
INO	Arsenic	3	3	100	mg/Kg		4.30	6.09	5.105	36.5	0.39	
INO	Barium	3	3	100	mg/Kg		51.2	70.3	57.8	826	540	
INO	Beryllium	3	3	100	mg/Kg		0.427	0.566	0.481	1	15	
INO	Cadmium	3	3	100	mg/Kg		0.586	1.91	1.07		3.7	
INO	Calcium	3	3	100	mg/Kg		9,170	82,280	40,363	52,300		
INO	Chromium	3	3	100	mg/Kg		12.0	15.4	13.9	29		
INO	Cobalt	3	3	100	mg/Kg		4.56	6.17	5.52	116	90	
INO	Copper	3	3	100	mg/Kg		19.7	26.7	23.8	56.2	310	
INO	Iron	3	3	100	mg/Kg		12,100	16,430	14,690	234,000	2,300	
INO	Lead	3	3	100	mg/Kg		14.0	24.9	19.4	48.6	40	
INO	Magnesium	3	3	100	mg/Kg		3,385	11,900	7,682	10,400		
INO	Manganese	3	3	100	mg/Kg		107	181	145	3,506	180	
INO	Mercury	3	3	100	mg/Kg		0.0402	0.0725	0.0531	0.1	2.3	
INO	Moisture, Percent	3	3	100	PERCENT		37.3	52.7	43.3			
INO	Nickel	3	3	100	mg/Kg		16.1	19.0	18.0	55.1	160	
INO	Potassium	3	3	100	mg/Kg		1,510	2,295	1,952	3,390		
INO	Selenium	3	3	100	mg/Kg		2.71	3.69	3.34	2	39	
INO	Sodium	3	3	100	mg/Kg		90.3	107	98.6			
INO	Vanadium	3	3	100	mg/Kg		21.5	25.0	23.3	40.9	7.8	

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Zinc	3	3	100	mg/Kg		60.2	92.0	72.4	322	2,300	
PAH	Acenaphthene	3	1	33	ug/Kg	34.3 - 46.9	5,750	5,750	1,930		370,000	
PAH	Acenaphthylene	3	2	67	ug/Kg	18.7 - 18.7	53.0	853	305			YES
PAH	Anthracene	3	3	100	ug/Kg		6.41	288	101		2,200,000	
PAH	Benzo(a)anthracene	3	3	100	ug/Kg		22.5	1,130	393		620	YES
PAH	Benzo(a)pyrene	3	3	100	ug/Kg		126	1,590	641		62	YES
PAH	Benzo(b)fluoranthene	3	3	100	ug/Kg		31.9	1,230	438		620	YES
PAH	Benzo(g,h,i)perylene	3	3	100	ug/Kg		22.3	728	269			YES
PAH	Benzo(k)fluoranthene	3	3	100	ug/Kg		41.5	881	324		6,200	
PAH	Chrysene	3	3	100	ug/Kg		33.4	1,330	468		62,000	
PAH	Dibenz(a,h)anthracene	3	3	100	ug/Kg		16.5	31.6	24.0		62	
PAH	Fluoranthene	3	3	100	ug/Kg		75.5	3,680	1,294		230,000	
PAH	Indeno(1,2,3-cd)pyrene	3	3	100	ug/Kg		13.6	751	266		620	YES
PAH	Naphthalene	3	2	67	ug/Kg	12.5 - 12.5	216	2,660	961		5,600	
PAH	Phenanthrene	3	3	100	ug/Kg		66.8	1,460	583			YES
PAH	Pyrene	3	3	100	ug/Kg		30.9	2,440	845		230,000	
VOC	1,1-Dichloroethane	3	1	33	ug/Kg	0.644 - 1.2	4.50	4.50	1.81		51,000	
VOC	1,1-Dichloroethene	3	2	67	ug/Kg	0.794 - 0.794	1.00	1.55	0.982		12,000	
VOC	2-Butanone (Methyl ethyl ketone)	3	2	67	ug/Kg	5.13 - 5.13	36.5	51.2	30.1		2,200,000	
VOC	Acetone	3	3	100	ug/Kg		13.8	234	145		1,400,000	
VOC	Cyclohexane	3	2	67	ug/Kg	0.762 - 0.762	2.30	11.0	4.56		280,000	
VOC	Toluene	3	2	67	ug/Kg	0.865 - 0.865	0.520	0.860	0.604		66,000	
Groundwater												
INO	Aluminum (total)	3	3	100	ug/L		1,290	11,600	6,503	309	3,600	YES
INO	Antimony (total)	3	3	100	ug/L		2.00	3.00	2.53		1.5	YES
INO	Arsenic (total)	3	3	100	ug/L		45.3	221	113	7.4	0.045	YES
INO	Barium (total)	3	3	100	ug/L		286	842	489	11,800	260	
INO	Beryllium (total)	3	3	100	ug/L		0.0850	0.760	0.428		7.3	
INO	Cadmium (total)	3	2	67	ug/L	0.04 - 0.04	0.240	1.40	0.547		1.8	
INO	Calcium (total)	3	3	100	ug/L		237,000	743,000	559,667	316,000		
INO	Chromium (total)	3	2	67	ug/L	0.38 - 0.38	20.0	31.7	17.23333			
INO	Cobalt (total)	3	3	100	ug/L		2.60	9.90	6.40	12.1	73	
INO	Copper (total)	3	3	100	ug/L		4.00	17.7	11.8	19.8	150	
INO	Hardness (as CACO3)	2	2	100	mg/L		936	1,440	1,188			
INO	Iron (total)	3	3	100	ug/L		3,590	27,300	15,263	1,550	1,100	YES
INO	Lead (total)	3	3	100	ug/L		2.90	17.9	11.1			
INO	Magnesium (total)	3	3	100	ug/L		118,000	263,000	181,333	217,000		
INO	Manganese (total)	3	3	100	ug/L		409	1,020	702	636	88	YES
INO	Nickel (total)	3	3	100	ug/L		11.1	36.5	25.2	8.6	73	
INO	Nitrate	2	1	50	mg/L	0.0341 - 0.0341	0.137	0.137	0.0685			
INO	Potassium (total)	3	3	100	ug/L		40,500	56,400	49,000	116,000		
INO	Selenium (total)	3	0	0	ug/L	3.2 - 3.2					18	
INO	Silver (total)	3	2	67	ug/L	0.04 - 0.04	0.0820	0.130	0.0707		18	
INO	Sodium (total)	3	3	100	ug/L		380,000	785,000	623,667	1,390,000		

Table 4-1
Summary of Statistics and Identification of Human Health COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground Inside the Burn Area
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Suspended Solids (residue, Non-filterable)	2	2	100	mg/L		298	109,000	54,649			
INO	Thallium (total)	3	2	67	ug/L	0.1 - 0.1	0.36	2.30	0.88667		0.24	YES
INO	Total Dissolved Solids	2	2	100	mg/L		2,870	3,310	3,090			
INO	Turbidity	2	2	100	NTU		101	1,910	1,006			
INO	Vanadium (total)	3	2	67	ug/L	5.44 - 5.44	8.90	22.4	10.4		3.6	YES
INO	Zinc (total)	3	3	100	ug/L		11.3	47.2	29.6	507	1,100	
INX	Alkalinity, Total (as CaCO3)	2	2	100	mg/L		72.7	457	265			
INX	Chloride (as Cl)	2	2	100	mg/L		1,420	1,810	1,615			
INX	Cyanide	2	1	50	ug/L	1.72 - 1.72	290	290	145		73	YES
INX	Sulfate (as SO4)	2	2	100	mg/L		45.3	78.0	61.7			
PAH	Acenaphthene	1	1	100	ug/L		535	535	535		37	YES
PAH	Acenaphthylene	1	1	100	ug/L		26.2	26.2	26.2			
PAH	Anthracene	1	1	100	ug/L		3.24	3.24	3.24		180	
PAH	Benzo(a)anthracene	1	1	100	ug/L		0.293	0.293	0.293		0.092	YES
PAH	Fluoranthene	1	1	100	ug/L		1.65	1.65	1.65		150	
PAH	Naphthalene	1	1	100	ug/L		8.87	8.87	8.87		0.62	YES
PAH	Phenanthrene	1	1	100	ug/L		1.86	1.86	1.86			
PAH	Pyrene	1	1	100	ug/L		2.34	2.34	2.34		18	
VOC	Acetone	3	3	100	ug/L		27.4	518	339		550	
VOC	Benzene	3	2	67	ug/L	1.65 - 1.65	1,510	2,460	1,323	2.4	0.35	YES
VOC	Carbon Disulfide	3	3	100	ug/L		146	234	184		100	YES
VOC	Chloromethane	3	1	33	ug/L	25 - 25	54.0	54.0	18.0		16	YES
VOC	Cyclohexane	3	3	100	ug/L		295	683	535		1,000	
VOC	Ethylbenzene	3	3	100	ug/L		9.60	137	85.5	0.87	130	
VOC	Isopropylbenzene (Cumene)	3	3	100	ug/L		5.10	37.1	25.4		66	
VOC	Methylcyclohexane	3	3	100	ug/L		132	337	243		520	
VOC	Toluene	3	3	100	ug/L		17.6	403	248	1.7	72	
VOC	Xylenes, Total	3	3	100	ug/L		145	1,610	1,048	5.5	21	YES
VOC	m,p-Xylene (sum of isomers)	3	3	100	ug/L		115	1,160	748			
VOC	o-Xylene (1,2-Dimethylbenzene)	3	3	100	ug/L		29.9	454	303			

COPC - chemical of potential concern
DIO - dioxan/furan
HE
HMX - 1,3,5,7-tetranitro-1,3,5,7-tetrazocane (octogen or High-Molecular-weight rdX)
INO
INX
mg/kg - milligrams per kilogram
ng/kg - nanograms per kilogram
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PCE - tetrachloroethene
RDX - 1,3,5-Trinitroperhydro-1,3,5-triazine (cyclotrimethylenetrinitramine or cyclonite or hexogen or T4)
SV - semivolatile organic compound
TCDD - tetrachlorodibenzo-p-dioxan
TEQ - toxicity equivalent
ug/kg - micrograms per kilogram
VOC - volatile organic compound

Source: Revised Final Baseline Human Health Risk Assessment (Jacobs, 2010a).

Table 4-2

Summary of Noncancer Hazards and Cancer Risk Estimates From Potential Exposures at Reservoir 2 Burning Ground Inside the Burn Area Plum Brook Ordnance Works, Sandusky, Ohio

Groundskeeper Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	8.E-05
Dermal Contact	3.E-05	1.E-06
Inhalation	6.E-04	4.E-09
Total	12	8.E-05

Construction Worker Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	3.E+01	4.E-06
Dermal Contact	2.E-04	2.E-07
Inhalation	5.E-04	7.E-11
Total	33	4.E-06

Adult Hunter Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E-01	5.E-06
Dermal Contact	1.E-05	7.E-07
Inhalation	NA	NA
Total	0.7	6.E-06

Construction Worker Risks From Exposure to Subsurface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	2.E+02	2.E-05
Dermal Contact	1.E-01	4.E-07
Inhalation	NA	NA
Total	154	2.E-05

Adult Hunter Risks From Ingestion of Venison		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	9.E-05	1.E-09
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	9.E-05	1.E-09

Indoor Worker Risks From Exposure to Grounndwater		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	2.E-03
Dermal Contact	6.E-01	4.E-05
Inhalation	NA	NA
Total	15	2.E-03

Child Risks From Ingestion of Venison		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	2.E-04	5.E-10
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	2.E-04	5.E-10

Indoor Worker Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	6.E+00	4.E-05
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	6	4.E-05

Table 4-2

Summary of Noncancer Hazards and Cancer Risk Estimates From Potential Exposures at Reservoir 2 Burning Ground Inside the Burn Area Plum Brook Ordnance Works, Sandusky, Ohio

Adult Residential Risks From Exposure to Groundwater

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	4.E+01	4.E-03
Dermal Contact	2.E+00	1.E-04
Inhalation	NA	NA
Total	44	5.E-03

Child Residential Risks From Exposure to Groundwater

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+02	3.E-03
Dermal Contact	4.E+00	8.E-05
Inhalation	NA	NA
Total	101	3.E-03

Adult Residential Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	1.E-04
Dermal Contact	3.E-04	1.E-05
Inhalation	7.E-04	4.E-09
Total	15	1.E-04

Child Residential Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+02	2.E-04
Dermal Contact	5.E-04	5.E-06
Inhalation	2.E-03	3.E-09
Total	140	2.E-04

Adult Residential Risks From Exposure to Subsurface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E+01	1.E-03
Dermal Contact	2.E-01	3.E-05
Inhalation	NA	NA
Total	70	1.E-03

Child Residential Risks From Exposure to Subsurface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E+02	2.E-03
Dermal Contact	3.E-01	1.E-05
Inhalation	NA	NA
Total	651	3.E-03

Source: Revised Final Baseline Human health Risk Assessment (Jacobs, 2010a).

Table 4-3

Summary of Noncancer Hazards and Cancer Risk Estimates From Potential Exposures at Reservoir 2 Burning Ground Outside the Burn Area Plum Brook Ordnance works, Sandusky, Ohio

Groundskeeper Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+00	2.E-05
Dermal Contact	NA	9.E-07
Inhalation	6.E-05	1.E-09
Total	1	3.E-05

Construction Worker Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	3.E+00	1.E-06
Dermal Contact	NA	2.E-07
Inhalation	5.E-05	2.E-11
Total	3	2.E-06

Adult Hunter Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E-02	2.E-06
Dermal Contact	NA	5.E-07
Inhalation	NA	NA
Total	0.1	2.E-06

Construction Worker Risks From Exposure to Subsurface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+00	1.E-06
Dermal Contact	3.E-02	1.E-07
Inhalation	NA	NA
Total	1.3	1.E-06

Adult Hunter Risks From Ingestion of Venison

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	9.E-05	1.E-09
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	9.E-05	1.E-09

Construction Worker Risks From Exposure to Sediment

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	NA	1.E-07
Dermal Contact	NA	5.E-08
Inhalation	NA	NA
Total	NA	2.E-07

Child Risks From Ingestion of Venison

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	2.E-04	4.E-10
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	2.E-04	4.E-10

Indoor Worker Risks From Exposure to Groundwater

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	2.E-03
Dermal Contact	6.E-01	4.E-05
Inhalation	NA	NA
Total	15	2.E-03

Indoor Worker Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	6.E-01	1.E-05
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	0.6	1.E-05

Table 4-3

Summary of Noncancer Hazards and Cancer Risk Estimates From Potential Exposures at Reservoir 2 Burning Ground Outside the Burn Area Plum Brook Ordnance works, Sandusky, Ohio

Adult Residential Risks From Exposure to Groundwater

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	4.E+01	4.E-03
Dermal Contact	2.E+00	1.E-04
Inhalation	NA	NA
Total	44	5.E-03

Child Residential Risks From Exposure to Groundwater

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+02	3.E-03
Dermal Contact	4.E+00	8.E-05
Inhalation	NA	NA
Total	101	3.E-03

Adult Residential Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	2.E+00	3.E-05
Dermal Contact	NA	1.E-05
Inhalation	7.E-05	1.E-09
Total	1.6	4.E-05

Child Residential Risks From Exposure to Surface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	7.E-05
Dermal Contact	NA	4.E-06
Inhalation	2.E-04	8.E-10
Total	15	7.E-05

Adult Residential Risks From Exposure to Subsurface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	6.E-01	2.E-05
Dermal Contact	4.E-02	6.E-06
Inhalation	NA	NA
Total	0.6	3.E-05

Child Residential Risks From Exposure to Subsurface Soil

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	5.E+00	5.E-05
Dermal Contact	7.E-02	3.E-06
Inhalation	NA	NA
Total	5	5.E-05

Adult Residential Risks From Exposure to Sediment

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	NA	7.E-07
Dermal Contact	NA	8.E-07
Inhalation	NA	NA
Total	NA	1.E-06

Child Residential Risks From Exposure to Sediment

Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	NA	2.E-06
Dermal Contact	NA	4.E-07
Inhalation	NA	NA
Total	NA	2.E-06

Source: Revised Final Baseline Human health Risk Assessment (Jacobs, 2010a).

Table 5-1
Summary of Statistics and Identification of Ecological COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	95% UCL on Arithmetic Mean	Background	Toxicity Screening Level	COPEC
Inside the Burn Area												
Surface Soil												
DIO	2,3,7,8-TCDD TEQ	14	14	100	ng/Kg		0.69882	1187.33234	131.34547		0.199	YES
HE	1,3,5-Trinitrobenzene	19	5	26	ug/Kg	125 - 50000	686	85400	12584.92105		376	YES
HE	1,3-Dinitrobenzene	19	1	5	ug/Kg	125 - 50000	3545	3545	2995.78947		655	YES
HE	2,4,6-Trinitrotoluene	19	16	84	ug/Kg	125 - 250	394	35400000	4163046.526			YES
HE	2,4-Dinitrotoluene	19	14	74	ug/Kg	125 - 50000	370	9700000	919530.1579		1280	YES
HE	2,6-Dinitrotoluene	19	7	37	ug/Kg	125 - 50000	352	1400000	105162.7105		32.8	YES
HE	2-Amino-4,6-Dinitrotoluene	13	7	54	ug/Kg	125 - 125	2960	342000	45055			YES
HE	2-Nitrotoluene	19	3	16	ug/Kg	125 - 50000	782	7040	3432.21053			YES
HE	3-Nitrotoluene	19	1	5	ug/Kg	125 - 50000	777	777	2850.10526			YES
HE	4-Amino-2,6-Dinitrotoluene	19	4	21	ug/Kg	125 - 250000	2180	10600	12564.34211			YES
HE	4-Nitrotoluene	13	3	23	ug/Kg	125 - 12500	444	6670	1868			YES
INO	Aluminum	19	19	100	mg/Kg		4640	17390	10141.31579	15500	50	YES
INO	Antimony	19	6	32	mg/Kg	0.404 - 7.7	0.963	5.55	1.98047	9.3	0.142	YES
INO	Arsenic	19	19	100	mg/Kg		4.7	27.8	10.03474	36.5	5.7	YES
INO	Barium	19	19	100	mg/Kg		57.8	3965	468.8	826	1.04	YES
INO	Beryllium	19	16	84	mg/Kg	0.59 - 0.64	0.548	1.27	0.66584	1	1.06	YES
INO	Cadmium	19	14	74	mg/Kg	0.59 - 0.64	0.0657	2.04	0.53402		0.00222	YES
INO	Calcium	19	19	100	mg/Kg		2945	21120	7977.10526	52300		YES
INO	Chromium	19	19	100	mg/Kg		8.86	81.45	22.60579	29	0.4	YES
INO	Cobalt	19	18	95	mg/Kg	6.3 - 6.3	6.23	25.2	10.78632	116	0.14	YES
INO	Copper	19	19	100	mg/Kg		9.815	1580	157.07974	56.2	5.4	YES
INO	Iron	19	19	100	mg/Kg		13130	36260	23037.10526	234000	200	YES
INO	Lead	19	19	100	mg/Kg		8.94	8220	929.54053	48.6	0.0537	YES
INO	Magnesium	19	19	100	mg/Kg		2300	7830	4433.42105	10400		YES
INO	Manganese	19	19	100	mg/Kg		152	1000	334.81579	3506	100	YES
INO	Mercury	19	17	89	mg/Kg	0.039 - 0.04	0.0218	0.409	0.13854	0.1	0.1	YES
INO	Moisture, Percent	19	19	100	PERCENT		15.6	29.98	20.6			YES
INO	Nickel	19	19	100	mg/Kg		16.4	103	41.47368	55.1	13.6	YES
INO	Potassium	19	18	95	mg/Kg	626 - 626	928	2870	1614.78947	3390		YES
INO	Selenium	19	18	95	mg/Kg	0.59 - 0.59	0.267	4.47	1.4145	2	0.0276	YES
INO	Silver	19	13	68	mg/Kg	0.108 - 1.3	0.132	1.285	0.53195	11.1	2	
INO	Sodium	19	13	68	mg/Kg	592 - 639	64.7	1390	400.21842			YES
INO	Thallium	19	14	74	mg/Kg	1.18 - 1.26	1.3	3.32	1.69	1.3	0.0569	YES
INO	Tin	3	1	33	mg/Kg	0.467 - 0.472	5.31	5.31	1.9265		7.62	
INO	Vanadium	19	19	100	mg/Kg		10.5	40.8	24.95789	40.9	1.59	YES
INO	Zinc	19	19	100	mg/Kg		48.55	1540	308.02368	322	6.62	YES

Table 5-1
Summary of Statistics and Identification of Ecological COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
PAH	Acenaphthene	19	11	58	ug/Kg	73.1 - 420	90.9	67400	7898.44737		20000	YES
PAH	Acenaphthylene	19	12	63	ug/Kg	39.9 - 420	42.2	131000	14785.69737		682000	
PAH	Anthracene	19	6	32	ug/Kg	4.55 - 410	4.69	73.2	75.39974		1480000	
PAH	Benzo(a)anthracene	19	8	42	ug/Kg	8.04 - 420	9.7	501	128.85342		5210	
PAH	Benzo(a)pyrene	19	5	26	ug/Kg	9.65 - 420	18.9	108	109.18342		1520	
PAH	Benzo(b)fluoranthene	19	10	53	ug/Kg	3.82 - 420	4	212	113.83158		59800	
PAH	Benzo(g,h,i)perylene	19	3	16	ug/Kg	13.9 - 601	47.4	103	116.70526		119000	
PAH	Benzo(k)fluoranthene	19	9	47	ug/Kg	13.8 - 420	42.3	469	143.34737		148000	
PAH	Chrysene	19	10	53	ug/Kg	5.68 - 410	38.9	928	157.82421		4730	
PAH	Dibenz(a,h)anthracene	19	3	16	ug/Kg	3.18 - 420	16.1	302	106.30921		18400	
PAH	Fluoranthene	19	9	47	ug/Kg	22.5 - 973	56	720	215.92632		122000	
PAH	Fluorene	19	4	21	ug/Kg	24.7 - 1040	25.6	317	160.42895		30000	
PAH	Indeno(1,2,3-cd)pyrene	19	4	21	ug/Kg	3.43 - 420	33.9	151	88.44289		109000	
PAH	Naphthalene	19	10	53	ug/Kg	26 - 420	234	51300	5908.93421		99.4	YES
PAH	Phenanthrene	19	10	53	ug/Kg	19.2 - 420	68.8	1550	349.79737		45700	
PAH	Pyrene	19	4	21	ug/Kg	26.6 - 1150	44	203	140.9		78500	
PCB	PCB-1254 (Aroclor 1254)	19	2	11	ug/Kg	40 - 14200	1660	3670	2003.78947		40000	
PCB	PCB-1260 (Aroclor 1260)	19	11	58	ug/Kg	39 - 8620	632	11600	2932.86842			YES
VOC	1,1,1-Trichloroethane	19	3	16	ug/Kg	0.463 - 31	1.085	140	9.32663		29800	
VOC	1,1-Dichloroethane	19	1	5	ug/Kg	0.411 - 31	10.1	10.1	2.34782		20100	
VOC	1,1-Dichloroethene	19	7	37	ug/Kg	0.508 - 31	0.62	2.55	2.28505		8280	
VOC	2-Butanone (Methyl ethyl ketone)	19	3	16	ug/Kg	3.27 - 120	3.6	54	10.61658		89600	
VOC	Acetone	19	8	42	ug/Kg	3.07 - 26	8.7	300	38.35447		2500	
VOC	Benzene	19	7	37	ug/Kg	0.393 - 31	1.4	20.6	3.83095		255	
VOC	Chloroform	19	1	5	ug/Kg	0.454 - 31	2	2	1.96245		1190	
VOC	Cyclohexane	13	5	38	ug/Kg	0.419 - 1.05	0.83	24.9	4.58158			YES
VOC	Ethylbenzene	19	1	5	ug/Kg	0.332 - 31	2.3	2.3	1.90529		5160	
VOC	Isopropylbenzene (Cumene)	12	1	8	ug/Kg	0.393 - 1.11	1.3	1.3	0.39075			YES
VOC	Methylcyclohexane	10	4	40	ug/Kg	0.445 - 1.12	1.1	23.9	3.01935			YES
VOC	Methylene Chloride	19	1	5	ug/Kg	1.18 - 31	1.9	1.9	2.33263		4050	
VOC	Tetrachloroethene (PCE)	19	1	5	ug/Kg	0.332 - 31	0.87	0.87	1.84076		9920	
VOC	Toluene	19	7	37	ug/Kg	0.297 - 31	0.99	1570	88.90084		5450	
VOC	Xylenes, Total	19	2	11	ug/Kg	0.341 - 31	0.78	12.5	2.46963		10000	

Table 5-1
Summary of Statistics and Identification of Ecological COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
Outside the Burn Area												
Surface Soil												
HE	1,3,5-Trinitrobenzene	55	13	24	ug/Kg	87 - 5000	210	15000	576.32727		376	YES
HE	1,3-Dinitrobenzene	55	3	5	ug/Kg	83 - 12000	120	220	228.22727		655	
HE	2,4,6-Trinitrotoluene	55	33	60	ug/Kg	87 - 250	140	2270000	50035.18182			YES
HE	2,4-Dinitrotoluene	55	25	45	ug/Kg	110 - 250	240	200000	5302.47273		1280	YES
HE	2,6-Dinitrotoluene	55	14	25	ug/Kg	110 - 12000	152	78000	1897.71818		32.8	YES
HE	2-Amino-4,6-Dinitrotoluene	45	16	36	ug/Kg	125 - 625	150	26000	1076.54444			YES
HE	2-Nitrotoluene	55	6	11	ug/Kg	87 - 12000	110	2000	268.23636			YES
HE	4-Amino-2,6-Dinitrotoluene	55	16	29	ug/Kg	87 - 110000	130	27000	2130.89091			YES
HE	4-Nitrotoluene	45	1	2	ug/Kg	87 - 625	260	260	69.08889			YES
HE	HMX	55	4	7	ug/Kg	87 - 25000	150	820	424.15455			YES
HE	Nitrobenzene	65	1	2	ug/Kg	92 - 12000	180	180	221.70769		1310	
HE	RDX	55	2	4	ug/Kg	87 - 25000	270	540	416.21818			YES
INO	Aluminum	45	45	100	mg/Kg		8840	16450	11571.33333	15500	50	YES
INO	Antimony	45	3	7	mg/Kg	0.401 - 7.8	0.534	0.782	1.37022	9.3	0.142	YES
INO	Arsenic	45	45	100	mg/Kg		5.13	21.7	8.62778	36.5	5.7	YES
INO	Barium	45	45	100	mg/Kg		47.1	263	102.50889	826	1.04	YES
INO	Beryllium	45	40	89	mg/Kg	0.6 - 0.65	0.515	0.946	0.62764	1	1.06	
INO	Cadmium	45	35	78	mg/Kg	0.0572 - 0.65	0.0771	1.74	0.40024		0.00222	YES
INO	Calcium	45	45	100	mg/Kg		2320	61200	8862.55556	52300		YES
INO	Chromium	45	45	100	mg/Kg		10.7	26.7	17.78667	29	0.4	YES
INO	Cobalt	45	45	100	mg/Kg		4.02	30.1	8.51567	116	0.14	YES
INO	Copper	45	45	100	mg/Kg		13	534	48.11222	56.2	5.4	YES
INO	Iron	45	45	100	mg/Kg		11550	33300	20664.66667	234000	200	YES
INO	Lead	55	55	100	mg/Kg		7.88	603	143.99918	48.6	0.0537	YES
INO	Magnesium	45	45	100	mg/Kg		993	20100	3962.84444	10400		YES
INO	Manganese	45	45	100	mg/Kg		147	3870	423.45556	3506	100	YES
INO	Mercury	45	40	89	mg/Kg	0.038 - 0.041	0.0152	0.518	0.10182	0.1	0.1	YES
INO	Moisture, Percent	30	30	100	PERCENT		12.2	35.66	20.85033			YES
INO	Nickel	45	45	100	mg/Kg		11.6	96.5	24.46111	55.1	13.6	YES
INO	Potassium	45	45	100	mg/Kg		598	2620	1562.43333	3390		YES
INO	Selenium	45	21	47	mg/Kg	0.202 - 0.83	0.527	2.13	0.72742	2	0.0276	YES
INO	Silver	45	8	18	mg/Kg	0.105 - 1.3	0.138	0.973	0.25151	11.1	2	
INO	Sodium	45	21	47	mg/Kg	245 - 646	45.9	402	154.13222			YES
INO	Thallium	45	10	22	mg/Kg	0.31 - 23.6	1.2	2.1	0.91422	1.3	0.0569	YES
INO	Tin	4	1	25	mg/Kg	0.474 - 0.486	3.78	3.78	1.12425		7.62	
INO	Vanadium	45	45	100	mg/Kg		20.3	41.4	27.39444	40.9	1.59	YES
INO	Zinc	45	45	100	mg/Kg		35.7	498	120.45556	322	6.62	YES
INX	Cyanide	25	12	48	mg/Kg	0.15 - 0.65	0.17	1	0.2838		1.33	

Table 5-1
Summary of Statistics and Identification of Ecological COPCs for Constituents Detected in Environmental Media
Reservoir 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
PAH	Acenaphthene	55	11	20	ug/Kg	24 - 430	34.2	697	100.57455		20000	
PAH	Acenaphthylene	55	12	22	ug/Kg	14.7 - 430	26.8	1960	166.22091		682000	
PAH	Anthracene	55	13	24	ug/Kg	1.67 - 430	2.74	55	44.26191		1480000	
PAH	Benzo(a)anthracene	55	21	38	ug/Kg	2.96 - 430	4.08	186	63.28927		5210	
PAH	Benzo(a)pyrene	55	26	47	ug/Kg	3.65 - 430	10.6	360	78.66227		1520	
PAH	Benzo(b)fluoranthene	55	24	44	ug/Kg	1.44 - 430	5.125	820	100.51936		59800	
PAH	Benzo(g,h,i)perylene	55	18	33	ug/Kg	5.25 - 430	13.05	270	65.90064		119000	
PAH	Benzo(k)fluoranthene	55	27	49	ug/Kg	1.37 - 430	30.9	430	101.49973		148000	
PAH	Chrysene	55	25	45	ug/Kg	2.15 - 430	8.3	297	78.23682		4730	
PAH	Dibenz(a,h)anthracene	55	5	9	ug/Kg	3.17 - 430	10.4	124	48.26945		18400	
PAH	Fluoranthene	55	29	53	ug/Kg	8.51 - 430	21.3	350	94.78282		122000	
PAH	Fluorene	55	9	16	ug/Kg	9.1 - 430	10.7	91.3	51.34627		30000	
PAH	Indeno(1,2,3-cd)pyrene	55	18	33	ug/Kg	1.3 - 430	8.2	230	60.74418		109000	
PAH	Naphthalene	55	11	20	ug/Kg	9.84 - 430	23.4	1737.5	104.26945		99.4	YES
PAH	Phenanthrene	55	25	45	ug/Kg	7.06 - 430	12.8	190	70.46264		45700	
PAH	Pyrene	55	25	45	ug/Kg	10.1 - 430	13	295	83.91182		78500	
PCB	PCB-1260 (Aroclor 1260)	55	33	60	ug/Kg	38 - 13300	13	44400	1596.83636			YES
SV	1,4-Dichlorobenzene	30	1	3	ug/Kg	0.304 - 430	0.42	0.42	67.29775		546	
SV	2-Methylnaphthalene	35	4	11	ug/Kg	24 - 430	36	110	72.75714		3240	
SV	bis(2-Ethylhexyl)phthalate	10	1	10	ug/Kg	380 - 430	61	61	186.6		925	
VOC	1,1,1-Trichloroethane	30	5	17	ug/Kg	0.435 - 32	0.8	11.9	3.5978		29800	
VOC	1,1-Dichloroethane	30	2	7	ug/Kg	0.386 - 32	0.66	0.67	2.85762		20100	
VOC	1,1-Dichloroethene	30	8	27	ug/Kg	0.446 - 32	0.48	1	2.95477		8280	
VOC	Acetone	30	6	20	ug/Kg	2.89 - 130	4.6	18	13.05567		2500	
VOC	Cyclohexane	20	2	10	ug/Kg	0.394 - 0.586	0.72	3.9	0.44798			YES
VOC	Styrene	30	1	3	ug/Kg	0.32 - 32	1	1	2.82807		4690	
VOC	Tetrachloroethene (PCE)	30	7	23	ug/Kg	0.312 - 32	0.39	3.4	3.13308		9920	
VOC	Toluene	30	2	7	ug/Kg	0.279 - 32	1.5	1.9	2.69532		5450	

Source: Revised Final Baseline Human Health Risk Assessment (Jacobs, 2010a).

Table 5-2

Hazard Quotients for All Wildlife Assessment Receptors Inside the Burn Area
Reservoir No. 2 Burning Ground
Former Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Short-Tailed Shrew	White-Tailed Deer	Marsh Wren	Deer Mouse	Eastern Cottontail Rabbit	Red-Tailed Hawk	Raccoon
2,3,7,8-TCDD TEQ[a]	**9.2E+01**	6.2E-03	**NA[b]**	**4.5E+01**	**2.2E+00**	NA	**1.1E+01**
2,4-Dinitrotoluene	**1.6E+04**	**6.3E+01**	**3.0E+03**	**1.9E+04**	**8.2E+03**	**3.5E+01**	**5.4E+02**
2,6-Dinitrotoluene	**4.6E+02**	**2.5E+00**	**8.3E+01**	**6.6E+02**	**3.3E+02**	**1.2E+00**	**1.4E+01**
2,4,6-Trinitrotoluene	**2.8E+03**	**4.9E+00**	**4.2E+03**	**2.2E+03**	**6.4E+02**	**3.6E+01**	**1.2E+02**
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA
Aluminum	**2.8E+02**	9.3E-02	**2.4E+00**	**1.2E+02**	**3.4E+01**	1.5E-02	**2.8E+00**
Antimony	9.5E-02	2.9E-04	NA	8.6E-02	4.5E-02	NA	1.3E-03
Arsenic	3.1E-01	3.6E-04	6.3E-02	1.6E-01	8.3E-02	5.0E-04	3.5E-03
Barium	**2.6E+01**	6.0E-02	**3.1E+00**	**2.0E+01**	**9.8E+00**	3.1E-02	3.2E-01
Beryllium	5.7E-01	2.3E-04	NA	2.5E-01	7.4E-02	NA	5.8E-03
Cadmium	1.7E-01	2.8E-04	7.2E-02	1.3E-01	4.0E-02	6.1E-04	3.1E-03
Chromium	1.8E-01	1.9E-04	8.4E-02	5.7E-02	6.4E-02	6.5E-04	2.2E-03
Cobalt	5.1E-01	2.6E-03	NA	6.5E-01	3.8E-01	NA	8.4E-03
Copper	5.1E-01	6.7E-03	3.5E-02	**1.3E+00**	9.5E-01	1.7E-03	1.4E-02
Iron	**4.7E+01**	1.4E-02	**1.2E+01**	**2.0E+01**	**5.4E+00**	7.4E-02	4.7E-01
Lead	**5.0E+00**	1.1E-02	**2.6E+00**	**2.9E+00**	**2.3E+00**	3.0E-02	6.7E-02
Manganese	4.0E-01	2.9E-04	1.9E-02	2.1E-01	6.1E-02	1.3E-04	4.3E-03
Mercury	3.9E-03	7.1E-06	2.4E-03	2.1E-03	1.6E-03	2.4E-05	5.2E-05
Nickel	2.4E-02	4.5E-05	2.6E-03	1.2E-02	1.1E-02	2.9E-05	3.2E-04
Selenium	4.4E-01	2.2E-04	8.6E-02	2.0E-01	6.2E-02	5.7E-04	4.5E-03
Thallium	**1.4E+00**	4.6E-04	1.4E-01	5.9E-01	1.6E-01	8.9E-04	1.4E-02
Vanadium	**6.3E+00**	2.0E-03	5.7E-02	**2.7E+00**	7.4E-01	3.5E-04	6.3E-02
Zinc	2.9E-01	3.9E-05	**1.8E+00**	1.3E-01	1.6E-02	1.1E-02	3.2E-03
Acenaphthene	**2.7E+02**	2.4E-03	NA	**1.4E+02**	3.7E-01	NA	**2.3E+02**
Naphthalene	**6.4E+01**	4.0E-03	NA	**3.3E+01**	5.6E-01	NA	**1.7E+01**

Source of hazard quotient values: Jacobs Engineering Inc., 2010, Revised Final Screening Level Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio, February.

Note: Bolded hazard quotients exceed a value of 1. Bolded, shaded hazard quotient values indicate an elevated potential for adverse ecological effects (i.e., >10).

[a]2,3,7,8-TCDD TEQ refers to 2,3,7,8-tetrachloro-dibenzodioxin toxicity equivalents.
[b]"NA" indicates that no toxicological effective dose was available.

Table 5-3

Hazard Quotient for All Wildlife Assessment Receptors Outside the Burn Area
Reservoir No. 2 Burning Ground
Former Plum Brook Ordnancne Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Short-Tailed Shrew	White-Tailed Deer	Marsh Wren	Deer Mouse	Eastern Cottontail Rabbit	Red-Tailed Hawk	Raccoon
2,4-Dinitrotoluene	**5.1E+01**	1.9E-01	**9.3E+00**	**5.9E+01**	**2.6E+01**	1.1E-01	**1.4E+01**
2,6-Dinitrotoluene	**1.6E+01**	8.5E-02	**2.9E+00**	**2.3E+01**	**1.1E+01**	4.0E-02	**2.1E+00**
2,4,6-Trinitrotoluene	**2.8E+02**	4.9E-01	**4.2E+02**	**2.3E+02**	**6.4E+01**	**3.6E+00**	**2.0E+03**
1,3,5-Trinitrobenzene	**NA**[a]	NA	NA	NA	NA	NA	NA
Aluminum	**3.0E+02**	9.8E-02	**2.5E+00**	**1.3E+02**	**3.6E+01**	1.6E-02	**2.9E+04**
Arsenic	2.4E-01	2.8E-04	4.8E-02	1.2E-01	6.3E-02	3.8E-04	1.8E-02
Antimony	3.0E-02	9.0E-05	NA	2.7E-02	1.4E-02	NA	1.0E-03
Barium	**1.1E+00**	2.5E-03	1.3E-01	8.3E-01	4.0E-01	1.3E-03	9.9E-01
Cadmium	7.4E-02	1.2E-04	3.1E-02	5.6E-02	1.7E-02	2.6E-04	1.9E-03
Chromium	1.1E-01	1.2E-04	5.4E-02	3.7E-02	4.1E-02	4.2E-04	4.7E-03
Cobalt	3.9E-01	2.0E-03	NA	4.9E-01	2.8E-01	NA	4.5E-02
Copper	1.8E-01	2.4E-03	1.2E-02	4.5E-01	3.4E-01	5.8E-04	7.3E-02
Iron	**4.0E+01**	1.2E-02	**1.0E+01**	**1.7E+01**	**4.6E+00**	6.3E-02	**7.1E+03**
Lead	6.0E-01	1.3E-03	3.1E-01	3.4E-01	2.8E-01	3.6E-03	4.0E-01
Manganese	5.5E-01	4.1E-04	2.6E-02	3.0E-01	8.6E-02	1.9E-04	**3.9E+00**
Mercury	2.8E-03	5.0E-06	1.7E-03	1.5E-03	1.1E-03	1.7E-05	6.9E-05
Nickel	1.3E-02	2.4E-05	1.4E-03	6.2E-03	5.6E-03	1.5E-05	9.9E-04
Selenium	2.3E-01	1.1E-04	4.5E-02	1.1E-01	3.2E-02	2.9E-04	5.4E-03
Thallium	9.0E-01	3.0E-04	9.3E-02	3.9E-01	1.1E-01	5.8E-04	2.4E-02
Vanadium	**6.5E+00**	2.1E-03	5.8E-02	**2.8E+00**	7.6E-01	3.6E-04	**1.6E+00**
Zinc	1.2E-01	1.6E-05	7.3E-01	5.3E-02	6.3E-03	4.5E-03	2.2E-01
Naphthalene	7.3E-01	4.5E-05	NA	3.7E-01	6.3E-03	NA	1.0E-02

Source of hazard quotient values: Jacobs Engineering Inc., 2010, Revised Final Screening Level Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio, February.

Note: Bolded hazard quotients exceed a value of 1. Bolded, shaded hazard quotient values indicate an elevated potential for adverse ecological effects (i.e., >10).

[a]"NA" indicates that no toxicological effective dose was available.

FIGURES

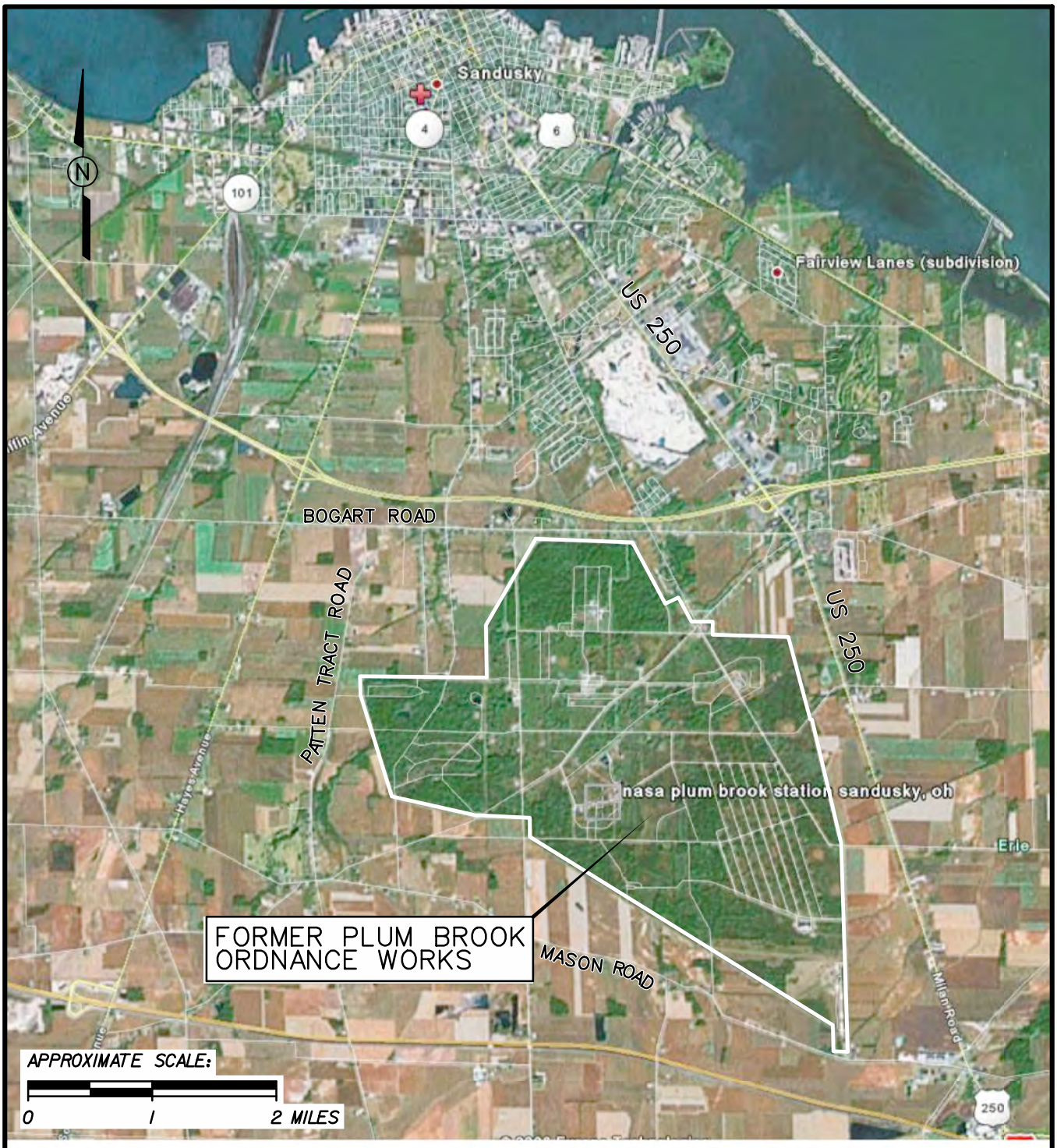

FIGURE 1-1
PBOW VICINITY MAP

RESERVOIR NO. 2 BURNING GROUND
REMEDIAL INVESTIGATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

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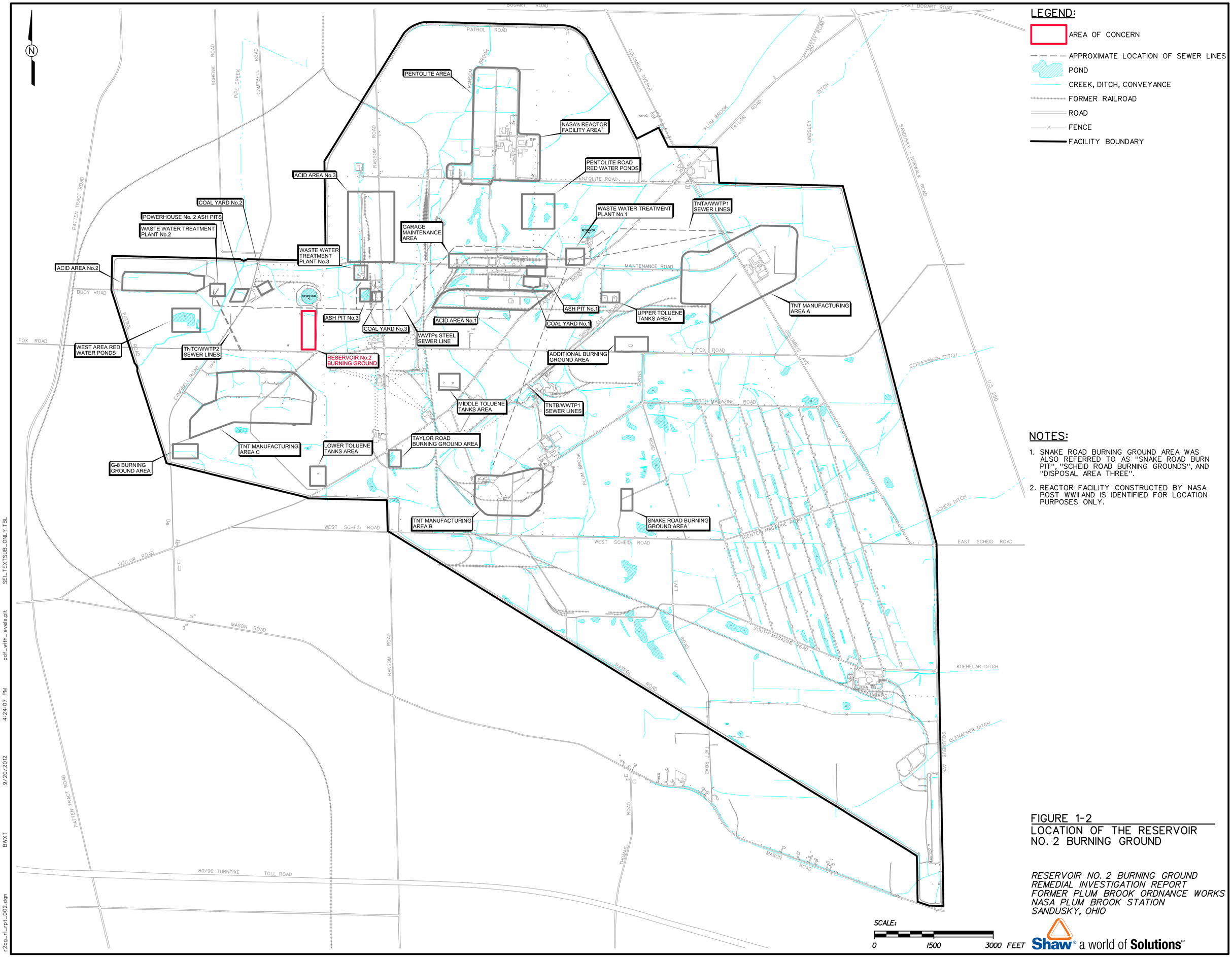

LEGEND:

- AREA OF CONCERN
- APPROXIMATE LOCATION OF SEWER LINES
- POND
- CREEK, DITCH, CONVEYANCE
- FORMER RAILROAD
- ROAD
- FENCE
- FACILITY BOUNDARY

NOTES:

1. SNAKE ROAD BURNING GROUND AREA WAS ALSO REFERRED TO AS "SNAKE ROAD BURN PIT", "SCHEID ROAD BURNING GROUNDS", AND "DISPOSAL AREA THREE".
2. REACTOR FACILITY CONSTRUCTED BY NASA POST WWII AND IS IDENTIFIED FOR LOCATION PURPOSES ONLY.

SCALE: 0 1500 3000 FEET

FIGURE 1-2
LOCATION OF THE RESERVOIR NO. 2 BURNING GROUND

RESERVOIR NO. 2 BURNING GROUND
REMEDIAL INVESTIGATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

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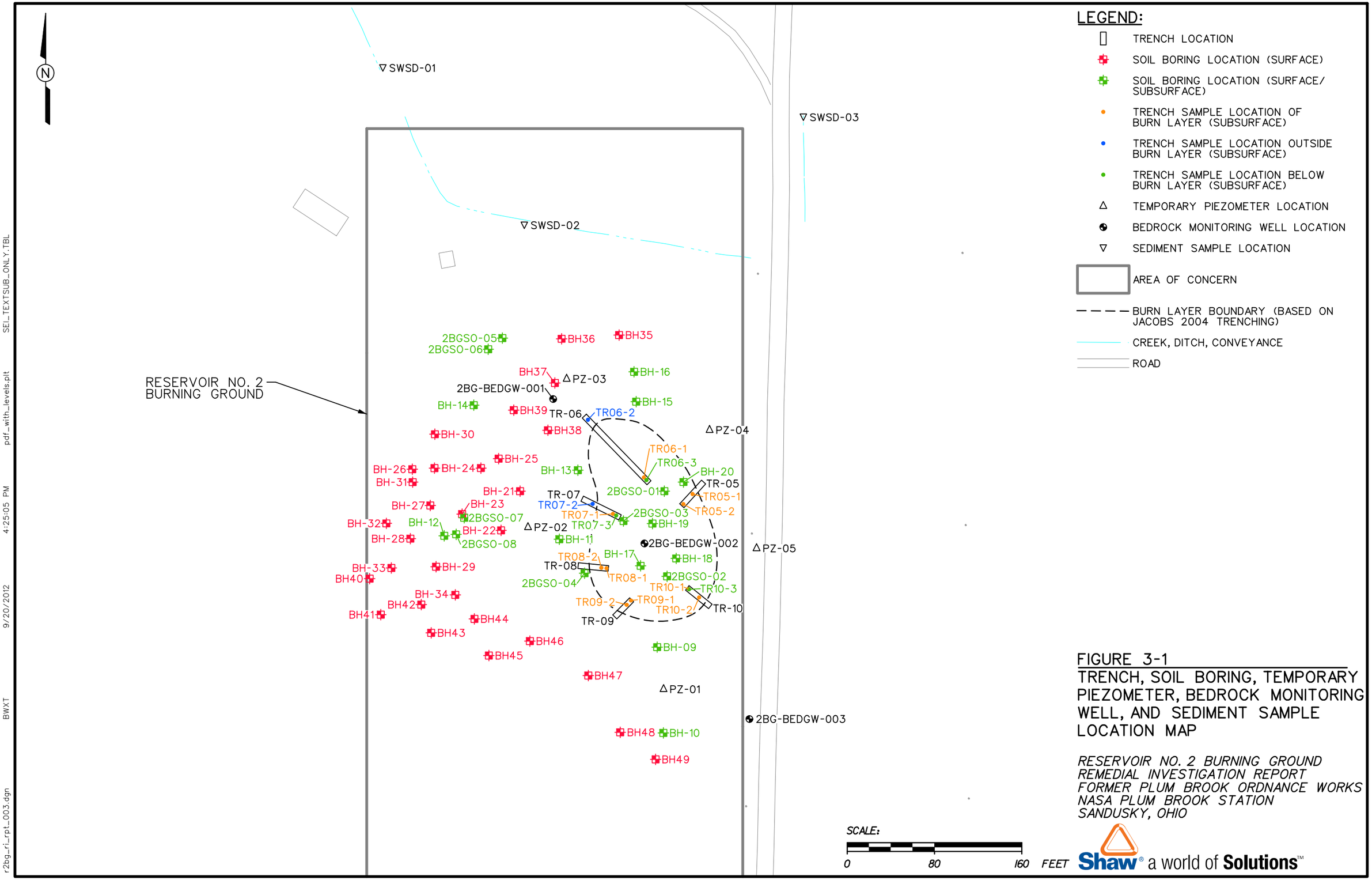

FIGURE 3-1
TRENCH, SOIL BORING, TEMPORARY PIEZOMETER, BEDROCK MONITORING WELL, AND SEDIMENT SAMPLE LOCATION MAP

RESERVOIR NO. 2 BURNING GROUND
REMEDIAL INVESTIGATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

SCALE:
0 80 160 FEET

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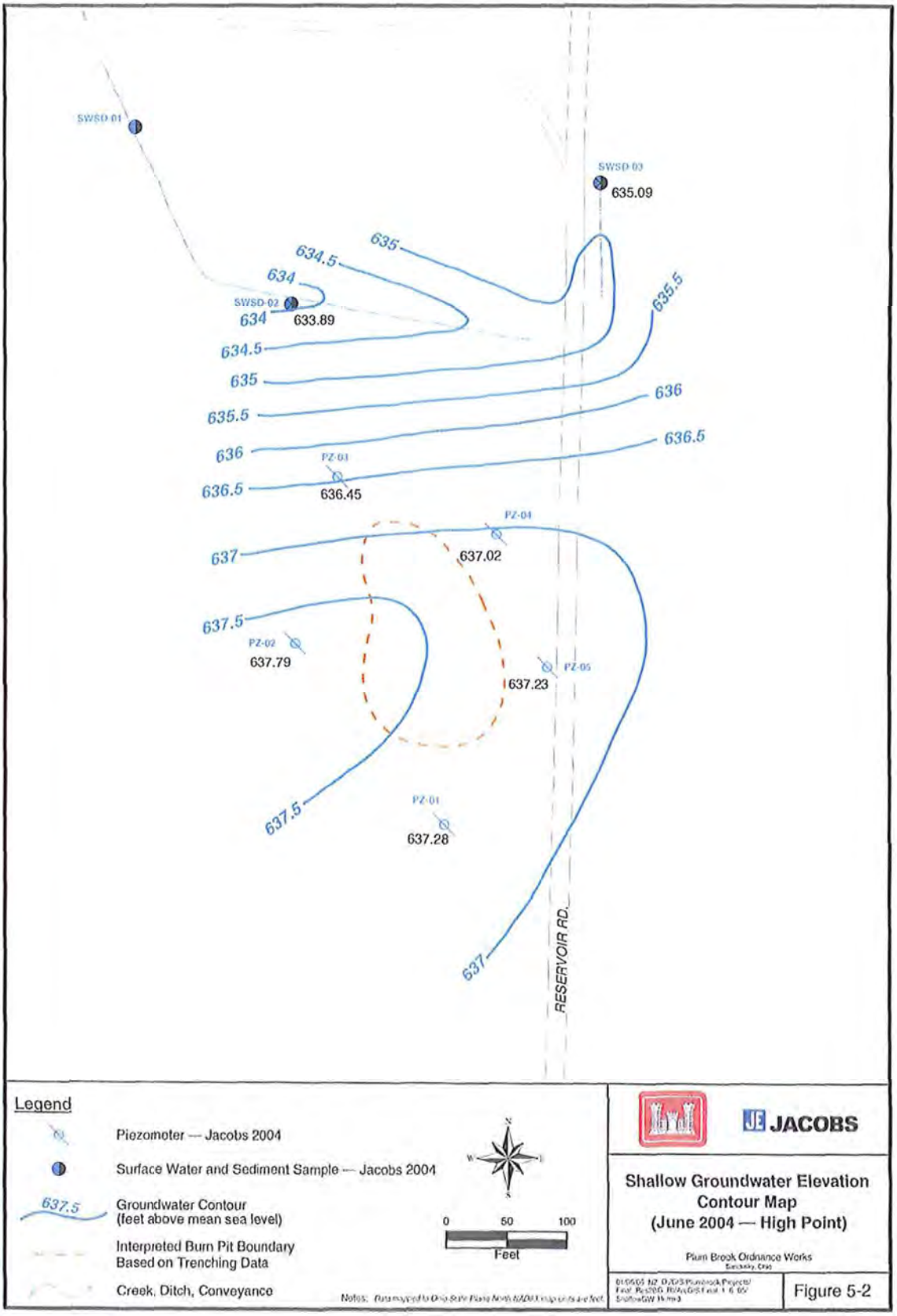

SOURCE: FINAL SITE CHARACTERIZATION REPORT (JACOBS, 2006).

FIGURE 3-2
OVERBURDEN/SHALE GROUNDWATER ELEVATION CONTOUR MAP (JUNE 2004)

RESERVOIR NO. 2 BURNING GROUND
REMEDIAL INVESTIGATION REPORT

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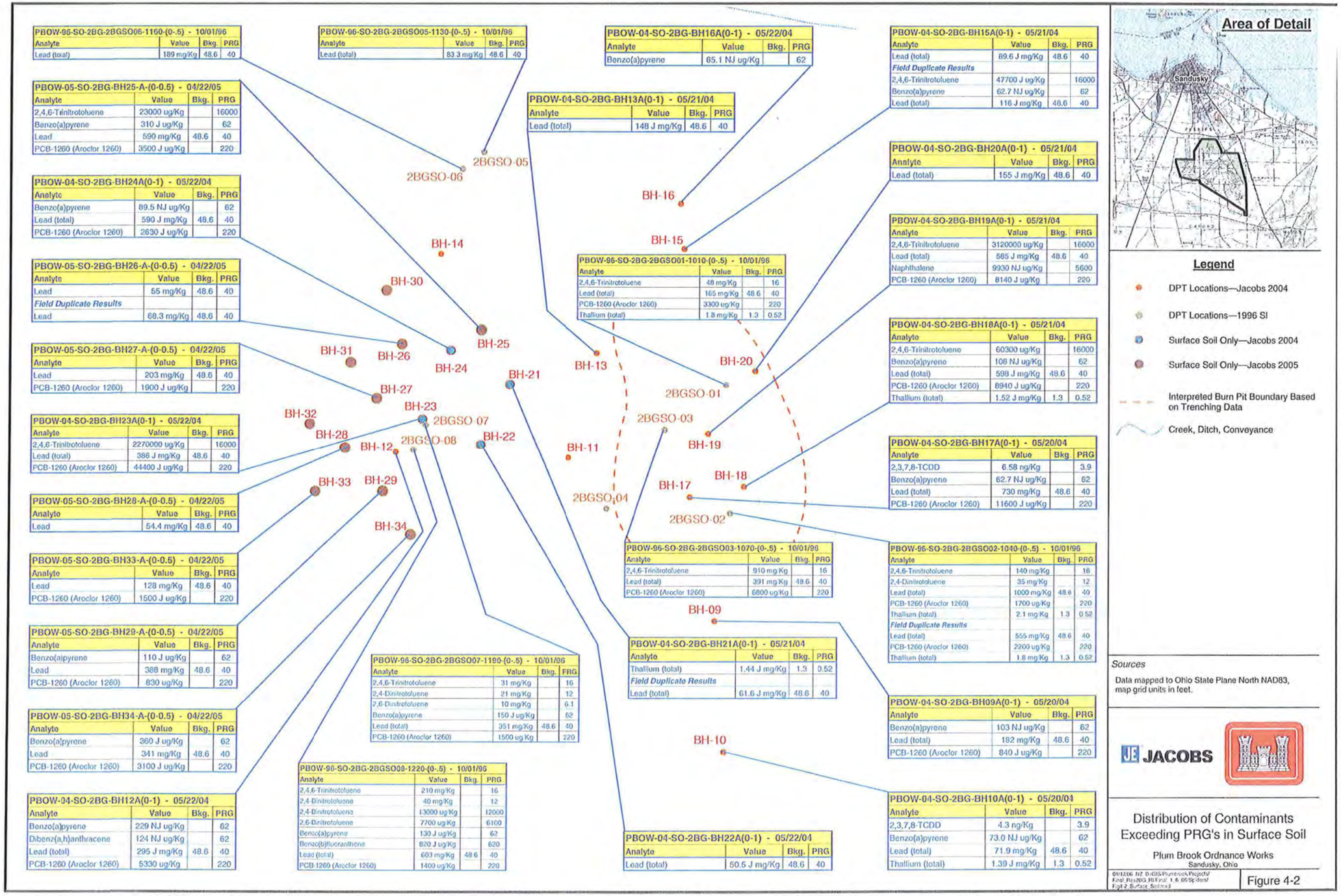

SOURCE: FINAL SITE CHARACTERIZATION REPORT (JACOBS, 2006).

FIGURE 3-3 DISTIBUTION OF CONTAMINANTS EXCEEDING PRGs IN SURFACE SOIL

RESERVOIR NO. 2 BURNING GROUND REMEDIAL INVESTIGATION REPORT

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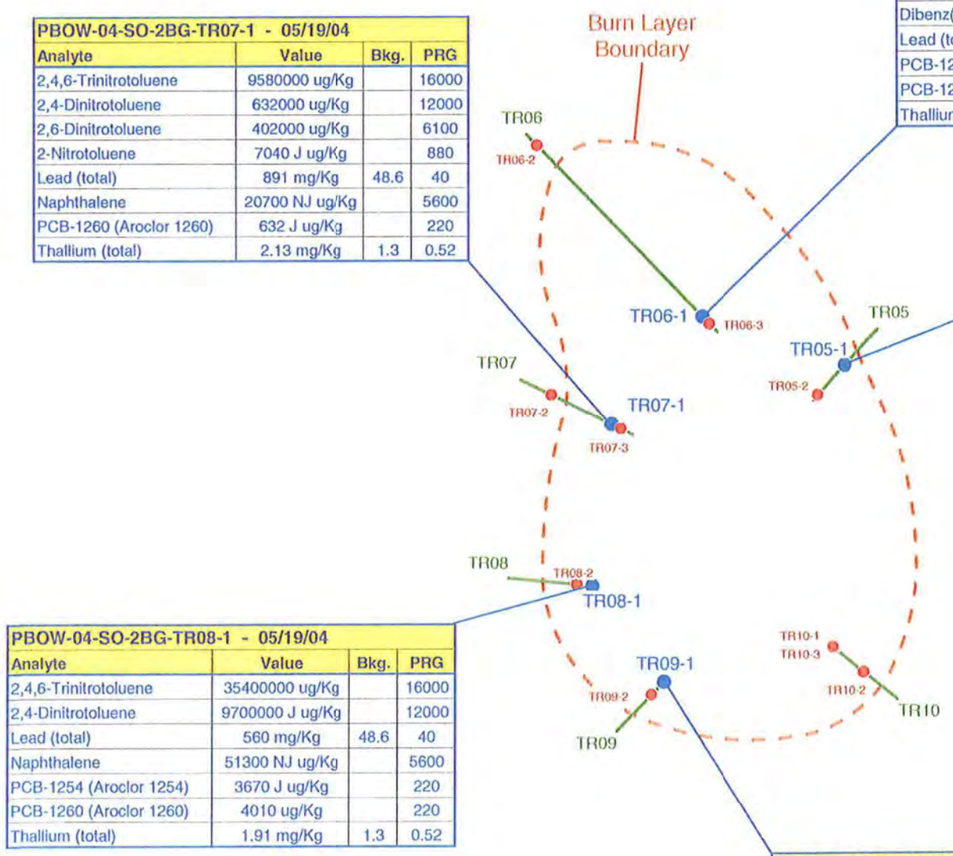

PBOW-04-SO-2BG-TR07-1 - 05/19/04

Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	9580000 ug/Kg		16000
2,4-Dinitrotoluene	632000 ug/Kg		12000
2,6-Dinitrotoluene	402000 ug/Kg		6100
2-Nitrotoluene	7040 J ug/Kg		880
Lead (total)	891 mg/Kg	48.6	40
Naphthalene	20700 NJ ug/Kg		5600
PCB-1260 (Aroclor 1260)	632 J ug/Kg		220
Thallium (total)	2.13 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR06-1 - 05/19/04

Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	74900 ug/Kg		16000
2,4-Dinitrotoluene	26200 J ug/Kg		12000
2,6-Dinitrotoluene	10800 ug/Kg		6100
Barium (total)	2490 J mg/Kg	826	540
Benzo(a)pyrene	108 NJ ug/Kg		62
Dibenz(a,h)anthracene	302 NJ ug/Kg		62
Lead (total)	3640 mg/Kg	48.6	40
PCB-1254 (Aroclor 1254)	1660 J ug/Kg		220
PCB-1260 (Aroclor 1260)	1870 ug/Kg		220
Thallium (total)	3.32 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR05-1 - 05/19/04

Analyte	Value	Bkg.	PRG
1,3-Dinitrobenzene	4320 ug/Kg		610
2,4,6-Trinitrotoluene	885000 ug/Kg		16000
2,4-Dinitrotoluene	104000 J ug/Kg		12000
2,6-Dinitrotoluene	111000 ug/Kg		6100
2-Nitrotoluene	4500 J ug/Kg		880
Barium (total)	2730 J mg/Kg	826	540
Copper (total)	1320 J mg/Kg	56.2	310
Lead (total)	4510 J mg/Kg	48.6	40
Naphthalene	15900 NJ ug/Kg		5600
Thallium (total)	2.21 mg/Kg	1.3	0.52
Field Duplicate Results			
1,3-Dinitrobenzene	2770 J ug/Kg		610
2,4,6-Trinitrotoluene	1120000 ug/Kg		16000
2,4-Dinitrotoluene	88100 ug/Kg		12000
2,6-Dinitrotoluene	102000 ug/Kg		6100
2-Nitrotoluene	4280 J ug/Kg		880
Barium (total)	5200 J mg/Kg	826	540
Copper (total)	1840 J mg/Kg	56.2	310
Lead (total)	11930 J mg/Kg	48.6	40
Thallium (total)	1.79 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR08-1 - 05/19/04

Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	35400000 ug/Kg		16000
2,4-Dinitrotoluene	9700000 J ug/Kg		12000
Lead (total)	560 mg/Kg	48.6	40
Naphthalene	51300 NJ ug/Kg		5600
PCB-1254 (Aroclor 1254)	3670 J ug/Kg		220
PCB-1260 (Aroclor 1260)	4010 ug/Kg		220
Thallium (total)	1.91 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR09-1 - 05/19/04

Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	28700000 ug/Kg		16000
2,4-Dinitrotoluene	6770000 J ug/Kg		12000
2,6-Dinitrotoluene	1400000 ug/Kg		6100
Lead (total)	551 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1220 J ug/Kg		220
Thallium (total)	2.44 mg/Kg	1.3	0.52

Legend

- Interpreted Burn Pit Boundary Based on Trenching Data
- 106 Exploratory Trenches—Jacobs 2004
- Creek, Ditch, Conveyance
- Sample Location—Full Suite Analytical
- Sample Location—Dioxin and Furan Only

N W E S

0 25 50
Feet

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JE JACOBS

Distribution of Contaminants Exceeding PRG's in the Burn layer

Plum Brook Ordnance Works
Sandusky, Ohio

Figure 4-4

SOURCE: FINAL SITE CHARACTERIZATION REPORT (JACOBS, 2006).

FIGURE 3-4 DISTRIBUTION OF CONTAMINANTS EXCEEDING PRGs IN THE BURN LAYER SOIL

RESERVOIR NO. 2 BURNING GROUND REMEDIAL INVESTIGATION REPORT

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PBOW-96-SO-2BG-2BGSO05-1150-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Field Duplicate Results			
Aluminum (total)	16000 mg/Kg	15500	7600
Thallium (total)	2.1 mg/Kg	1.3	0.52

2BGSO-05

2BGSO-06

PBOW-04-SO-2BG-BH16A(3-5) - 05/25/04			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.8 J mg/Kg	1.3	0.52

BH-16

PBOW-96-SO-2BG-2BGSO01-1020-(2-3) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4-Dinitrotoluene	19000 ug/Kg		12000
Thallium (total)	1.9 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO01-1030-(6-7) - 10/01/96			
Thallium (total)	2.8 mg/Kg	1.3	0.52

BH-14

Burn Layer Boundary

BH-15

PBOW-96-SO-2BG-2BGSO07-1200-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.4 mg/Kg	1.3	0.52

2BGSO-07

BH-13

BH-20

2BGSO-01

PBOW-96-SO-2BG-2BGSO03-1080-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	94 mg/Kg		16
2,4-Dinitrotoluene	160 mg/Kg		12
Lead (total)	232 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1800 ug/Kg		220
Thallium (total)	3.3 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO03-1090-(6-7) - 10/02/96			
Aluminum (total)	17000 mg/Kg	15500	7600
Thallium (total)	2.3 mg/Kg	1.3	0.52

BH-12

2BGSO-08

2BGSO-03

BH-19

BH-11

PBOW-04-SO-2BG-BH19A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.63 J mg/Kg	1.3	0.52

PBOW-96-SO-2BG-2BGSO04-1110-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.6 mg/Kg	1.3	0.52

2BGSO-04

BH-18

BH-17

2BGSO-02

PBOW-04-SO-2BG-BH18A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	17900 J ug/Kg		16000
2,4-Dinitrotoluene	19200 J ug/Kg		12000
2,6-Dinitrotoluene	15400 J ug/Kg		6100
Aluminum (total)	17390 mg/Kg	15500	7600
Lead (total)	103 mg/Kg	48.6	40
Thallium (total)	2.07 J mg/Kg	1.3	0.52

PBOW-04-SO-2BG-BH10A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	16450 mg/Kg	15500	7600
Thallium (total)	1.44 J mg/Kg	1.3	0.52
PBOW-04-SO-2BG-BH10A(8-10) - 05/26/04			
Aluminum (total)	233600 mg/Kg	15500	7600
Arsenic (total)	131 J mg/Kg	36.5	0.39
Cadmium (total)	8.64 J mg/Kg		3.7
Cobalt (total)	166 J mg/Kg	116	90
Copper (total)	504 J mg/Kg	56.2	310
Iron (total)	412600 J mg/Kg	234000	2300
Lead (total)	227 J mg/Kg	48.6	40
Manganese (total)	8230 J mg/Kg	3506	180
Nickel (total)	475 J mg/Kg	55.1	160
Selenium (total)	51.8 mg/Kg	2	39

PBOW-04-SO-2BG-BH09A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	15750 mg/Kg	15500	7600
Manganese (total)	3870 J mg/Kg	3506	180

BH-09

PBOW-04-SO-2BG-BH17A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	15660 mg/Kg	15500	7600

PBOW-96-SO-2BG-2BGSO02-1050-(2-3) - 10/01/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.8 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO02-1060-(6-7) - 10/01/96			
Aluminum (total)	16100 mg/Kg	15500	7600
Thallium (total)	2.7 mg/Kg	1.3	0.52

BH-10

Legend

- DPT Locations—Jacobs 2004
- DPT Locations—1996 SI
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS

Distribution of Contaminants Exceeding PRG's in Subsurface Soil

Plum Brook Ordnance Works
Sandusky, Ohio

01/0906 NT D:\GIS\Plumbrook\Projects\Final_Rpt2BG_Fit\Final_1.6.05\Spiders\Fig4.5_Sub_Surface_Soil.mxd

Figure 4-5

SOURCE: FINAL SITE CHARACTERIZATION REPORT (JACOBS, 2006).

NOTE: EXCLUDES BURN LAYER SOIL (SEE FIG. 3-4).

FIGURE 3-5 DISTRIBUTION OF CONTAMINANTS EXCEEDING PRGs IN SUBSURFACE SOIL

RESERVOIR NO. 2 BURNING GROUND REMEDIAL INVESTIGATION REPORT

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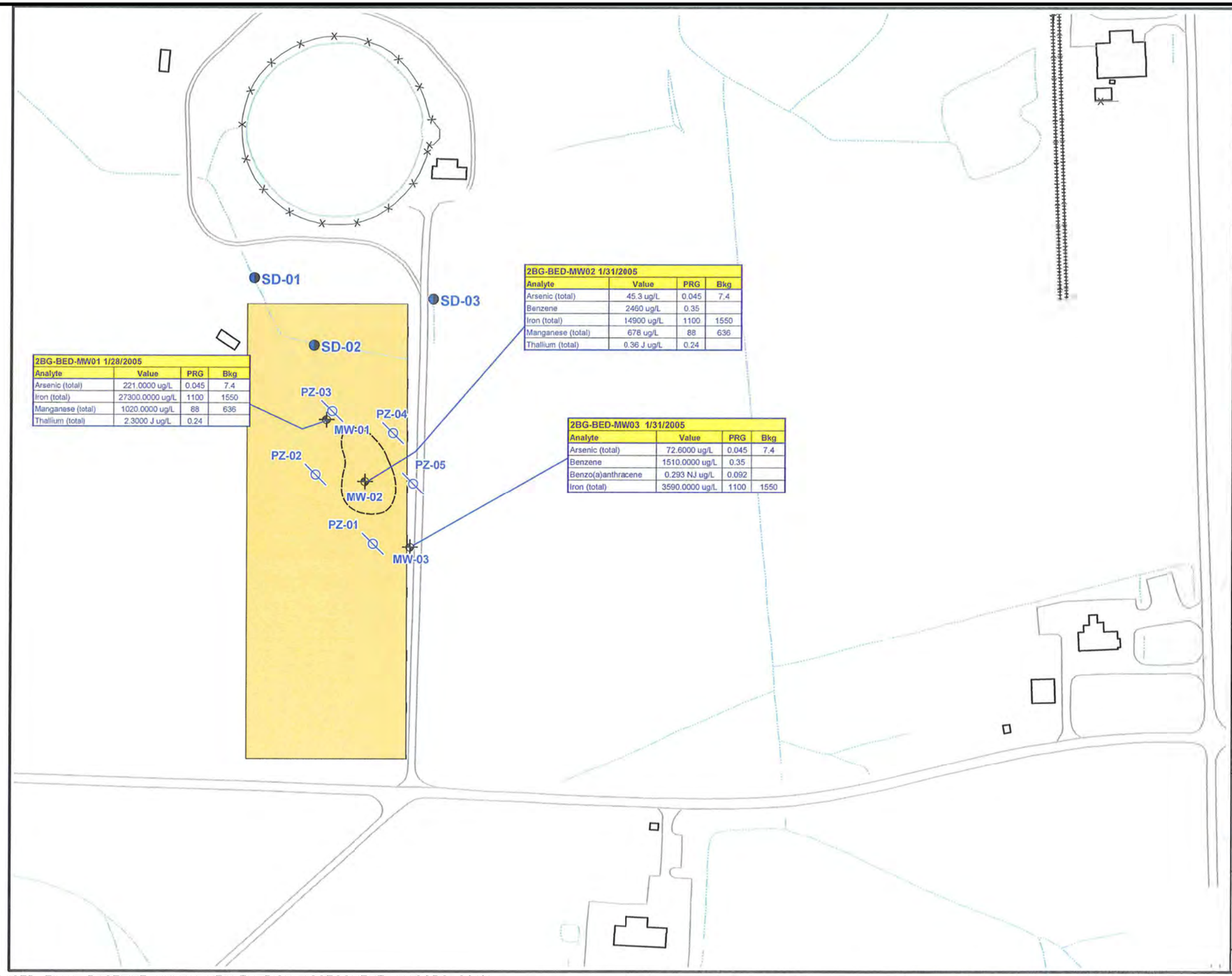

SOURCE: REVISED FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT (JACOBS, 2010).

FIGURE 3-6 DISTRIBUTION OF CONTAMINANTS EXCEEDING PRGs IN GROUNDWATER

RESERVOIR NO. 2 BURNING GROUND REMEDIAL INVESTIGATION REPORT

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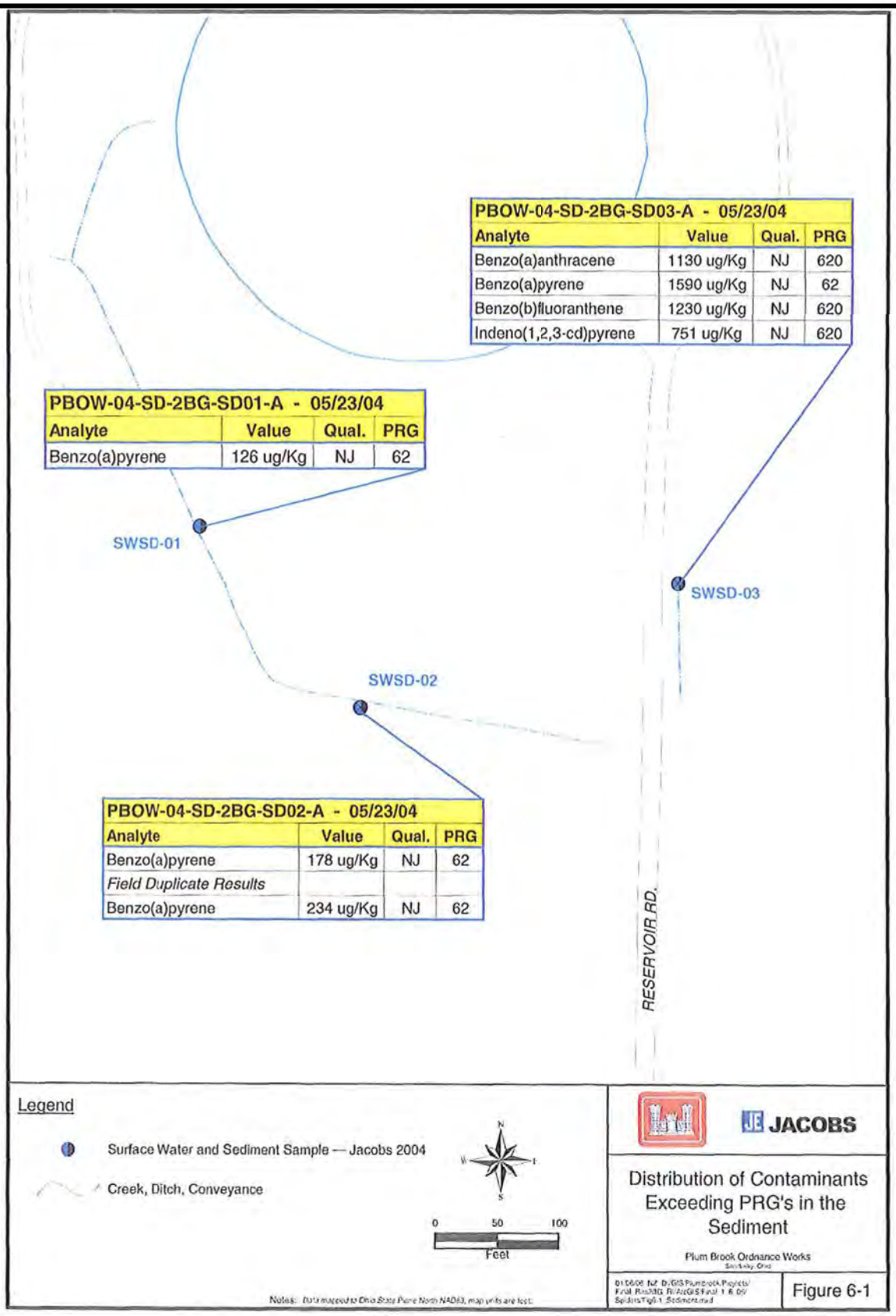

SOURCE: FINAL SITE CHARACTERIZATION REPORT (JACOBS, 2006).

FIGURE 3-7
DISTRIBUTION OF CONTAMINANTS EXCEEDING PRGs IN SEDIMENT

RESERVOIR NO. 2 BURNING GROUND
REMEDIAL INVESTIGATION REPORT

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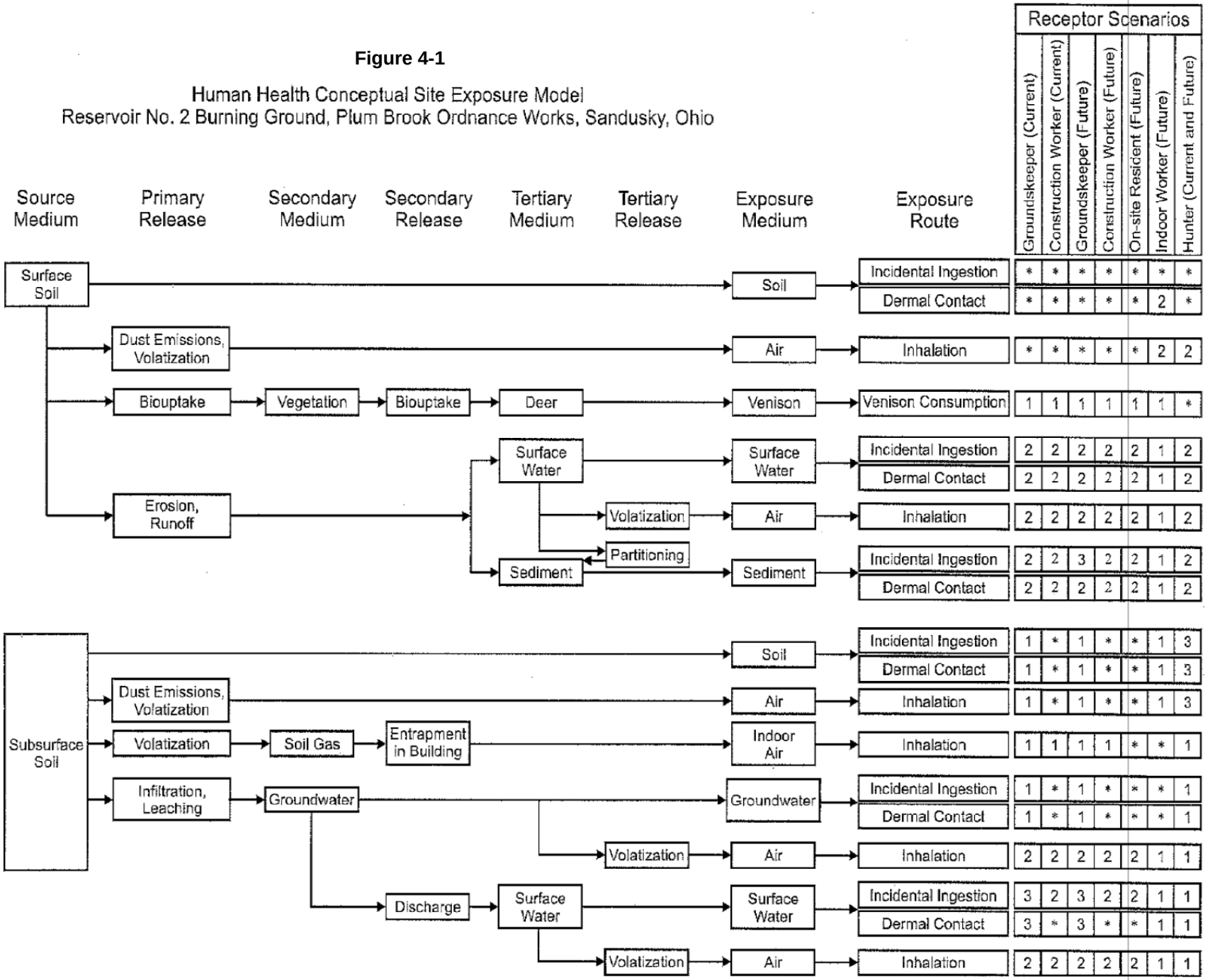
Figure 4-1

Human Health Conceptual Site Exposure Model
Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio



* = Complete exposure route quantified in the risk assessment.
1 = There is no plausible pathway for exposure in this medium.
2 = Although theoretically complete, this pathway in not quantified as explained in text.
3 = Contact with this medium, although plausible, is not part of this receptor's normal or expected activities; therefore, contact would be sporadic and is not quantified.

Source: Revised Final Baseline Human Health Risk Assessment (Jacobs, 2010a)

SOURCE: REVISED FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (JACOBS, 2010).

FIGURE 5-1 HABITAT MAP

RESERVOIR NO. 2 BURNING GROUND REMEDIAL INVESTIGATION REPORT

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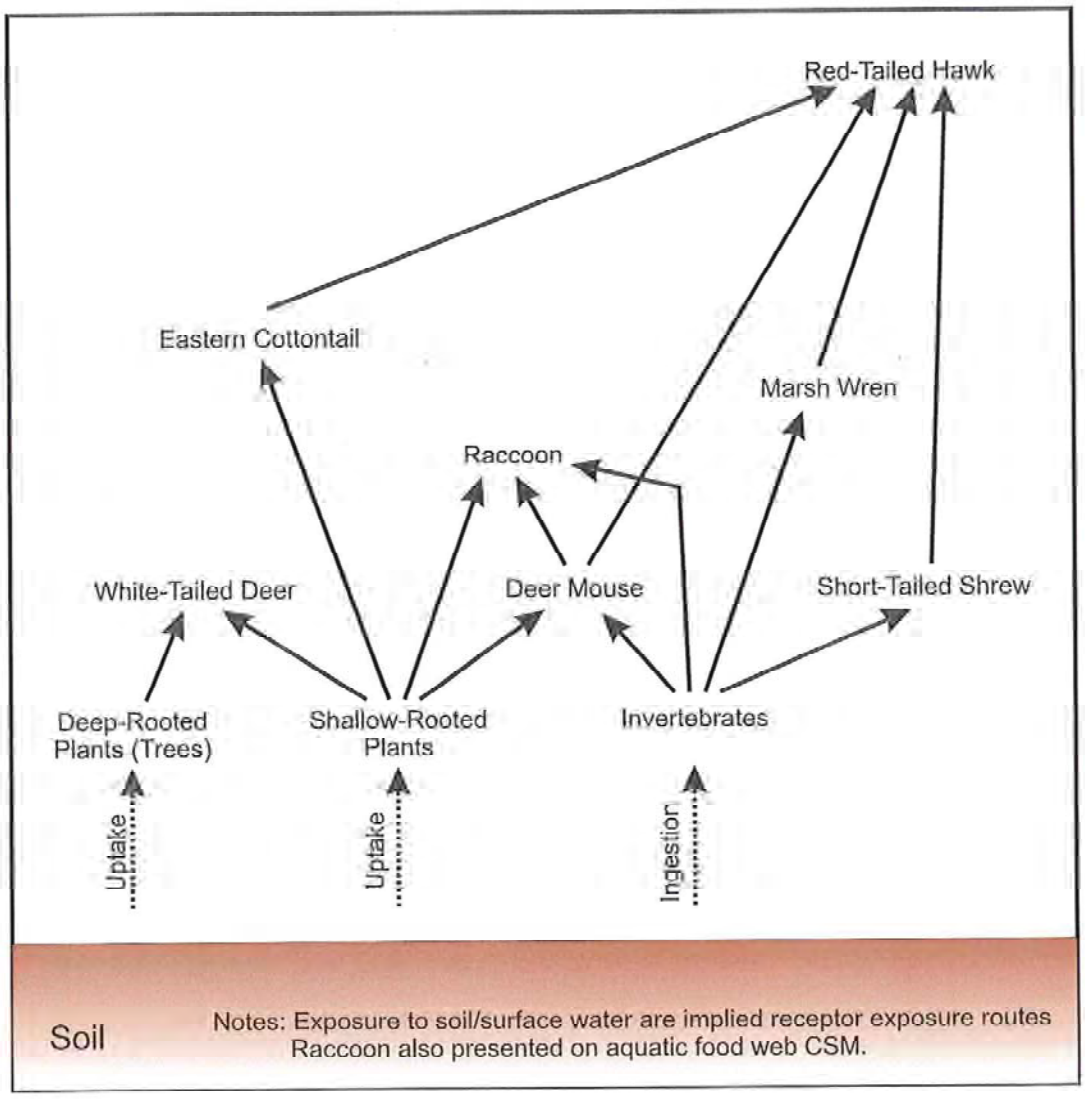
Figure 5-2

Simplified Terrestrial Food Web Conceptual Site Model (CSM)
Reservoir No. 2 Burning Ground
Former Plum Brook Ordnance Works, Sandusky, Ohio



Source: Revised Final Screening Level Ecological Risk Assessment (Jacobs, 2010b).

APPENDIX A

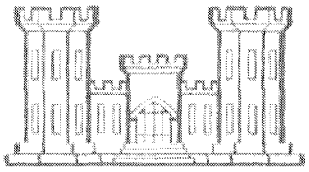
RESERVOIR NO. 2 BURNING GROUND SCR
(ELECTRONIC DELIVERABLE ONLY)

FINAL SITE CHARACTERIZATION REPORT

Remedial Investigation Part 1,
At Reservoir No. 2 Burning Ground

Former Plum Brook Ordnance Works
Sandusky, Ohio

Prepared for:



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0002

Prepared by:

JACOBS ENGINEERING GROUP, INC.
125 BROADWAY
OAK RIDGE, TN 37830

January 2005

COMPLETION OF INDEPENDENT TECHNICAL REVIEW

Jacobs Engineering Group, Inc. has completed the Final Site Characterization Report, Remedial Investigation Part 1, at the Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio. Notice is hereby given that all comments received on the Interim Final Site Characterization Report have been incorporated into the Final Report in accordance with the associated responses provided in Appendix L.

(Signature)	(Discipline)	(Date)
	Chemist	01/10/06

Independent Technical Review Team Leader and Team Members

(Signature)	(Discipline)	(Date)

Independent Technical Review Team Leader and Team Members

(Signature)	(Discipline)	(Date)

Independent Technical Review Team Leader and Team Members

(Signature)	(Discipline)	(Date)
	Geologist	1/10/06

Jacobs Final Site Characterization Report Author

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows (Describe the major technical concerns, possible impact, and resolution):

Comment: See Appendix L for Team Member Comments

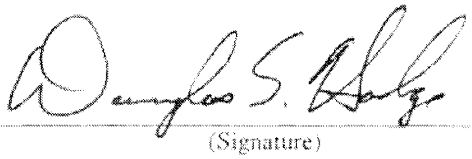
Comment:

Comment:

Comment:

Comment:

All concerns resulting from independent technical review of the project have been considered.



(Signature)

(Date)

(Project Manager)

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LIST OF ACRONYMNS AND ABBREVIATIONS

amsl	above mean sea level
ASTM	American Society for Testing and Materials
2BG	Reservoir Number 2 Burning Ground
bgs	below ground surface
CELRH	U.S. Army Corps of Engineers – Huntington District
CELRN	U.S. Army Corps of Engineers – Nashville District
CSM	Conceptual Site Model
DI	deionized
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DPT	direct push technology
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FSP	Field Sampling Plan
ft	feet
gpm	gallons per minute
GRC	John Glen Research Center
ID	inner diameter
IDW	investigation-derived wastes
IT	International Technology Corporation
Jacobs	Jacobs Engineering Group
NASA	National Aeronautics and Space Administration
OEPA	Ohio Environmental Protection Agency
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PBOW	Plum Brook Ordnance Works
PBOSG	Plum Brook Operating Support Group
PCB	polychlorinated biphenyls
PID	photoionization detector
PPE	personal protective equipment
PRG	preliminary remediation goal
PVC	polyvinylchloride
QA	quality assurance
RBC	risk based criteria
RI	remedial investigation
SAIC	Science Application International Corporation
SAP	Sampling and Analysis Plan
SI	site investigation
SVOC	semi-volatile organic compound
SWFSP	Site Wide Field Sampling Plan
SWSAP	Site Wide Sampling and Analysis Plan
TAL	Target Analyte List
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
TNT	trinitrotoluene
USACE	United States Army Corps of Engineers
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report addresses the findings of sampling conducted as part of a remedial investigation performed at the Reservoir No. 2 Burning Ground Site (2BG), located at the former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio. The scope of this document does not include a human health or ecological risk assessment, however the collected data will support a human health risk assessment to be performed at a later date.

PBOW was built in early 1941 as a manufacturing plant for TNT, DNT, and pentolite. The 2BG site was used as a burning ground, which was part of the decontamination process following shutdown of the plant in 1945. Typical decontamination procedures consisted of moving all structures, equipment, and manufacturing debris to an outdoor facility for burning.

A Site Investigation (SI) was performed at 2BG in 1996, which identified surface and subsurface soil contamination above U.S Environmental Protection Agency (USEPA) Region III Risk Based Criteria (RBC). Organic contaminants in surface and subsurface soil exceeding the RBCs included polynuclear aromatic hydrocarbons (PAH), explosives, polychlorinated biphenyls (PCB), and lead.

A Remedial Investigation (RI) was performed May through July 2004 to define the extent of soil contamination and to evaluate impacts to the groundwater, surface water, and sediment in the vicinity of 2BG. One round of groundwater sampling was performed January 2005. Additional soil sampling was completed April 2005 to further delineate the extent of contamination of surface soil west of the burn area.

Trenching was performed utilizing a rubber-tire backhoe to delineate the boundary of the burn area and to collect discrete samples of the burn layer material. Preliminary excavations were conducted prior to trenching to define the approximate boundary of the burn area. Six confirmatory trenches were then conducted to more accurately define the burn area and to collect discrete subsurface samples. A total of 15 soil samples were collected during trenching: ten from the burn layer material (five for full analytical suite, five for dioxins/furans only), three from the soil beneath the burn layer, and two from the soil outside of the burn layer.

Soil borings were completed both inside and outside of the burn area to characterize the overburden and to collect surface and subsurface soil samples. Subsurface soil samples were collected utilizing a Geoprobe 5400 equipped with a Macrocore sampling device. Surface soil samples were collected with a hand auger equipped with dedicated disposable stainless steel sleeves. A total of 50 soil samples were collected from 26 locations; four inside the burn area and 22 outside of the burn area. Subsurface soil samples were collected from two intervals: three to five feet (ft) below ground surface (bgs) and eight to ten ft bgs.

Five temporary piezometers were installed outside of the burn area to determine the depth, gradient, and seasonal variability of the shallow overburden groundwater. Water level measurements were collected over a two-month period from 22 May through 20 July 2004

Three bedrock wells were installed at the site to determine the depth and gradient of the bedrock aquifer and to collect ground water samples to evaluate impacts from the burning ground. Development of the bedrock monitoring wells was limited due to slow recovery of the

wells. None of the wells recharged quickly enough to enable a complete purge of all drill cuttings and fines or to allow for the collection of water parameters. One round of groundwater samples were collected using a dedicated disposable bailer, without performing any purge or the collection of water parameters. This deviation from the work plan was necessary due to the slow recharge and limited water volumes and was agreed to at the December 2004 team meeting. Three planned shallow overburden wells, collocated with the three bedrock wells, were not installed due to insufficient permeable zones within the overburden.

Sediment samples were collected from the drainage ditch north of the site at three locations; one upgradient of the site, one directly adjacent to the site, and one downgradient of the site. Surface water samples were not collected due to the ephemeral nature of the drainage ditch. No additional attempts will be made to sample the surface water based on the absence of site contaminants in the sediment, as agreed at the team meeting on 2 December 2004.

The analytical data obtained during this investigation were found to be acceptable with minor QC deficiencies for some data sets resulting in data qualification as reported in the Chemical Data Quality Report included as Appendix G.

Based on the information obtained from these investigations, the burn layer at 2BG covers an area approximately 17,000 sq ft, or less than half an acre. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft bgs and one ft in thickness.

Contaminants in soil exceeding the USEPA Residential Preliminary Remediation Goals (PRG) (October 2004) and established background values for inorganics are primarily limited to surface soil and the burn layer material. These contaminants include dioxins/furans, PCBs, explosives, PAHs, and metals.

Soil within the burn layer footprint represents the most contaminated area at the site. All seven of the surface soil samples from inside the burn area contained multiple contaminants exceeding the PRGs. All five of the samples analyzed for the full analytical suite collected from burn layer material contained multiple contaminants exceeding the PRGs. The highest concentrations of explosives and lead at the site were found in the burn layer material. Concentrations of these contaminants are two to three orders of magnitude higher than the PRGs for all samples. The burn layer material sampled from trenches TR08 and TR09 is composed of 3.6% and 4.5% explosives, respectively.

Surface soil contamination outside of the burn area is not as pervasive. Twenty of the 27 samples collected outside of the burn area contained one or more contaminants exceeding PRGs.

Subsurface soil contamination is minimal both inside and outside of the burn layer footprint. Sixteen of the thirty-four subsurface soil samples contained contaminants exceeding PRGs. Only three subsurface soil samples contained organic constituents exceeding the PRGs, which were located within the burn area. Compounds exceeding the PRGs outside of the burn area is limited to metals (Figure 4-4).

Concentrations of organic compounds in subsurface soil are generally several orders of magnitude lower than the PRGs. PCBs were not detected in any of the subsurface soil samples. Explosives were detected in the subsurface soil beneath the burn layer at six of the seven locations, but at levels considerably lower than the PRGs. Based on this data, downward and lateral migration of contaminants is minimal.

Contaminants in sediment exceeding the USEPA Region 9 Residential PRGs (October 2004) are limited to PAHs. Other contaminants detected in the sediment include dioxins/furans and VOCs. Organic concentrations are significantly higher at the location upstream of the site, adjacent to the service road, suggesting that contaminants are related to a source other than the burning ground. PCBs and explosives, which are the primary contaminants associated with the burning ground, were not detected in the sediments.

The bedrock aquifer at 2BG has very low potential for contaminant transport, based on the low porosity observed from the rock cores and the extremely low permeability observed during development. Contaminants exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values for inorganics include PAHs, metals, and VOCs. The organic contaminants are believed to be related to naturally occurring petroleum in the Delaware Limestone, which has been observed throughout PBOW.

Further actions should be considered to address the contaminants exceeding the USEPA Region 9 PRGs (October 2004) at 2BG and to address data gaps related to bedrock groundwater. The recommendations for consideration are as follows:

- Conduct additional surface soil sampling to fully delineate contamination west of the burn area.
- Collect additional water level measurements from the bedrock wells until static conditions are established, in order to provide data usable for site-wide groundwater contouring.
- Conduct an Engineering Evaluation / Cost Analysis to evaluate potential remediation alternatives for the surface soil and burn layer material.
- Evaluate the need for a human health and ecological risk assessment after completion of the Engineering Evaluation / Cost Analysis
- Evaluate the need for any future remedial actions based on results from the human health risk assessment.

1.0 INTRODUCTION

The U.S. Army is conducting investigations of the environmental impact at previously owned U.S. Department of Defense (DOD) properties. This work is being performed by the U.S. Army Corps of Engineers (USACE) under the Defense Environmental Restoration Program. Chemical contamination related to DOD activities has been documented at the former Plum Brook Ordnance Works (PBOW) located near Sandusky, Ohio. The PBOW site is a formerly used defense site under DERP, currently being managed by the Corps of Engineers, Huntington District (CELRH) and technically overseen by the Corps of Engineers, Nashville District (CELRN).

PBOW was operated from 1941 to 1945 as a manufacturing plant for trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. The site is currently owned by the National Aeronautics and Space Administration (NASA) and is operated as the Plum Brook Station (PBS) of the John Glenn Research Center, which is located at Lewis Field, Cleveland, Ohio.

This Remedial Investigation of the Reservoir No. 2 Burning Ground (2BG) is being conducted by Jacobs Engineering Group (Jacobs) under contract DACW62-03-D-0004, Delivery Order #2. The work includes engineering services to conduct environmental investigations at PBOW including soil, sediment, surface water, and groundwater. This report addresses the findings of a field investigation conducted at 2BG during the period May 2004 through July 2004. The scope of this document does not include a human health or ecological risk assessment, however the collected data will support a human health risk assessment to be performed at a later date.

1.1 SITE BACKGROUND

1.1.1 Site Location

PBOW is located south of Sandusky, Ohio, (Figure 1-1). The 2BG site is located in the northwestern portion of PBOW, approximately 400 ft south of Reservoir No. 2 at the former Plum Brook Station ball field between Ransom Road and Campbell Street (Figure 1-2).

1.1.2 Site History

The 9,009-acre PBOW site was built in early 1941 as a manufacturing plant for TNT, DNT, and pentolite. Production of explosives began in December 1941 and continued until 1945. It is estimated that more than one billion pounds of explosives were manufactured during the four-year operating period.

After the plant was shut down, decontamination for TNT, acid, pentolite, and DNT within many of the process structures and processing lines began. Typical decontamination procedures consisted of moving all structures, equipment, and manufacturing debris to an outdoor facility for burning.

The 2BG site was used as a burning ground for production process wastes. It is not known when the site was first used for burning; however, the 1950 aerial photo (Figure 3-1) clearly

shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. Restoration of the site was performed in 1963 when the area was cleared of debris and the ground restored to proper grade.

NASA acquired the PBOW in 1963 and presently utilizes about 6,400 acres for conducting space research. The 2BG site was used temporarily as a baseball field by NASA and is currently a grass-covered open field with young hardwood trees and brush surrounding the area.

1.1.3 Previous Environmental Investigations

A preliminary assessment (PA) conducted by Science Application International Corporation (SAIC) at PBOW identified the presence of a burn ground near Reservoir No. 2 (SAIC, 1991). Dames & Moore performed a detailed records review and conducted personnel interviews, which identified the area south of Reservoir No. 2 as the former burning ground (Dames & Moore, 1995).

A review of aerial photographs taken in 1950 (Figure 1-3), 1958 (Figure 1-4), and 1968 (Figure 1-5) indicated the presence of a disturbed area with a rectangular berm (1950), a pronounced burn ground (1958), and a large cleared area that shows the land to have been restored (1968). Based on these photos, the size of the burning ground was estimated to be 125 ft wide by 175 ft long.

A Site Investigation (SI) of 2BG was conducted in 1996 by IT Corporation (IT) to delineate the boundary of the burn area, to determine the existence and nature of contamination, and to evaluate potential risks to human health and the environment. Geophysical surveys were conducted to identify subsurface anomalies. Based on these surveys, four exploratory trenches were excavated within the boundary of the burn area. Eight soil borings were completed to a depth of seven ft to characterize lithology and to collect soil samples for off-site laboratory analysis.

The SI identified surface and subsurface soil contamination above U.S Environmental Protection Agency (USEPA) Region III Risk Based Criteria (RBC). Organic contaminants in surface and subsurface soil exceeding the RBCs were identified, including the following:

- Polynuclear aromatic hydrocarbons (PAHs): Benzo(a)pyrene
- Nitroaromatics: 2,4-Dinitrotoluene, 2,6-Dinitrotoluene 1,3,5-Trinitrobenzene, 2,4,6-Trinitrotoluene, and 4-Amino-2,6-Dinitrotoluene
- Polychlorinated biphenyls (PCBs): Aroclor 1260 (surface soil only, subsurface soil not analyzed for PCBs)

Inorganic contaminants in surface and subsurface soil exceeding both the RBCs and the established background values were limited to lead, aluminum, and thallium. Subsurface soil was not analyzed for PCBs.

1.2 PROJECT OBJECTIVES

The objectives of this RI include:

- Determine the nature and extent of DOD related contamination in soil and groundwater at the site
- Determine the chemical characteristics of contamination
- Evaluate the fate and transport of contamination
- Determine the depth, extent, and nature of a soil burn layer
- Obtain site data of a quality, quantity and distribution appropriate for site characterization, risk assessment, and feasibility study
- Define site physical features and characteristics
- Evaluate and use existing data appropriate to the investigation area
- Determine the presence or absence of 2BG impacts on the drainage way bounding the north side of the site

1.3 SCOPE OF WORK

This investigation included the characterization of surface soil, subsurface soil, sediment, surface water, and shallow overburden and bedrock groundwater.

1.3.1 Soil Investigation

The soil investigation task included trenching with a backhoe, soil borings using direct push technology (DPT), and surface soil sampling using a hand auger. Trenching was performed to delineate the boundary of the burn area and to collect discrete samples of the burn layer material for off-site chemical analysis. DPT soil borings and surface soil sampling were completed both inside and outside of the burn area to characterize the overburden and to collect surface and subsurface soil samples for off-site chemical analysis. Further detail regarding the soil investigation is provided in Section 4.0 of this report.

1.3.2 Groundwater Investigation

Five temporary piezometers were installed outside of the burn area to determine the depth, gradient, and seasonal variability of the shallow overburden groundwater. Water level measurements were collected seven times during the period of 22 May 2004 through 20 July 2004.

Three bedrock wells were installed at the site: one upgradient of the site (north of the burn area), one within the burn area, and one downgradient (south-southeast of the burn area). Minimal well development was performed due to insufficient recharge of the wells. One round

of groundwater samples were collected using dedicated disposable bailers without purging due to limited water volumes and slow recharge of the wells.

Three planned shallow overburden wells, co-located with the bedrock wells, were not installed due to insufficient permeable zones within the overburden. This decision was agreed to by the CELRN geologist and the Ohio Environmental Protection Agency (OEPA).

Further detail regarding the groundwater investigation is provided in Section 5.0 of this report.

1.3.3 Surface Water and Sediment Investigation

Sediment samples were collected from the drainage ditch north of the site, including one upstream location, one location adjacent to the site, and one downstream location. Further detail regarding the sediment investigation is provided in Section 6.0 of this report.

Surface water samples were not collected due to excessive rain during the period 18 May 2004 through 26 May 2004 and due to the absence of surface water during the period 15 June 2004 through 20 July 2004. During the 02 December 2004 Team Meeting, surface water sampling was eliminated from this investigation, based on the ephemeral nature of the drainage ditch and the absence of site contaminants in the sediment.

1.3.4 Associated Field Activities

Site clearing was conducted to provide access to wooded areas south and east of the site. The removal of brush was performed with a rubber-tire backhoe.

All environmental sampling locations were surveyed using conventional survey methods and were converted to Ohio State Plane North NAD83.

Investigation-derived waste (IDW) was containerized in accordance with the Sampling and Analysis Plan (SAP), Jacobs (2004a). IDW characterization samples were collected and submitted for off-site analysis. Based on the sample results, all IDW was consolidated as non hazardous waste and was transported from the site on 26 October 2004 and disposed at an approved off-site facility.

1.3.5 Review of Previous Investigation Data

The analytical data validation summary generated in support of the IT SI for 2BG was evaluated to ensure the data set was adequate for incorporation into a future risk assessment. One-hundred percent of the analytical data were validated at Level III per the EPA *National Functional Guidelines for Organic and Inorganic Data Review*. The analytical methodology was evaluated and deemed appropriate for generating definitive data. The data were found to be acceptable for the intended data usages as qualified.

1.4 REPORT ORGANIZATION

This report is organized as follows:

Section 1.0 Introduction, presents the Project Background, the Site Investigation Objectives, the Scope of Work, and the Report Organization.

Section 2.0 PBOW Facility and 2BG Environment, describes the PBOW and 2BG environmental setting.

Section 3.0 Investigation Procedures, outlines the investigation procedures and activities performed.

Section 4.0 Soil Investigation, presents the findings for surface and subsurface soil.

Section 5.0 Groundwater Investigation, presents the findings for the shallow and bedrock groundwater.

Section 6.0 Surface Water and Sediment Investigation, presents the findings of the Surface Water and Sediment Investigation.

Section 7.0 Conclusions and Recommendations, summarizes the investigation findings and provides conclusions for nature and extent of contamination, fate and transport, and recommendations for future actions.

References are provided after Section 7.0. Tables, figures, and appendices are included following the text in the order in which they have been referenced.

2.0 PBOW FACILITY AND 2BG ENVIRONMENT

2.1 PHYSIOGRAPHY AND TOPOGRAPHY

PBOW is located within the Eastern Lake section of the Central Lowland Province near the southwestern shore of Lake Erie. The region is characterized by lake plains, outwash plains, and till plains with occasional small hills produced during the retreat of the Wisconsinan ice sheet. Approximately two thirds of Erie County was once covered by a glacial lake. Processes associated with the lake produced features such as beach ridges and wave cut cliffs.

The area was originally a flat lake bottom resulting from glacial melt waters. Across PBOW, the topography is relatively flat with a gentle north-northeast slope towards Lake Erie. The land surface at 2BG is flat. Elevations at the site range from 638.9 to 640.6 ft above mean sea level (amsl).

The 2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern edge of the field. The remains of a baseball field are still evident at the site. A paved service road is adjacent to the east side of the site. The ground surface is relatively flat, with minimal slope toward the north and northwest. Elevations at the site range from 639 to 641 ft amsl. The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are now wooded.

Geophysical surveys conducted during the 1996 SI indicated that debris remains in the subsurface, and was confirmed by the excavation of metallic debris during exploratory trenching. Excavated debris included piping, strapping, and plates. Additional soil descriptions recorded during trenching include reference to black cinder, ash, metal objects, broken tiles, tile fragments, and broken ceramics. The soil descriptions indicate the presence of a burn layer defined as black cinder and ash, ranging from 0.9 to 1.4 ft below ground surface (bgs) with thicknesses ranging from 0.5 to 1.2 ft. The soil descriptions for the overlaying surface material indicate that the burning ground was covered with backfill material of unknown origin. Section 4.0 of this report provides a detailed description of this burn layer location.

2.2 GEOLOGY

2.2.1 PBOW Geology

Most of the soil of Erie County was formed from either glacial till or glacial melt water deposits. The dominant soil materials are derived from glacial till, outwash (gravel and sand), and lacustrine (very fine sand, silt and clay) deposits. Other soil types have been formed from more recent deposits of alluvium or the weathering of parent rock. Within PBOW, the soil origins are listed as lacustrine. The glacial drift is less than 20 feet thick on average and bedrock is exposed in many places.

The bedrock formations of northwestern Ohio consist of Devonian and Silurian carbonates (limestones and dolomites) and clastics (sandstones and shales). The regional dip is to the southeast at approximately 35 ft per mile, with younger rocks subcropping to the east. The

Silurian and Devonian formations unconformably overlie sedimentary sequences of Ordovician and Cambrian Age, which in turn unconformably overlie the Pre-Cambrian crystalline Greenville Basement.

At PBOW, four Devonian formations subcrop beneath the glacial drift cover (Shaw, 2003). From oldest to youngest, these formations are Delaware Limestone, Plum Brook Shale, Prout Limestone, and the Huron Shale member of the Ohio Shale. A geologic map, Figure 2-1, in the 2002 Groundwater Data Summary and Evaluation Report (Shaw, 2003), shows the spatial distribution of these subcrops across PBOW.

The Delaware Limestone conformably overlies the Columbus Limestone, and is approximately 75 ft thick. The contact between the two formations occurs to the northwest of PBOW. The Delaware Limestone subcrops beneath the glacial drift in the extreme northwestern corner of PBOW. It is described as a massive to thick-bedded, brown to gray, fossiliferous limestone and dolomite. Karst topography occurs in some of the Silurian and Devonian carbonates in the northern and western sections of Erie County, (SAIC, 1991).

The Plum Brook Shale unconformably overlies the Delaware Limestone and subcrops beneath the glacial drift over most of the northwest portion of the site. It is approximately 35 ft thick, and is described as a blue, soft, fossiliferous shale containing thin layers of dark, hard fossiliferous limestone.

The Prout Limestone is a 15-foot thick limestone, which conformably overlies the Plum Brook Shale. The Prout Limestone subcrops beneath the glacial drift as a thin (1000 to 2000 foot wide) northeast striking band across the middle of PBOW. It is described as a dark gray to bluish gray to blue, very hard, silicious, fossiliferous limestone or dolomitic mudstone.

The Huron Shale is the lower member of the Ohio Shale and subcrops beneath the glacial drift over much of the southern and eastern portions of PBOW. It is described as a grayish black, dense, platy to fissile shale containing large pyrite/carbonate concentrations (one to six ft in diameter). It is up to 300 ft thick. The glacial drift cover over the Huron Shale is generally thinner than over other formations, in many places the shale is within several ft of the surface.

2.2.2 Reservoir No. 2 Burning Ground Geology

Overburden thickness ranges from 20 to 23.5 ft, with thickness tending to increase toward the north. The overburden is characterized as clay or silty clay with a fairly continuous layer of silt and clayey silt near the surface. The top of this silt layer ranges in depth from 5.25 to 8 ft bgs and the bottom of the silt layer ranges from 6.25 to 10 ft bgs. The thickness of the silt layer, where present, ranges from 0.25 to 3 ft, with an average thickness of 1.7 ft. No silt was present at four of the DPT boring locations. The clay content of this silt layer varies with location and with depth and is generally marked by gradational changes downward from silt to clay. The lower 10 to 15 ft of the overburden is a highly plastic clay, with decreasing plasticity and increasing angular rock fragments near the bedrock interface. Detailed lithologic information for boreholes is provided in Appendices B and C.

The Plum Brook Shale subcrops beneath these unconsolidated deposits over the entire site. The thickness of this shale ranges from 1.75 ft to 11 ft, with thickness decreasing to the north-northwest. The Delaware Limestone underlies the Plum Brook Shale. Average thickness of the

limestone at the 2BG site is unknown, since borings extended no further than 41 ft below the top of the formation. Rock cores collected during the monitoring well installation showed few fractures, low porosity, and occasional zones with naturally occurring oil and hydrogen sulfide gas which are common in the Delaware Limestone (Shaw, 2004).

2.3 GROUNDWATER

2.3.1 PBOW Description

Groundwater at PBOW includes the shallow overburden and the bedrock aquifers. Numerous wells have been installed across the site to characterize these two water-bearing units (Shaw, 2003). The shallow overburden generally has low yields over most of the site due to the high percentage of silt and clay. Water levels in the shallow overburden range from less than 1 ft bgs to 6 ft bgs during wet season and fluctuate up to four ft on a seasonal basis. Water levels generally mirror the local topography. Shallow groundwater flow is typically toward the local surface drainage features with a general northerly trend.

Bedrock groundwater has been subdivided into two separate units at PBOW: 1) the Plum Brook Shale and Ohio Shale, and 2) the Delaware Limestone. Water levels in the Plum Brook Shale and Ohio shale closely match those of the shallow overburden. Water levels in the Delaware Limestone are on average 30 ft bgs. Groundwater flow in the Delaware Limestone is generally to the north, however there are major fracture zones transecting the site, which influence groundwater flow in several areas (Shaw, 2003).

Two aquifers are utilized for drinking water in the area surrounding PBOW: a carbonate aquifer outcropping in the western portion of Erie County and a shale aquifer outcropping in the eastern portion. PBOW is located within the transition of the two aquifers. Both aquifers are overlain by a veneer of glacial drift, generally less than 20 ft, that is considered a poor source of groundwater except in areas of sand and gravel lenses.

The carbonate aquifer is subdivided into two zones by the Ohio Department of Natural Resources based on usage and yields. Zone one is characterized as cavernous limestone and dolomite. Yields from zone one range from 100 to 500 gallons per minute (gpm) in the karst terrain of western Erie County and decrease to the east, as evidenced by a well just west of PBOW that has a yield of eight gpm. Zone one is present in the north and northwestern portions of PBOW at depths of approximately 100 ft. Zone two is a deeper carbonate aquifer that generally yields 15 gpm or less. Zone two is present in the north portion of PBOW at depths of 300 ft.

The shale aquifer and overlying discontinuous sand and gravel deposits are designated as zone three. Zone three is present over all of the eastern and southern portions of PBOW and seldom yields more than three gpm.

Residences to the north and west of PBOW are served by city, county, and rural water departments. Residences south and west of PBOW are supplied by wells. As of 1991, a total of 179 permitted private drinking water wells, listed at the Erie County Health Department, were within a four-mile radius of PBOW (SAIC, 1991). The nearest recorded well was at 6115

Schenk Road, approximately 3800 ft from the site; however, a closer well was observed at 1810 Schenk Road, located approximately 2250 ft from the site.

2.3.2 Reservoir No. 2 Burning Ground Groundwater

Groundwater at 2BG includes both shallow overburden and the Delaware Limestone aquifers. Groundwater elevations in the shallow overburden range from 634.4 ft amsl to 637.4 ft amsl. Depths to the shallow groundwater during the summer months range from 2.4 to 6.2 ft bgs. Shallow groundwater generally flows to the north toward the drainage ditch.

Groundwater elevation contours for the deeper Delaware Limestone aquifer indicate a linear feature on a regional scale, running northeast-southwest through PBOW, in the vicinity of 2BG, which acts as a preferential flow path (Shaw, 2003). This feature is parallel to the bedrock strike and may represent a fracture system and/or karst development. Groundwater elevations drop steeply toward this zone on either side. The 2BG site is located approximately 500 ft northwest of the axis of this feature. Although adequate water level data has not been collected at the site to confirm flow directions, it is likely that groundwater flows from the site in a southeastern direction toward this regional feature.

2.4 SURFACE WATER

2.4.1 PBOW Description

PBOW lies in the eastern region of the Pickeral Creek – Pipe Creek Basin, which in turn, lies within the St. Lawrence River drainage basin. The Huron River Basin lies approximately 3.5 miles east of PBOW. Sandusky Bay and Lake Erie are approximately 4.5 miles north of the site.

Eleven streams pass through or originate within PBOW and are a part of four drainage areas: 1) Sawmill Creek (southern PBOW); 2) Plum Brook (central PBOW); 3) Pipe Creek (western PBOW); and 4) Storrs-Hemminger Ditch. All streams flow north or northeasterly into Sandusky Bay.

Numerous ponds lie within and around PBOW. Seventeen isolated ponds and reservoirs, and three red water ponds are located on PBOW. It is not known if the ponds are fed from shallow groundwater. Pond water levels remain high, even during the winter months.

Surface water intakes within 15 miles of PBOW include Lake Erie, Huron River, and reservoirs fed by the west branch of the Huron River and it's tributaries.

The Erie County Health Department does not permit the use of surface water for private drinking water supply and no surface water within PBOW is used as a drinking water supply. It is unknown whether surface waters are used for livestock in the local area. Crop irrigation is not common in Ohio. Lake Erie and Sandusky Bay are a resource for recreational sports including fishing, swimming, and boating.

2.4.2 Reservoir No. 2 Burning Ground Surface Water

The only surface water feature within the 2BG site is a drainage ditch that runs east to west and forms the north edge of the site. The drainage ditch is located 200 to 300 ft north of the former burn area and drains to the west across the site, then northwest to Pipe Creek. This drainage feature is approximately four ft wide and six to seven ft deep. Elevations in the ditch range from 635 ft amsl upstream of the site to 633 ft amsl downstream. A less pronounced drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is ephemeral and flows only during the wet season and following precipitations events, remaining essentially dry during the summer months. Flowing water was observed during a site reconnaissance in November 2003 and during the soil investigation in May 2004. Flow in the ditch began to dissipate in mid June, with only small, disconnected pools observed at this time. By late June 2004 the stream channel was dry and remained so during investigation activities in late July 2004.

Reservoir No. 2 lies approximately 400 ft north of this drainage ditch. This reservoir is roughly circular, has a surface area of less than one acre, and has an embankment approximately five ft above the natural ground surface.

2.5 CLIMATE

The climate for the Sandusky area is continental, but strongly influenced by Lake Erie. Predominantly westerly winds parallel the shoreline of Lake Erie. In a 1956 study by the National Advisory Committee for Aeronautics, the wind direction at PBOW was from the southwest approximately 55 percent of the time throughout the year (SAIC, 1991). The frequency of northerly and northeasterly winds increases during the spring and summer.

The average annual precipitation for the city of Sandusky from 1971 to 2000 is 34.46 inches (Midwestern Climate Center, 2004). The mean monthly precipitation at the U.S. Weather Bureau Station for Sandusky for the 30-year period ranged from a low of 1.72 inches for February to a high of 4.19 inches for June. The monthly average precipitation for all months for 1971 through 2000 is provided in Table 2-1. This table also lists the extreme high and low monthly precipitation totals and the year the extreme occurred.

Average daily temperatures for Sandusky for the 30-year period 1971 to 2000 ranged from 25.6° F in January to 73.8° F in July. Summers are moderately warm and humid, with temperatures occasionally exceeding 90° F. The monthly average maximum, minimum, and mean temperatures for all months for the period 1971 to 2000 are provided in Table 2-2. This table also lists the extreme high and low monthly mean temperatures and the year the extreme occurred. Winters are cold and cloudy, with sub-zero temperatures occurring an average of five days per winter. The first freeze is typically in October with the last freeze normally occurring in April.

2.6 LAND USE

2.6.1 PBOW Land Use

Prior to acquisition of the site for construction of the PBOW, the area was largely agricultural. During construction of the PBOW, most of the forested areas were cleared. Today, second generation forests have returned to large portions of the site that are not actively used by NASA. Other undeveloped areas of the site are maintained as open fields. The surrounding area is mostly agricultural and residential.

Potential future uses of portions or all of the facility property include:

1. The continuation of NASA activities at PBOW.
2. Recreational uses such as hunting and fishing. PBOW is open to deer hunters during the hunting season.
3. Selling of portions of the site by GSA to other parties (state or local government or private individual).
4. Agricultural uses.
5. Residential uses.
6. Training area for use by National Guard Units.
7. Construction activities.

Items 3 through 7 are speculative and no negotiations have been scheduled to define future land use.

2.6.2 Reservoir No. 2 Burning Ground Land Use

The 2BG site was used as a burning ground for production process wastes. It is not known when the facility was constructed; however, the 1950 aerial photo clearly shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. Restoration of the site was performed in 1963 when the area was cleared of debris and the ground restored to proper grade. The 2BG site was used temporarily as a baseball field by NASA and is currently a grass-covered open field with young hardwood trees and brush surrounding the area. No specific future uses of this site have been identified.

3.0 INVESTIGATION PROCEDURES

This investigation included the characterization of surface soil, subsurface soil, sediment, surface water, and shallow overburden and bedrock groundwater.

The field sampling events for the soil and sediment investigation occurred between 18 May and 26 May 2004. Five shallow piezometers were also installed at this time. Installation of the bedrock monitoring wells and preliminary well development occurred between 15 June and 24 June 2004. Additional well development was performed on 21 July 2004 and 1 November 2004. Piezometer abandonment and IDW characterization sampling was performed 20 July and 21 July 2004. One round of groundwater samples were collected from the bedrock wells during the period 28 January 2005 to 31 January 2005. Additional surface soil sampling was performed west of the burn area on 22 April 2005 to further delineate the extent of contamination at the site. CELRN representatives were present to observe all field investigation sampling activities.

Surface water was not collected due to excessive rainfall during the first sampling event and insufficient flow during the later two sampling events. During the 02 December 2004 Team Meeting, surface water sampling was eliminated from this investigation, based on the ephemeral nature of the drainage ditch and the absence of site contaminants in the sediment.

All field investigations were performed in accordance with the Final Site-Wide Sampling and Analysis Plan (SWSAP) (Jacobs, 2004a) and the Final Site-Specific Field Sampling Plan (SWFSP) (Jacobs, 2004b), with the exception of the groundwater investigation. Groundwater development did not meet the purge volume requirements or include water parameter measurements due to the minimal water volumes in the well and the slow well recovery. Groundwater sampling was conducted for one round and did not include any purging prior to sampling, water parameter measurements, or collection of all analytical parameters for some wells. The groundwater data will be used for qualitative purposes only. Direction for this deviation is based on a team decision during the 02 December 2004 team meeting.

Collection of additional surface soil samples on 22 April 2005 was conducted in accordance with the Addendum to the Site Specific Sampling Plan (Jacobs, 2005).

3.1 COORDINATION OF SITE ACCESS AND UTILITY CLEARANCE

Site access and utility clearance for fieldwork activities were coordinated with appropriate NASA personnel. NASA personnel checked and cleared all sampling locations to identify potential buried utilities. No relocation of proposed sampling locations was required. A Digging and Excavation Permit was obtained prior to initiating subsurface investigations. A copy of the permit is provided in Appendix A.

Jacobs utilized personnel of the Plum Brook Operating Support Group (PBOSG) to clear brush and vegetation from overgrown areas of the site, to provide access for field sampling personnel and equipment. Minor clearing of some young hardwoods and underbrush along the eastern and southern perimeter of the site was required for boreholes BH-09 and BH-10, piezometers PZ-01 and PZ-05, monitoring well 2BG- BEDMW-003, and trench locations TR-09 and TR-10

(Figures 3-1, 3-2, and 3-3). All cleared growth was left on site to provide natural wildlife habitat and cover.

NASA provided storage and staging facilities for equipment and supplies and a storage facility for liquid IDW.

Jacobs and NASA coordinated the schedule for field activities to avoid conflicts among site uses and to identify access limitations to specific areas during certain portions of the fieldwork.

3.2 HEALTH AND SAFETY PROGRAM

All work was performed in accordance with the Final Site-Wide Safety and Health Plan (Jacobs, 2004c) and the Final Site-Specific Safety and Health Plan Addendum for 2BG (Jacobs 2004d). An initial site safety briefing/kick-off meeting was held prior to the initiation of fieldwork including all Jacobs field personnel, field personnel from the PBOSG, the subcontracted drilling companies, and the on-site CELRN representatives. The briefing addressed pertinent sections of the site Health and Safety Plan, including the potential contaminants of concern and their recognition, field procedures, emergency procedures, and the type of monitoring and personal protective equipment (PPE) to be used during the fieldwork. The participants also discussed how to recognize potential contamination and the actions to be followed in the event that contamination was suspected or encountered. An additional site safety briefing for all field team members was held each morning to address specific health and safety concerns and to review health and safety protocol.

Site Safety and Health oversight was provided by a Jacobs Health and Safety Officer during the first week of the soil investigation phase, which included the trench excavation and piezometer installation. The Jacobs site manager assumed health and safety oversight responsibilities during all other field activities.

Modified Level D PPE was used for most activities, which included hard hats, safety glasses, steel-toed boots, nitrile gloves, and tyvek coveralls. A photoionization detector (PID) was calibrated and zeroed to background each day and used during the soil sampling activities. PID readings above background were not observed during any of the subsurface investigations. A hydrogen sulfide meter was used during the drilling of bedrock wells and subsequent well development. All bedrock monitoring wells exhibited hydrogen sulfide readings above the preset instrument alarm limits of 10 ppm. The hydrogen sulfide is associated with naturally occurring hydrocarbons present in the Delaware Limestone. Workers were required to stay upwind of the work zone on multiple occasions. The buddy system, whereby two personnel worked together at all times, was adhered to during all phases of the fieldwork. No significant health and safety issues arose during the field activities.

3.3 SOIL SAMPLING PROCEDURES

Surface and subsurface soil samples were collected from locations both inside and outside of the former burn area. Soil sampling was performed utilizing a backhoe, a hand auger, or a Geoprobe 5400 DPT rig, depending on the type of sample being collected.

3.3.1 Trench Excavations

Preliminary excavations were conducted in a radial pattern from the assumed center of the burn area to define the approximate boundary of the burn area. Excavations were conducted with a rubber-tire backhoe and were performed every 20 ft until completing two consecutive excavations outside of the burn area. Six confirmatory trenches were then conducted to more accurately define the burn area and to collect discrete subsurface samples (Figure 3-1). The trenches were oriented perpendicular to the burn area boundary and were extended approximately 10 to 15 ft beyond the boundary. A total of 15 soil samples were collected during trenching: ten from the burn layer material, three from the soil beneath the burn layer, and two from the soil outside of the burn layer. Sample locations are provided on Figure 3-1. Sample media and the analysis performed are provided on Table 3-1.

Soil samples from the trenches were collected directly from the backhoe bucket. Samples for non-volatile organic compounds analysis were collected with a stainless steel spoon and homogenized in a glass bowl. Dedicated disposable spoons and bowls were used for each sample. Sampling equipment was cleaned prior to use; first with an alqinox wash, then a potable water rinse, and a final rinse with ASTM Type 2 deionized water (DI). Equipment was then individually wrapped in aluminum foil to ensure no contaminants were introduced. Samples for volatile organic compounds (VOC) analysis were collected directly from the backhoe bucket using a 5035 T-Handle Samplesmart Kit or an Encore sampler, both specifically designed for the collection of VOC samples.

The backhoe bucket was steam-cleaned between the collection of each sample and decontamination water was containerized and labeled appropriately. Each trench was backfilled with the original excavated soil, in the order in which it was removed, prior to excavation of a new trench. At the conclusion of the trenching investigation, the exposed soil at each location was seeded and covered with straw. Appendix I contains photo logs of trenching activities.

3.3.2 Surface Soil

Surface soil samples were collected from 26 locations, twelve of which were co-located with subsurface soil borings (BH-09 through BH-20) (Figure 3-2). The remaining fourteen surface soil samples were collected adjacent to an area of PCB contamination west of the burn area that was identified during the 1996 SI. Ten of these samples (BH-25 through BH-34) were collected 22 April 2005 as a follow-on study to further delineate the extent of contamination. The analysis performed at each location is provided in Table 3-2. Surface soil samples were collected prior to mobilization of the DPT rig in order to minimize disturbance of the surface soil.

Surface soil samples were collected with a hand auger equipped with dedicated disposable stainless steel sleeves. VOC samples were collected directly from the sleeve using a 5035 T-Handle Samplesmart Kit or an Encore sampler. Samples for non-VOC analysis were extruded from the sleeve and homogenized in a dedicated disposable glass bowl using a stainless steel spoon and Teflon stir sticks.

Dedicated disposable spoons and bowls were used for each sample. Sampling equipment was cleaned prior to use; first with an alqinox wash, then a potable rinse, and a final ASTM Type 2 DI rinse. Equipment was then individually wrapped in aluminum foil to ensure no contaminants

were introduced. The hand auger was decontaminated between each sample using the same procedure.

3.3.3 DPT Soil Borings

Soil borings were conducted at twelve locations, co-located with surface soil sample locations (Figure 3-2). Four of the borings were placed inside of the burn area. The remaining eight borings were placed outside of the burn area: four within the disturbed area identified on the 1958 aerial photo and four in the non-disturbed area. Subsurface soil samples were collected from two intervals at each borehole: three to five ft bgs and eight to ten ft bgs. The analysis performed for samples collected at each location is provided in Table 3-3. Borings for subsurface soil sampling were conducted using a Geoprobe 5400 equipped with a Macrocore sampling device. The Macrocore sampler was equipped with acetate liners for lithologic samples and stainless steel sleeves for analytical samples. VOC samples were collected directly from the stainless steel sleeves using a 5035 T-Handle Samplesmart Kit or an Encore sampler. Samples for non-VOC analysis were extruded from the sleeve and homogenized in a dedicated disposable glass bowl using a stainless steel spoon and Teflon stir sticks.

Dedicated disposable bowls and spoons were decontaminated prior to use as discussed above. Drilling rods and other downhole equipment was steam cleaned between borings. New acetate liners and stainless steel sleeves were used for each sample.

A geologist completed a field log for each of the soil borings. Copies of the DPT boring logs are included in Appendix B.

3.3.4 Survey of Soil Sampling Locations

All soil sampling locations were surveyed using conventional methods. The northing, easting, and ground elevation are listed in Appendix F and correspond to Ohio State Plane North NAD83.

3.4 GROUNDWATER INVESTIGATION PROCEDURES

The groundwater investigation included the installation of five temporary piezometers placed around the perimeter of the former burn area and the installation and sampling of three bedrock monitoring wells (Figure 3-3). Overburden monitoring wells were not installed due to insufficient permeable material in the subsurface. OEPA and the CELRN geologist concurred with this decision.

The piezometers were installed during the soil investigation activities 20 May through 25 May 2004 to determine the depth, gradient, and seasonal variability of the shallow overburden groundwater. The bedrock monitoring wells were installed 16 June through 23 June 2004. Bedrock wells were installed to provide groundwater characterization at the center of the burn area as well as upgradient and downgradient of the site (Figure 3-3). All groundwater sampling points were installed in accordance with the FSP. A geologist completed a field log for each of the soil borings associated with the installation of a well or piezometer (Appendix C). A detailed description of each installation follows.

3.4.1 Piezometer Installation and Water Level Measurements

Borings for piezometers were advanced using a Geoprobe 5400 equipped with the macrocore sampling device. All borings were advanced to top of bedrock. Piezometers were completed with 1-inch ID polyvinylchloride (PVC) screen and riser. Screened intervals were from the bedrock to 10 ft above bedrock. The annulus was filled with 30/60 sand pack to one ft bgs. Granular bentonite was used for the surface seal.

Water level measurements were collected over a two-month period from 22 May through 20 July 2004, using a Solinst water level meter, which was decontaminated between each well reading. The piezometers were removed on 20 July 2004, and the boreholes were tremmie grouted from the bottom up to ground surface using a bentonite slurry. Well sealing reports are provided in Appendix K.

3.4.2 Monitoring Well Installation in Bedrock

Bedrock monitoring wells were installed with a CME 85 drill rig equipped with a 94 mm wire-line coring device. Six-inch steel surface casing was installed to a minimum of 3 ft into bedrock. Rock coring was then conducted from the bottom of the surface casing to total depth. The borehole was then reamed with a 5 7/8-inch reaming bit to total boring depth. Potable water was used on occasion to flush solids from the well. All wells were completed with 2-inch ID schedule 40 PVC screens and risers. Additional completion details are provided in Appendix D.

Photologs of the continuous rock cores are presented in Appendix J. The rock cores are stored in wooden core boxes at an indoor staging facility and are available for further inspection.

3.4.3 Monitoring Well Development

Development of the bedrock monitoring wells was limited because of a lack of water. All water was removed from the well during the initial phase of development utilizing a bladder pump. None of the wells recharged quickly enough to enable a complete purge of all drill cuttings and fines or to allow for the collection of water parameters. The wells were allowed to recover for four weeks during the period 24 June 2004 to 21 July 2004. Minimal recovery during that time period did not allow for routine development to be performed. All water was again purged from the wells on 21 July 2004 utilizing disposable bailers. A third round of purging was completed on 1 November 2004 utilizing a disposable bailer. Well development records are presented in Appendix E.

3.4.4 Survey of Well Locations

All monitoring wells were surveyed using conventional methods, which included determination of elevation at top of casing. The northing, easting, and elevation of top of casing for each monitoring well are listed in Appendix F and correspond to the NASA Plum Brook Coordinate System. Survey coordinates were converted to Ohio State Plane North NAD83.

3.4.5 Monitoring Well Sampling

The first quarterly round of sampling of the monitoring wells was scheduled for 20 July 2004; however, samples were not collected due to insufficient water volume in the wells. This effort to

collect samples was abandoned with concurrence from the CELRN site geologist. Instead of the scheduled sampling, further well development was performed with a bailer to remove fines and all water from the bottom of the wells. Final water levels and total depth of the wells were recorded on 21 July 2004. Additional water levels were collected on 9 August 2004, 25 October 2004, and 1 November 2004. Water levels were continuing to rise between each monitoring event; however, the recovery of the wells was very slow. During this three-month recovery period, monitoring well 2BG-BEDMW-001 recovered 2.28 ft. Monitoring wells 2BG-BEDWM-002 and 2BG- BEDMW-003 recovered 5.96 ft and 7.34 ft, respectively.

One round of ground water samples were collected from the wells in January 2005, following a three-month recover period since the last attempts at development. Groundwater sampling was conducted without any purging or water parameter measurements because of the limited water volume. Direction for this deviation is based on a team decision during the 02 December 2004 team meeting, where it was determined that the data would be used for qualitative purposes only. The full suite of analysis was not collected from each well because of the limited well volumes. The analytes sampled for each well are presented in Table 3-4, which was based on a prioritized list of analysis approved by CELRN and OEPA prior to sampling activities. Groundwater data collection forms are provided in Appendix N.

3.4.6 Slug Testing

Slug testing of the newly installed monitoring wells was not performed due to insufficient water volumes in the wells. The recharge rates for all three bedrock monitoring wells is very slow based on recorded water levels following well development. Hydraulic conductivities are expected to be very low for all three wells.

3.5 SURFACE WATER AND SEDIMENT INVESTIGATION PROCEDURES

A single surface drainage feature is present to the north of the 2BG site. The FSP proposed the collection of three collocated surface water and sediment samples from this intermittent flow drainage ditch. The specifics of each sampling task are discussed below.

3.5.1 Surface Water Sampling

Three attempts were made to collect surface water samples during the field investigation. Daily rainfall events during the period 18 May through 26 May 2004, prevented samples from being collected; per the approved FSP, surface water samples should not be collected within 48 hours of any precipitation event.

During the period 15 June through 24 June 2004, there was no flow and only a few small widely-spaced pools were found. There was also insufficient volume at the upstream location for collection of all required samples. It was determined, with concurrence from the CELRN geologist, that these waters would not be representative, and therefore, were not sampled.

During the period 20 July through 21 July 2004, no water was present in the drainage ditch.

During the 02 December 2004 Team Meeting, surface water sampling was eliminated from this investigation, based on the ephemeral nature of the drainage ditch and the absence of site contaminants in the sediment.

3.5.2 Sediment Sampling

Sediment samples were collected from the drainage ditch at three locations; one upgradient of the site, one directly adjacent to the site, and one downgradient of the site (Figure 3-3). All sample locations were positioned in the center of the channel. All sediment samples were analyzed for VOCs, PAHs, PCBs, nitroaromatics, metals, and dioxin/furans.

Sediment samples were collected with a hand auger equipped with dedicated disposable stainless steel sleeves. VOC samples were collected directly from the sleeve using a 5035 T-Handle Samplesmart Kit or an Encore sampler. Samples for non-VOC analyses were extruded from the sleeve and homogenized in a dedicated disposable glass bowl using a stainless steel spoon and Teflon stir sticks.

Dedicated disposable spoons and bowls were used for each sample. Sampling equipment was cleaned prior to use; first with an alqinox wash, then a potable water rinse, and a final rinse with ASTM Type 2 DI water. Equipment was then individually wrapped in aluminum foil to ensure no contaminants were introduced. The hand auger was decontaminated between each sample using the standard alqinox wash, potable rinse, and final ASTM Type 2 DI rinse.

3.6 SAMPLE PACKAGING, SHIPPING, AND DOCUMENTATION

Sample packaging, shipping, and documentation procedures described in the Site-Wide Sampling and Analysis Plan (SAP) (Jacobs 2004a) were followed during the field investigation of the 2BG site. Samples were packaged and shipped to the analytical laboratories via Federal Express. Chain of custodies were completed and maintained throughout the collection, shipping and laboratory analysis phase.

3.7 EQUIPMENT DECONTAMINATION

The procedures and processes, as defined in the Site-Wide SAP (Jacobs, 2004a) for equipment decontamination were strictly adhered to during all sample collection activities.

The backhoe bucket was pressure-washed and steam-cleaned before the excavation of each trench and between the collection of each soil sample. The downhole DPT equipment was also pressure-washed and steam-cleaned prior to and between each borehole location. Sample-specific equipment such as mixing bowls and mixing spoons were decontaminated prior to use and disposed after collection of each sample.

All drilling equipment used to install the groundwater monitoring wells was steam-cleaned prior to the start of drilling, between each borehole and at the conclusion of final borehole installation, prior to releasing the equipment from the 2BG site.

Small reusable hand tools such as hand augers, water level meters, and bladder pumps were decontaminated between each soil sampling location and/or each monitoring well sample

collection action. Sampling equipment was cleaned using the standard three-step process: first with an alqinox wash, then a potable rinse, and a final ASTM Type 2 DI rinse.

3.8 HANDLING OF INVESTIGATION-DERIVED WASTES

All IDW from soil borings and well borings was containerized separately and labeled according to contents and specific intervals represented. Decontamination fluid and monitoring-well purge water were containerized separately based on sampling activities.

A total of 14 drums of soil cuttings were collected during the well installation activities. A total of 17 five-gallon buckets of soil were collected during the DPT soil boring and piezometer installation activities. A total of 42 drums of decontamination water and monitoring well purge water was collected. Each container was labeled and is securely sealed. PBOSG transported the liquid IDW to an indoor facility for temporary storage while awaiting characterization analysis. The solid IDW is stored at the 2BG site on pallets and is covered with a tarp.

IDW characterization was performed on 20 July through 21 July 2004. A total of four soil samples were collected: one for each of the three monitoring well boreholes and one for the DPT boreholes. Prior to IDW sample collection, analytical results from the soil investigation were evaluated to determine whether the DPT soil IDW was potentially hazardous. The analytical results were multiplied by a factor of 20 and screened against TCLP criteria. Based on this screening, all DPT soil IDW was considered non-hazardous and therefore composited into one sample. All composite soil samples included a small amount of material from each container, which was homogenized in a glass bowl with a stainless steel spoon.

One liquid IDW sample was collected as a composite sample. Equal amounts of water were removed from each of the 42 drums using a glass Watera Tube and dispensed into an empty container that originally contained ASTM Type 2 DI water.

IDW samples were packaged and shipped to an off-site laboratory. Soil IDW was analyzed for toxicity characterization leaching potential (TCLP) VOCs, TCLP SVOCs, TCLP metals, ignitability, corrosivity, and reactivity. Liquid IDW was analyzed for VOCs, SVOCs, metals, ignitability, corrosivity, and reactivity. Sample results indicated all IDW was considered non-hazardous. All IDW was transported from the site on 26 October 2004 and disposed at an approved facility.

3.9 ANALYTICAL LABORATORY ANALYSIS AND DATA EVALUATION

The following sections describe the analytical methods, the data evaluation, and discuss the limitations of the data. Attachment II to the Chemical Data Quality Reports, included as Appendix G, contains a complete listing of the primary laboratory results and qualifiers applied as part of the data evaluations. Appendix G contains three separate Chemical Data Quality Reports (one for each sampling event); soil and sediment sampling (2004), additional soil sampling (2005), and round one groundwater (2005). The Chemical Quality Assurance Reports detail the evaluation of the Quality Assurance (QA) sample results and comparison to the associated primary results (Appendix H). Appendix H contains Chemical Quality Assurance Reports for the soil and sediment sampling (2004) and the additional soil sampling (2005). QA samples were not collected in conjunction with the groundwater sampling event due to the

limited volume of groundwater produced by the wells, and thus, there is not an associated Chemical Quality Assurance Report for the groundwater.

3.9.1 Laboratory Analysis

The 2BG RI included surface soil, subsurface soil, burn layer material, sediment, and groundwater sampling. Laboratory analyses conducted for burn layer material and subsurface soil sampled during trenching operations are presented in Table 3-1. Laboratory analyses conducted for surface soil are presented in Table 3-2. Laboratory analyses conducted for subsurface soil are presented in Table 3-3. Laboratory analyses conducted for sediment included VOCs, nitroaromatics, PAHs, PCBs, dioxin/furans, and metals. Laboratory analyses for the groundwater are presented in Table 3-4. Chain of Custody records are provided in Appendix M.

For the 2004 2BG soil and sediment sampling event, General Engineering Laboratories performed the VOC, nitroaromatic, and metals analyses for the primary samples; Ecology and Environment performed the PAH and PCB primary analyses; and Paradigm performed the primary dioxin/furan analyses. GPL Laboratories performed the VOC, nitroaromatic, PAH, PCB, and metals QA analyses, and PACE performed the QA dioxin/furan analyses.

For the 2005 2BG groundwater sampling event, General Engineering Laboratories performed the VOC, nitroaromatic, metals, and water quality analyses for the primary samples, and Ecology and Environment performed the PAH and PCB primary analyses. As previously noted QA samples were not able to be collected for the groundwater event due to limited sample volume. Sample volume limitations also prevented the PAH analysis for sample 2BG-BEDMW-002 from being completed, as the volume collected was required for the explosives and PCB analyses that were higher priority than the PAH analysis. The filtered metals analyses were not completed for samples 2BG-BEDMW-002 and 2BG-BEDMW-003 due to a discrepancy on the COC. The COC noted that the samples were preserved, so GEL did not filter the samples.

For the 2005 2BG additional soil sampling event, ELAB of Tennessee performed the nitroaromatic, PAH, PCB, and total lead analyses for the primary samples. GPL Laboratories performed the nitroaromatic, PAH, PCB, and total lead QA analyses.

All the laboratories provided complete data packages including the laboratory quality control documentation and raw data required by the SAP (Jacobs 2004b). Each data package included a case narrative describing the analytical methods used and documenting any quality control problems encountered.

3.9.2 Evaluation of Laboratory Data

3.9.2.1 Data Quality Assessment

Jacobs evaluated 100 percent of the primary sample data collected in support of the 2BG RI. The data evaluations were performed in accordance with the requirements of the SAP (Jacobs 2004), the guidance in "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (USEPA 1999), and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (USEPA 1994). The Chemical Data Quality Reports summarizing the Jacobs' data evaluation in terms of precision, accuracy,

representativeness, comparability, and completeness are provided as Appendix G. The qualifiers applied as part of the data evaluation are defined in Section 2.0 of the Chemical Data Quality Report and the limitations implied by the qualification should be considered when reviewing the data.

3.9.2.2 Chemical Quality Assessment Report

With the exception of the groundwater sampling event, QA samples were collected at a frequency of ten percent and analyzed for the same parameters as the primary samples. Stratum Engineering, an independent third party firm, performed the evaluation of the QA sample data and comparison of the QA data to the corresponding primary results. The Chemical Quality Assessment Reports were prepared in accordance with the requirements of the SAP (Jacobs 2004b) and the guidance of "Chemical Quality Assurance for HTRW Projects" (USAEC HTRW-CX 1997). The reports summarize the details of the evaluation performed by Stratum Engineering (Appendix H).

3.9.3 Data Limitations

Data limitations affecting several soil and sediment samples from the 2004 sampling event were noted with the sensitivity for the PCB analyses, and for most samples with the identification and quantitation of the PAH analyses for the 2004 soil and sediment samples and the 2005 groundwater. Otherwise, minor quality control (QC) deficiencies were present that resulted in data qualification as reported in the Chemical Data Quality Reports included as Appendix G. The data reported were found to be acceptable with the required qualifications.

3.9.3.1 PCB Sensitivity

Many of the 2004 soil and sediment samples collected for PCBs were analyzed at initial dilutions by the primary laboratory. Ten primary samples and three field duplicate samples were reported as non-detect for all PCB target analytes at sensitivity levels above the project data quality objectives (DQOs). The laboratory reported that the samples contained non-target analyte interferences, and that the extracts were colored after performing the appropriate clean-up steps. However, the three corresponding QA samples were analyzed undiluted without target analyte detections above the USEPA Region 9 PRGs (October 2004).

This comparison leads the evaluator to deduce that, since some of the project related samples had PCB detects requiring dilutions and were collected from a burn layer, the primary laboratory treated most of the project samples as such. This practice is common and protective of the analytical instrumentation. Ten of the samples were analyzed at initial dilutions ranging from 2X to 50X and reported with no target analytes detected. The laboratory should have re-analyzed the samples without detects at lesser dilutions. The re-analyses were not performed and ten of the project samples were reported as non-detect at sensitivity levels above the project DQOs.

The elevated PCB sensitivity creates a situation where the analytes are reported as non-detect at levels above the USEPA Region 9 PRGs. There are ten samples reported without PCB detects that have sensitivity levels elevated above the USEPA Region 9 PRGs. However, there is no affect or limitations on the samples analyzed undiluted or samples with reported detects for PCBs. Refer to Section 4.4 of the Soil and Sediment Chemical Data Quality Report

(Appendix G) for a table listing the ten samples analyzed at dilutions and reported as non-detect for PCBs above the USEPA Region 9 PRGs

3.9.3.2 PAH Confirmation

The primary PAH data for the 2004 soil and sediment samples and 2005 groundwater sample were reported without a confirmation analysis. The primary laboratory, Ecology and Environment, was directed by HTRW-CX to discontinue use of their HPLC PAH confirmation analysis until a more suitable confirmation column was developed. HTRW-CX did not feel that the confirmation column in use was dissimilar enough to provide an adequate confirmation. According to several analytical subcontractors, there is currently not another column available to replace the column that HTRW-CX does not approve. E&E reported the PAH data as unconfirmed.

The QA laboratory (GPL) did perform the PAH confirmation analysis using a gas chromatograph/mass spectrometer (GC/MS) without being directed to do so. There is a major disagreement between the PAH results from the primary and QA laboratories for the 2004 soil and sediment samples. The QA laboratory PAH results contained fewer detects, and the detects reported were at much lower levels compared to the primary data. The primary PAH results that were reported unconfirmed appear to be biased high and potentially include false positives in some cases. This is due to the high level of non-target matrix interferences present in the samples. Therefore, the primary PAH results reported as positive detects are qualified as estimated unconfirmed ("NJ") and should be viewed as screening level data that are likely high biased and may contain false positives.

The overall affect of this limitation is minimal to the surface, subsurface, and burn layer soils. Only one location, PBOW-04-SO-2BG-BH16A (0-1), had results exceeding the PRGs for only PAHs compounds. This location had a benzo(a)pyrene result of 65.1 ug/Kg and the PRG is 62 ug/Kg for this compound. All other locations with PRG exceedances for PAHs also contain other contaminants which exceed the PRGs.

All three primary sediment samples had PRG exceedances for only PAHs. These results are qualified as estimated unconfirmed ("NJ") due to the lack of confirmation, and resulting potential high bias. The corresponding sediment QA sample performed on PBOW-04-SD-2BG-SD02 did have PAH detects, but there were fewer compounds detected and they were all less than the PRGs. While it is not surprising to find PAHs detected in the drainage ditch, which is subject to run-off from a nearby road, it is recommended that these results be confirmed before proceeding with any remedial decisions.

The PAH analyses for the 2005 additional soil sampling effort were accomplished using an alternate method. A low level SW-846 8270C semi-volatile analysis was utilized in place of the SW-846 8310 analysis. While there were a few marginal surrogate outliers for the semi-volatile analysis that can likely be attributed to matrix artifacts in the samples, the data is definitive and acceptable for the intended data usages.

4.0 SOIL INVESTIGATION RESULTS

Previous investigations at the 2BG site confirmed the presence of a burn layer and associated soil contamination due to former PBOW operations. The objective of the soil investigation conducted under this RI was to delineate the extent of the burn layer and to define the extent of soil contamination at the site. Results from this study as well as data obtained during the 1996 SI are presented below.

4.1 DELINEATION OF BURN LAYER MATERIAL

Visual observations and measurements of the burn layer were conducted during exploratory excavations and trenching. Trenching during this investigation focused on determining the boundary of the burn layer. Data collected included the lateral extent, depth beneath the surface, thickness of the burn layer, and chemical constituents of the burn layer material. Trench excavations during the 1996 SI were placed in the interior of the burn layer and did not characterize the chemical nature of the burn layer material.

Based on the information obtained from these investigations, the burn layer at 2BG covers an area approximately 17,000 sq ft, or less than half an acre. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer coincides with the central portion of the disturbed area identified on the 1958 aerial photograph (Figure 4-1).

The top of the burn layer ranges from 0.5 to 2.0 ft bgs, averaging 1.1 ft bgs. The bottom of the burn layer ranges from 1.5 to 2.6 ft bgs, averaging 2.1 ft bgs. Thickness of the burn layer ranges from 0.5 to 1.75 ft, averaging 1.0 ft.

Physical descriptions of the burn layer material are fairly consistent across the area. The material is described as black, loose or unconsolidated, burn debris, consisting of cinder, ash, rock, sand, metallic objects, glass, and clay tiles. Metal objects include pipe, plates, straps, and miscellaneous material. Much of the metallic debris is rusted and corroded and generally cannot be identified.

Trenching activities for this investigation occurred during a very rainy period, 18 May through 20 May 2004. At that time, the burn layer was saturated with water and demonstrated a high degree of permeability, as evidenced by seepage of groundwater from the burn layer, which filled the bottom of the trench at most locations.

Soil beneath the burn layer is characterized as silty clay and is highly discolored. Subsurface soil outside of the burn area, is typically medium to light brown; however, black, red, and green shades, with a mottled appearance were frequently observed at depths of one to two ft beneath the burn layer.

4.2 DISTRIBUTION OF CONTAMINANTS INSIDE OF THE BURN AREA

Chemical characterization of soil within the footprint of the burn area included surface soil, burn layer material, and soil beneath the burn layer.

4.2.1 Surface Soil Sample Results

A total of seven surface soil samples have been collected inside of the burn area, which includes three samples collected during the 1996 SI. One of the surface soil samples collected during the 2004 investigation included analysis for dioxin/furans (BH-17). Contaminants detected include dioxins, furans, PCBs, explosives, PAHs, metals, and VOCs (Tables 4-1 through 4-8). Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values for inorganics include the following:

- 2,3,7,8-Tetrachlorodibenzo-p- dioxin – one location
- PCB-1260 (Arochlor 1260) – six locations
- 2,4,6-Trinitrotoluene – five locations
- Benzo(a)pyrene – two locations
- Lead – four locations

Distributions and concentrations of contaminants in the surface soil exceeding the PRGs are presented on Figures 4-2 and 4-3.

4.2.2 Burn Layer Sample Results

A total of ten samples were collected from the burn layer material during this investigation, five of which were analyzed for dioxins/furans only. Contaminants detected include dioxins, furans, PCBs, explosives, PAHs, metals, and VOCs (Tables 4-9 through 4-14). Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values for inorganics include the following:

- PCB-1254 (Arochlor 1254) – two of five locations
- PCB-1260 (Arochlor 1260) – four of five locations
- 2,4 –Dinitrotoluene – all five locations
- 2,6-Dinitrotoluene – four of five locations
- 2,4,6-Trinitrotoluene – all five locations
- 2-Nitrotoluene – two of five locations
- 1,3-Dinitrobenzene – one of five locations

- Benzo(a)pyrene – one of five locations
- Dibenz(a,h)anthracene – one of five locations
- Napthalene – three of five locations
- Lead – all five locations
- Thallium – all five locations
- Barium – one of five locations
- Copper – one of five locations

Distributions and concentrations of compounds exceeding the PRGs and the established background values for inorganics in burn layer material are presented on Figure 4-4. Concentrations of TNT at trench locations TR05, TR07, TR08 and TR09 are two to three orders of magnitude higher than the PRGs. Concentrations on DNT compounds at trench locations TR08 and TR09 are one to two orders of magnitude higher than the PRGs. Based on these concentrations, the burn layer material sampled from trenches TR08 and TR09 is composed of 3.6% to 4.5% explosives.

4.2.3 Subsurface Soil Sample Results

A total of seventeen subsurface soil samples were collected from beneath the burn layer, which includes six samples collected during the 1996 SI, three samples collected during the 2004 trenching activities, and eight samples collected during the 2004 DPT investigation. The six samples collected during the 1996 SI were collected from three locations at two intervals: two to three ft bgs and six to seven ft bgs. The 1996 SI sample collected from the two to three ft interval at location 2BGSO-03 included material from the burn layer, which may account for the high explosives concentrations (Figure 4-5). The burn layer at this location was encountered from 2.0 to 2.5 ft bgs. The three samples collected during the 2004 trenching program were analyzed for dioxins/furans only and represent the only locations where soil beneath the burn layer was analyzed for dioxins/furans. The eight samples collected during the 2004 DPT investigation were collected from four locations at two intervals: three to five ft bgs and eight to ten ft bgs. Contaminants detected from soil beneath the burn layer include dioxins, furans, explosives, PAHs, metals, and VOCs (Tables 4-14 through 4-20). Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) include the following:

- 2,4,6-Trinitrotoluene – two locations
- 2,4-Dinitrotoluene – three locations
- 2,6 – Dinitrotoluene – one location
- PCB-1260 (Arochlor 1260) – one location
- Thallium – five locations

- Aluminum – four locations

Distributions and concentrations of compounds exceeding the PRGs in soil beneath the burn layer are presented on Figure 4-5.

4.3 DISTRIBUTION OF CONTAMINANTS OUTSIDE OF THE BURN AREA

Chemical characterization of soil outside the burn area included surface soil and subsurface soil.

4.3.1 Surface Soil Sample Results

A total of 27 surface soil samples were collected outside of the burn area, which includes five samples collected during the 1996 SI, 12 samples during the 2004 investigation, and ten additional samples for further delineation purposes during January 2005. Three of the surface soil samples collected during the 2004 investigation included analysis for dioxin/furans (BH-09, BH-10, and BH-11). Contaminants detected include dioxins/furans, PCBs, explosives, PAHs, metals, and VOCs. Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values for inorganics include the following:

- 2,3,7,8-Tetrachlorodibenzo-p- dioxin – 1 of 3 locations sampled
- PCB-1260 (Arochlor 1260) – 11 of 27 locations
- 2,4,6-Trinitrotoluene – 5 of 27 locations
- Benzo(a)pyrene – 11 of 27 locations
- Dibenz(a,h)anthracene – 1 of 27 locations
- Benzo(b)fluoranthene – 1 of 27 locations
- Lead – 3 of 27 locations

Distributions and concentrations of compounds exceeding the PRGs in surface soil are presented on Figures 4-2 and 4-3. Half of the additional surface soil locations sampled in April 2005 had PRG exceedances for one or more compounds

4.3.2 Subsurface Soil Sample Results

A total of 28 subsurface soil samples have been collected outside of the burn area, which includes ten samples collected during the 1996 SI, two samples collected during the 2004 trenching activities, and sixteen samples collected during the 2004 DPT investigation. The ten samples collected during the 1996 SI were collected from five locations at two intervals: two to three ft bgs and six to seven ft bgs. The two samples collected during the 2004 trenching program were analyzed for dioxins/furans only and represent the only locations where subsurface soil outside of the burn area was analyzed for dioxins/furans. The sixteen samples collected during the 2004 DPT investigation were collected from eight locations at two intervals:

three to five ft bgs and eight to ten ft bgs. Contaminants detected from subsurface soil outside of the burn area include dioxins, furans, explosives, PAHs, metals, and VOCs. Compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values for inorganics are limited to metals. Distributions and concentrations of compounds exceeding the PRGs in subsurface soil are presented on Figure 4-5.

5.0 GROUNDWATER INVESTIGATION RESULTS

No previous groundwater investigations had been performed at the 2BG site to evaluate impacts to the groundwater due to former PBOW operations. The objective of this groundwater investigation was to characterize the shallow and bedrock aquifers and to evaluate the presence of chemical contamination in groundwater in the vicinity of the 2BG site. Results from this study are presented below.

5.1 SITE-WIDE GROUNDWATER FLOW CHARACTERIZATIION

5.1.1 Groundwater Flow Within the Overburden

Water level measurements were collected from five temporary piezometers installed around the perimeter of the site. A total of seven measurements were collected over a period of two months from 22 May through 20 July 2004.

Shallow groundwater levels at the site ranged from 2.4 to 6.2 ft bgs during this period. Piezometer hydrographs show water levels reached a high point during mid-June, following a very rainy period during the month of May and first half of June (Figure 5-1). Water levels then dropped an average of 2.2 ft during the period 15 June through 20 July 2004, which coincides with a relatively dry period.

Groundwater contour maps for both the high and low conditions (Figures 5-2 and 5-3) show a groundwater high in the southwest corner of the site. Shallow groundwater flows toward the north, northeast, and east from this point.

5.1.2 Groundwater Flow in Bedrock

Water level measurements were collected from three bedrock wells installed at the site; however, the data cannot be used to evaluate bedrock groundwater flow, because the wells did not fully recover following well development activities. A final water level measurement was recorded after purging the wells to within six inches of total depth on 21 July 2004. Additional water levels were collected on 9 August 2004, 25 October 2004, and 1 November 2004. During this three-month recovery period, monitoring wells 2BG-BEDMW-001, 2BG-BEDWM-002, and 2BG-BEDMW-003 recovered 2.28 ft, 5.96 ft and 7.34 ft respectively. The recovery rate is less than 1 ml/min for all three wells. Based on the depths of these wells and water levels in other PBOW bedrock wells, the water column should be 20 to 30 ft higher when fully recovered.

In the absence of site-specific data for bedrock groundwater at the 2BG site, data from other nearby bedrock monitoring wells have been used to estimate flow directions. Groundwater elevation contours for the Delaware Limestone provided in the 2002 Groundwater Data Summary Report (Shaw, 2003) indicate a linear feature running northeast-southwest through PBOW, that serves as a preferential flow path. This feature is parallel to the bedrock strike and may represent a fracture system and/or karst development. Flow is toward the northeast along this feature. Groundwater elevations drop steeply toward this zone on either side. The 2BG site is located approximately 500 ft northwest of this feature. Although adequate water level

data has not been collected at the site to confirm flow directions, it is likely that groundwater flows from the site in a southeastern direction toward this regional feature.

5.2 GROUNDWATER QUALITY

Chemical data for the shallow groundwater was not obtained during this investigation. Shallow overburden monitoring wells were not installed due to insufficient permeable material in the subsurface. OEPA and the CELRN geologist concurred with this decision.

One round of samples was collected from the bedrock monitoring wells. Due to the sampling methods employed, the data will be used for qualitative purposes only and will not support a risk assessment.

Contaminants detected include PAHs, metals, and VOCs (Tables 4-21 through 4-23). Due to the concentrations seen in several of the samples, they were analyzed at dilutions, which raised the respective method detection limits (MDLs) and/or reporting limits (RLs) above the maximum contaminant levels (MCLs) for some analytes. In these cases, however, the analyte in question was also detected above the MCL, so there is no impact from the elevated MDLs and/or RLs. Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) and established background values (Shaw, 2005) for inorganics include the following:

- Acenapthene – one well (PAH analysis performed for one well only)
- Benzo(a)anthracene – one well (PAH analysis performed for one well only)
- Napthalene - one well (PAH analysis performed for one well only)
- Arsenic – all three wells
- Iron – two of three wells
- Manganese – one of three wells
- Benzene – two of three wells
- Xylene – two of three wells

6.0 SURFACE WATER AND SEDIMENT INVESTIGATION RESULTS

Three sediment samples were collected from the drainage ditch on 23 May 2004. Locations are presented on Figure 3-3. Contaminants detected include dioxins, furans, PAHs, metals, and VOCs (Tables 6-1 through 6-4). Specific compounds exceeding the USEPA Region 9 Residential PRGs (October 2004) include the following:

- Benzo(a)Pyrene – all loactions
- Benzo(a)Anthracene – upstream location only
- Benzo(b)Flouranthene – upstream location only
- Indeno(1,2,3-c,d)Pyrene – upstream location only

Distributions and concentrations of compounds exceeding the PRGs in sediment are presented in Figure 6-1.

Surface water samples were not collected during this investigation due to weather conditions. Three attempts were made to collect surface water samples during the field investigation. Daily rainfall events during the period 18 May through 26 May 2004, prevented samples from being collected. According to the approved FSP, surface water samples would not be collected within 48 hours of any precipitation events. During this period there were no 48-hour periods without significant rainfall.

During the well installation event, from 15 June through 24 June 2004, surface water was not flowing and only a few small widely-spaced pools were found. There was also insufficient volume at the upstream location for collection of all required samples. It was determined, with concurrence of the CELRN geologist, that these waters would not be representative, and therefore, were not sampled. During the period 20 July through 21 July 2004, no water was present in the drainage ditch.

During the 02 December 2004 Team Meeting, surface water sampling was eliminated from this investigation, based on the ephemeral nature of the drainage ditch and the absence of site contaminants in the sediment.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The results of this investigation indicate that contaminants exceeding the USEPA Region 9 Residential PRGs (October 2004) are present at the site. Sufficient data have been collected for the 2BG soil to support a risk assessment and to evaluate future actions. Sufficient data have also been collected to evaluate impacts to the sediment in the drainage ditch north of the site. Groundwater data collected during this investigation is not sufficient to support a risk assessment; however, the data is useful for qualitative analysis of contaminants present in the bedrock groundwater. An evaluation of the surface water conditions is not possible, since samples were not collected.

7.1 SOIL INVESTIGATION

A total of 89 soil samples have been collected from the site during the 1996 SI and the 2004 - 2005 RI. Contaminants exceeding the USEPA Region 9 Residential PRGs are primarily limited to surface soil and the burn layer material (Figures 4-2 through 4-4).

The burn area is clearly the most contaminated area at the site. All seven of the surface soil samples from inside the burn area contained multiple contaminants exceeding the PRGs and all five of the burn layer samples analyzed for full suite analysis contained multiple contaminants exceeding the PRGs. The highest concentrations of explosives and lead at the site were found in the burn layer material. Concentrations of these contaminants are two to three orders of magnitude higher than the PRGs for all samples. The burn layer material sampled from trenches TR08 and TR09 is composed of 3.6% and 4.5% explosives, respectively.

Surface soil contamination outside of the burn area is not as pervasive. Twenty of the 27 samples collected outside of the burn area contained contaminants exceeding PRGs (Figure 4-2). Ten of these sample locations are concentrated in the southwest portion of the site, outside of the former disturbed area identified on the 1958 aerial photos. This area was originally identified during the 1996 SI. The additional borings completed during the 2004-2005 RI have not adequately delineated this area. The extent of contamination to the northeast and south of contaminated area remains undefined. Samples were not collected east of the burn area for delineation purposes, since the service road acts as a boundary. The surface soil contamination west of the burn area may be the result of debris staging prior to incineration or may be due to the regarding of the site.

Subsurface soil contamination is minimal. Sixteen of the thirty-four subsurface soil samples contained contaminants exceeding PRGs. Only three subsurface soil samples contained organic constituents exceeding the PRGs and are limited to inside the burn area. Two of these were collected during the 1996 investigation from a depth of two to three ft, which likely incorporated burn layer material. Soil descriptions from these boreholes indicate burn layer material is present down to 2.5 ft bgs. Contamination exceeding the PRGs outside of the burn area is limited to metals (Figure 4-4).

Concentrations of organic compounds in subsurface soil are generally several orders of magnitude lower than the PRGs. PCBs were not detected in any of the subsurface soil samples. Explosives were detected in the subsurface soil beneath the burn layer at six of the

seven locations, but at levels considerably lower than the PRGs. Explosives were detected in subsurface soil outside of the burn area in three of the thirteen locations (S04, BH-15, and BH-16). Based on this data, downward and lateral migration of contaminants is minimal.

Multiple dioxin/furan compounds were detected in the soil and burn layer material. PRGs have not been established for these compounds, except for 2,3,7,8-Tetrachlorodibenzo-P-Dioxin. PRGs were the only established screening criteria for this project: therefore, other published values were not used. Toxicity equivalency concentrations have been calculated for the other compounds based on toxicity equivalency factors (USEPA, 1994). These values have been used for screening on other USEPA projects and may be appropriate for future risk assessments.

7.2 GROUNDWATER INVESTIGATION

Limited investigation of the site groundwater has been performed. Shallow groundwater characterization was limited to water level measurements from temporary piezometers. Bedrock groundwater characterization was limited to one round of sampling. The groundwater data is considered screening level quality and will not be used for a human health risk assessment. Water level data collected from the bedrock wells is of limited use since the wells had not fully recovered during the investigation, due to very slow recharge rates.

Water level data for the shallow groundwater indicate a quick response to weather conditions. Water levels were observed to drop more than two ft in less than five weeks during a dry period. Shallow groundwater flows generally to the north, northeast, and east, away from a shallow groundwater high located in the southwest portion of the site.

The bedrock at the site is characterized as massive with low permeability and minimal fracturing. As a result the newly installed wells recover very slowly. Static water levels at the site are unknown, since the wells have not yet stabilized. Flow direction is assumed to be toward the southeast based on groundwater data collected as part of the site-wide investigation. Organic contaminants detected in the bedrock groundwater at 2BG were also found in bedrock groundwater at other locations within PBOW and are believed to be associated with naturally occurring petroleum in the Delaware Limestone (Shaw 2004). The primary contaminants in soil at 2BG, explosives and PCBs, were not detected in the bedrock groundwater. Based on the low porosity observed from the rock cores and the low permeability observed during development, the bedrock aquifer at 2BG has very low potential for contaminant transport.

7.3 SURFACE WATER AND SEDIMENT INVESTIGATION

Three sediment samples were collected from the drainage ditch north of the site. Contaminants exceeding the USEPA Region 9 Residential PRGs are limited to PAHs (Figure 6-1). Other contaminants detected in the sediment include dioxins/furans and VOCs. Organic concentrations are significantly higher at the location upstream of the site, suggesting that contaminants are related to a source other than the burning ground, such as run-off from the asphalt road, which is adjacent to the site. PCBs and explosives, which are the primary contaminants associated with the burning ground, were not detected in the sediments.

Surface water samples were not collected during this investigation due to weather conditions and the absence of water. Surface water sampling will not be performed due to the ephemeral nature of the drainage ditch and the absence of site contaminants in the sediment. This decision was agreed to at the team meeting conducted 02 December 2004.

7.4 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) for 2BG is based on information collected during the 1991 PA, 1995 records review, the 1996 SI, and the 2004-2005 RI. Sufficient data have been collected to develop a facility profile, physical profile, release profile, and land use and exposure profiles. Collection of ecological data was not within the scope of these investigations; therefore, data is not available for the development of an ecological profile.

The facility profile addressing site structures, physical boundaries, and current and historical processes, is presented in Sections 1.0 and 2.0 of this document. The primary source of contamination at the site is the burn layer, located in the southeast portion of the cleared area (Figure 4-1). Contaminants present in the burn layer include explosives, lead, PCBs, and dioxin/furans. A secondary source of contamination is the surface soil above and adjacent to the burn layer. Contaminants present in the surface soil include explosives, lead, PCBs, dioxins/furans, and PAHs. The highest concentrations of explosives, lead, and dioxins/furans are found in the burn layer, whereas the highest concentrations of PCBs are found in the surface soil west of the burn layer.

The physical profile addressing topographic features, vegetation, surface water features, geology, and meteorological data, has been presented in Section 2.0 of this document. Additional geologic, hydrologic, and hydrogeologic data was collected during the 2004 investigation, as presented in Sections 4.0, 5.0, and 6.0. Major components of the physical profile are the silt layer at 7 to 9 ft bgs, and the highly plastic clay layer ranging from 10 to 15 ft bgs, and extending to the bedrock interface. These two units control the movement of shallow groundwater at the site. Based on this model, the preferential flow path for shallow groundwater is laterally through the silt layer towards the drainage ditches.

The release profile has been evaluated for two types of contaminants: those which are mobile in groundwater, and those which are fixed to soil. PAH's and nitroaromatics represent site contaminants that are mobile in groundwater. PCB's, lead, and dioxins/furans represent site contaminants that are generally fixed to soil and are thus less mobile.

The primary release mechanisms for PAH and nitroaromatics are removal of the vegetative and backfill layer and leaching into the shallow groundwater (Figure 7-1). Removal of the vegetative and backfill layer is unlikely to occur by natural processes. Some form of construction or other human activity would be required for this release mechanism. If the contaminated soil were to be exposed, fugitive dust, localized to the immediate site, would also be a potential release mechanism.

Leaching of PAH and nitroaromatics into the shallow groundwater is likely due to high annual rainfall at the site and the shallow depths to the water table. As observed during the trenching activities, the burn layer was saturated with water, likely due to the highly porous nature of the burn layer materials coupled with the less permeable clays and silts beneath. Lateral migration

of shallow groundwater toward the drainage ditches during the wet season could potentially release contaminants into the surface water. Release of contaminants into the deeper bedrock groundwater is unlikely because of the highly impermeable clay layer beneath the site and the absence of fractures and low permeability observed in the Delaware Limestone. The fairly continuous silt layer beneath the site could serve as a preferential flow path for lateral migration of groundwater toward the east and north of the site, in the direction of the drainage ditches. However, this pathway has not been confirmed due to the absence of any shallow groundwater information.

The primary release mechanism for PCBs, lead, and dioxins/furans is the removal of the vegetative and backfill layer. As discussed above, some form of construction or other human activity would be required for this release mechanism to be viable, which would also include fugitive dust as a potential release.

Release of PCBs, lead, and dioxins/furans by leaching into the shallow groundwater has low potential based on the chemical affinity with soil for these compounds. The absence of these compounds in the subsurface soil supports this conclusion.

The land use and exposure profiles are included in Figures 7-1 and 7-2. The primary exposure scenarios for current site use are dermal contact to exposed soil and shallow groundwater. Dermal contact to surface water, both on and off-site, also represents potential exposure; however, this cannot be verified because surface water samples were not collected during the investigation. Exposure to site surface water would be limited to the wet season only. Dermal contact and/or ingestion of bedrock groundwater are also potential exposure routes; however, the release mechanisms for these exposure routes are unlikely. The primary exposure scenarios for future land use are the same as the current routes, with the exception of exposed soil and fugitive dust in the immediate vicinity for future residents.

7.5 RECOMMENDATIONS

Further actions should be considered to address the contaminants exceeding the USEPA Region 9 PRGs at 2BG and to address data gaps related to bedrock groundwater. The recommendations are as follows:

- Conduct additional surface soil sampling to fully delineate contamination west of the burn area.
- Collect additional water level measurements from the bedrock wells until static conditions are established, in order to provide data usable for site-wide groundwater contouring.
- Conduct an Engineering Evaluation / Cost Analysis to evaluate potential remediation alternatives for the surface soil and burn layer material.
- Evaluate the need for a human health and ecological risk assessment after completion of the Engineering Evaluation / Cost Analysis

- Evaluate the need for any future remedial actions based on results from the human health risk assessment.

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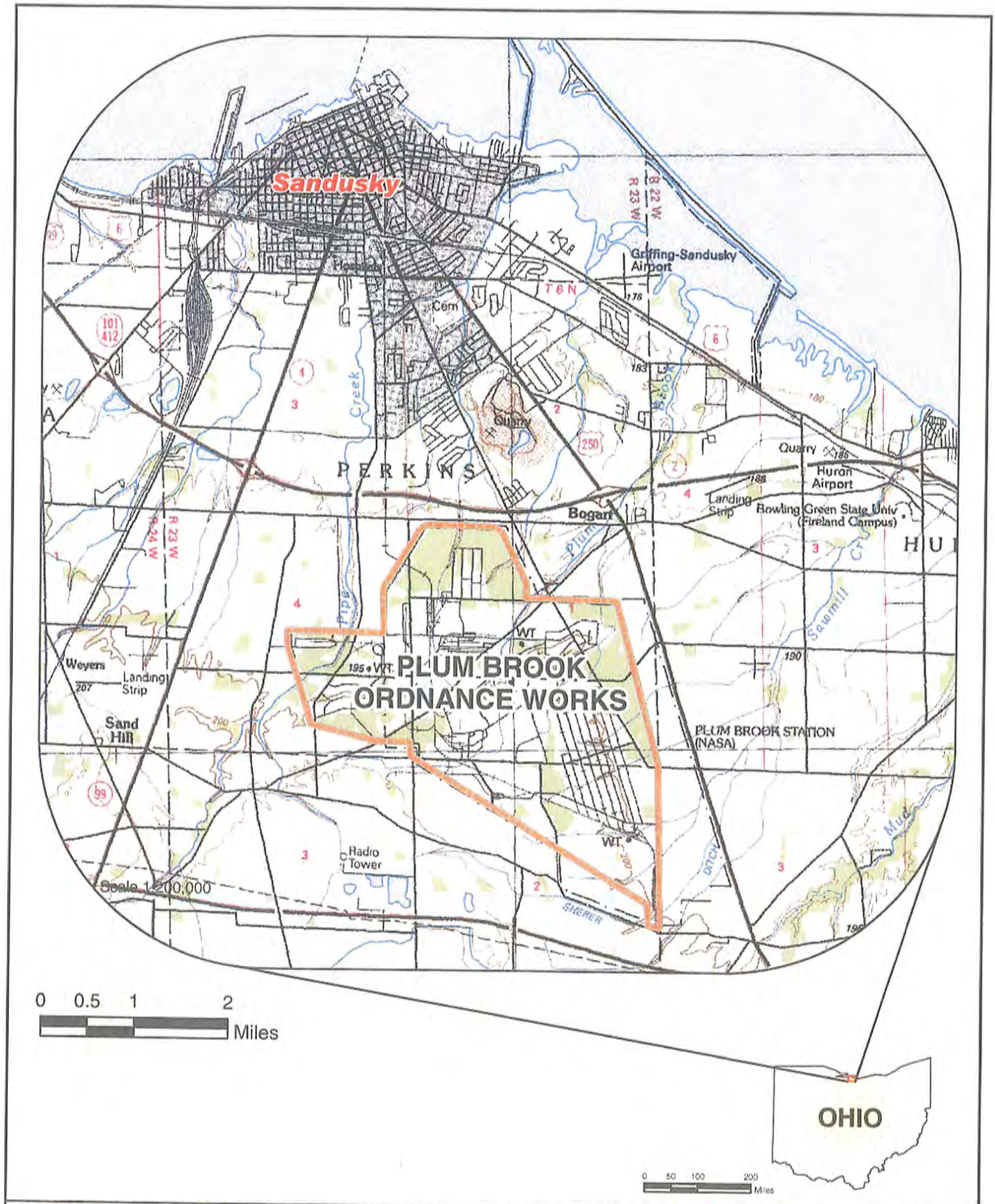


Legend

Plum Brook Ordnance Works Boundary

N

JACOBS

Location Map,
Plum Brook Ordnance Works
Sandusky, Ohio

Plumbrook Ordnance Works
Sandusky, Ohio

01/06/06 NZ D:/GIS/Plumbrook/Projects/Final_Res2BG_RI/Final_1_6_05/ArcGIS/PBOW_Site_Location.mxd

Figure 1-1

1910000.0000 1920000.0000 1930000.0000

630000.0000

620000.0000

PENTOLITE AREA

ACID AREA #3

PENTOLITE ROAD RED WATER PONDS

RESERVOIR #2 BURNING GROUND

ACID AREA #2

MAINTENANCE SHOP AREA

UPPER TOLUENE TANKS AREA

TNT MANUFACTURING AREA A

ACID AREA #1

WEST AREA RED WATER PONDS

ADDITIONAL BURNING GROUND AREA

G-8 BURNING GROUND AREA

LOWER TOLUENE TANKS AREA

TNT MANUFACTURING AREA C

SNAKE ROAD BURNING GROUND AREA

TALYOR ROAD BURNING GROUND AREA

TNT MANUFACTURING AREA B

PATROL ROAD

BOGART ROAD

PLUM BROOK

DITCH

RANSOM BROOK

LATSHAW

SANDUSKY - NORWALK ROAD

PENTOLITE ROAD

RANSOM ROAD

MAINTENANCE ROAD

PIPE CREEK

TAYLOR CUT

SHORT ROAD

FOX ROAD

SNAKE ROAD

CAMPBELL STREET

MAGAZINE ROAD

COLUMBUS AVE.

U.S. 250

WEST SCHEID ROAD

CENTER MAGAZINE ROAD

SCHEID DITCH

EAST SCHEID ROAD

TAFT ROAD

PATROL ROAD

Area of Detail

Legend

Area of Concern

Creek, Ditch, Conveyance

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

N W E S

0 2,000 4,000 Feet

JACOBS

Location Map, Reservoir No. 2 Burning Ground

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/06 NZ. D:\GIS\Plumbrook\Projects\Final_Res2BG_RI\ArcGIS\Final_1_6_05\Res2_AOC_Location.mxd

Figure 1-2

Legend

Interpreted Burn Pit Boundary
Based on Trenching Data

Creek, Ditch, Conveyance

N
W E
S

0 250 500
Feet

Notes: Data mapped to Ohio State Plane North NAD83, map units are feet

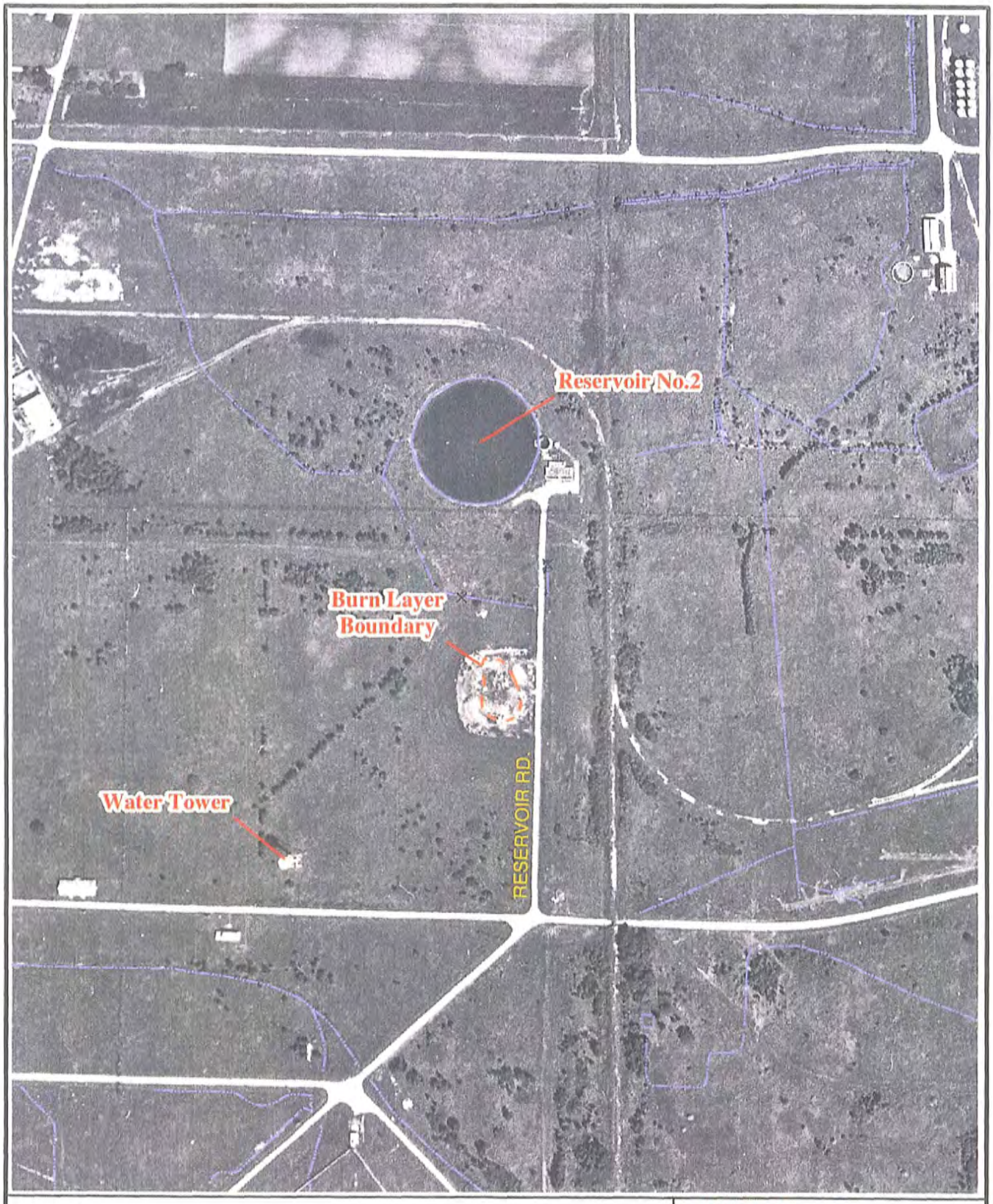
JACOBS

Reservoir No.2 Burning Ground — 1950 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/06 NZ D:/GIS/Plumbrook/Projects/
Final Res2BG RI/ArcGIS/Final 1-6-06/
Res2_1950.mxd

Figure 1-3



Legend

Interpreted Burn Pit Boundary Based on Trenching Data

Creek, Ditch, Conveyance

N
W
E
S

0 250 500
Feet

Notes: Data mapped to Ohio State Plane North NAD83, map units are feet.

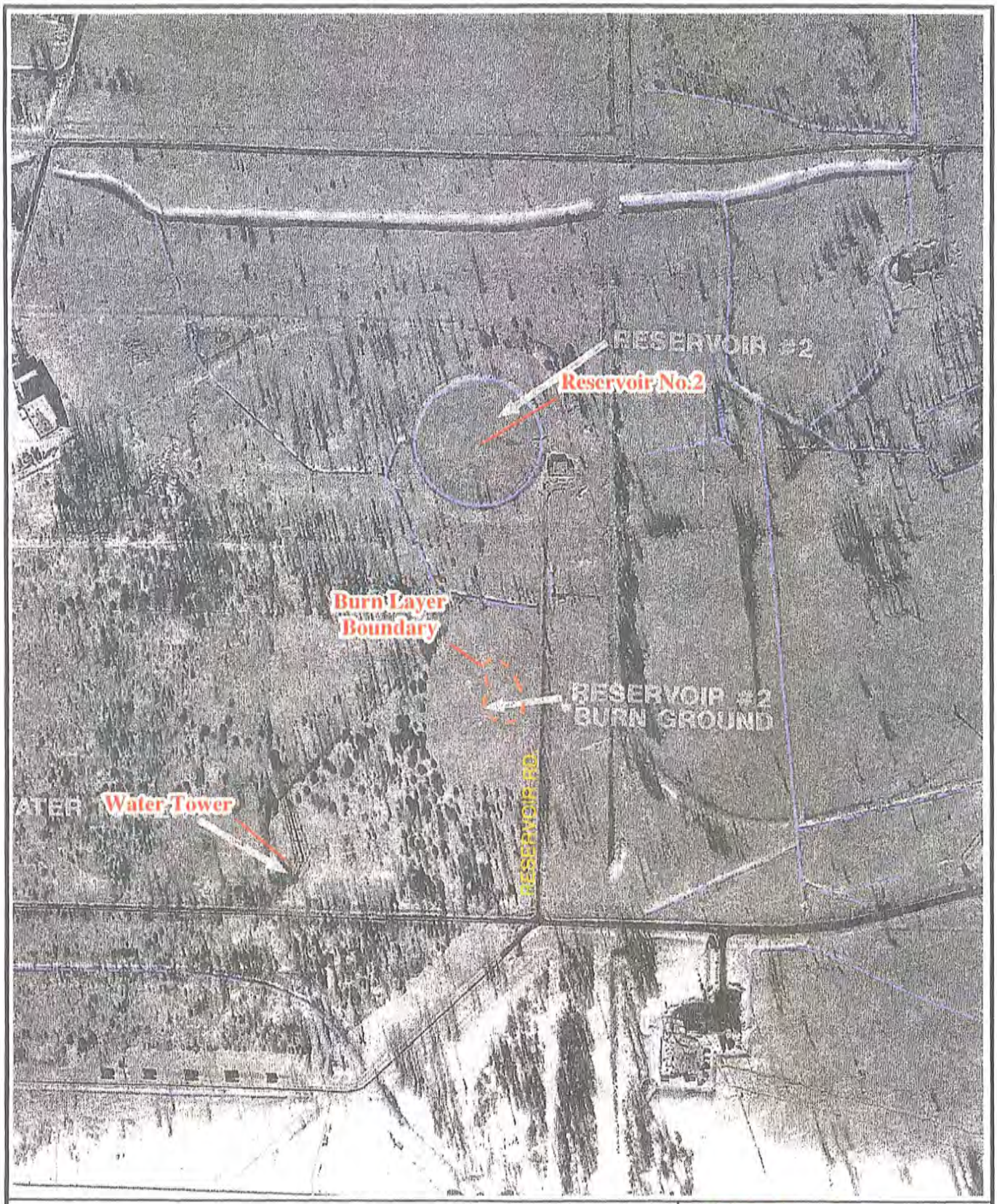
JE JACOBS

Reservoir No.2 Burning Ground — 1958 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

06/27/05 NZ D:/GIS/Plumbrook/Projects/Final Res2BG_RI/Final 1_6_05/Res2_1958.mxd

Figure 1-4



Legend

Interpreted Burn Pit Boundary Based on Trenching Data

Creek, Ditch, Conveyance

N
W
E
S

0 250 500

Feet

Notes: *Data mapped to Ohio State Plane North NAD83, map units are feet.*

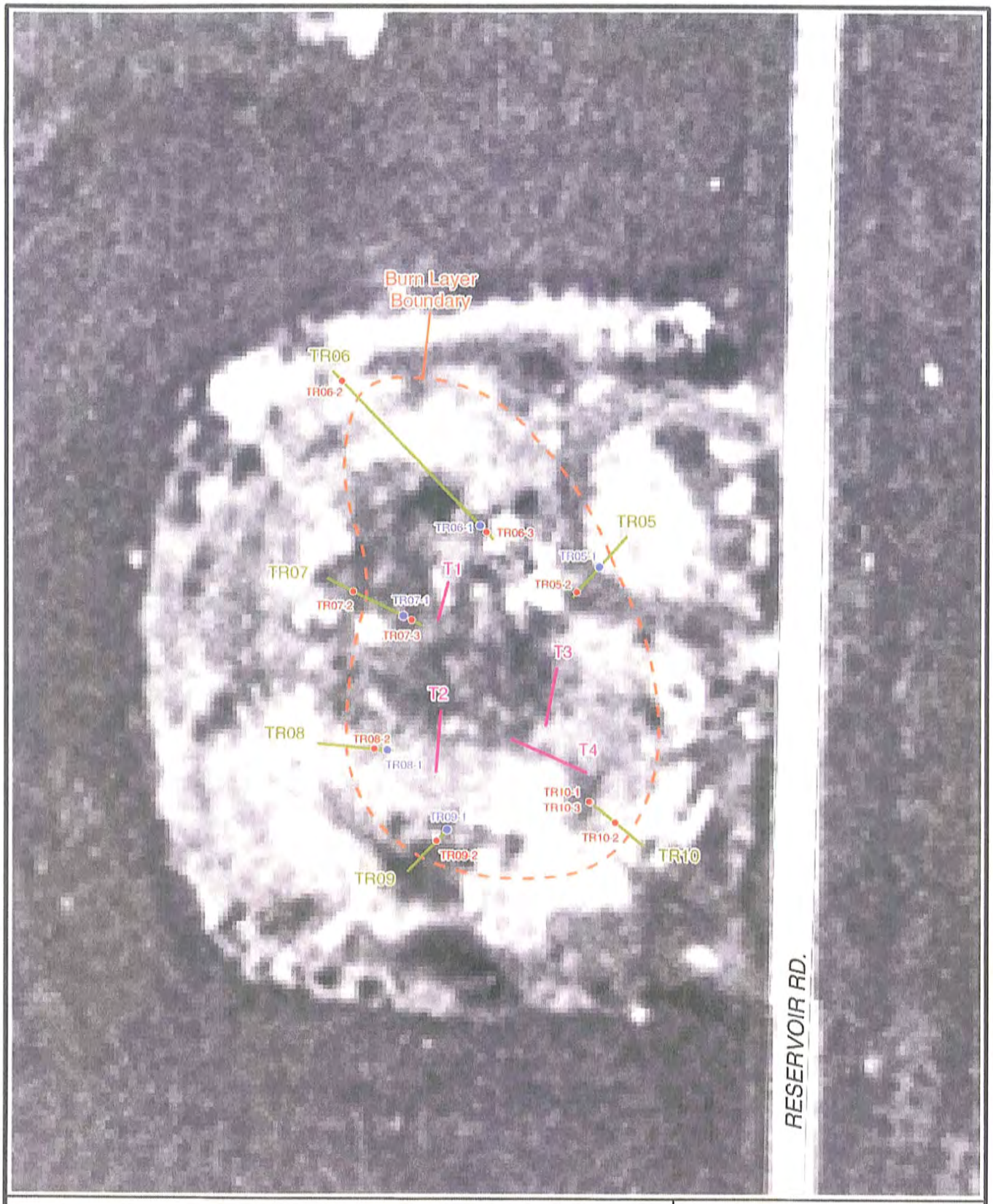
JE JACOBS

Reservoir No.2 Burning Ground — 1968 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

06/27/05 NZ D:/GIS/Plumbrook/Projects/Final Res2BG RI/ArcGIS/Res2_1968.mxd

Figure 1-5



Legend

- TR06 — Exploratory Trenches—Jacobs 2004
- T2 — Exploratory Trenches—1996 SI
- Sample Location—Full Suite Analytical
- Sample Location—Dioxin and Furan Only
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

N, W, E, S

0 25 50

Feet

Notes: *Data mapped to Ohio State Plane North NAD83, map units are feet.*

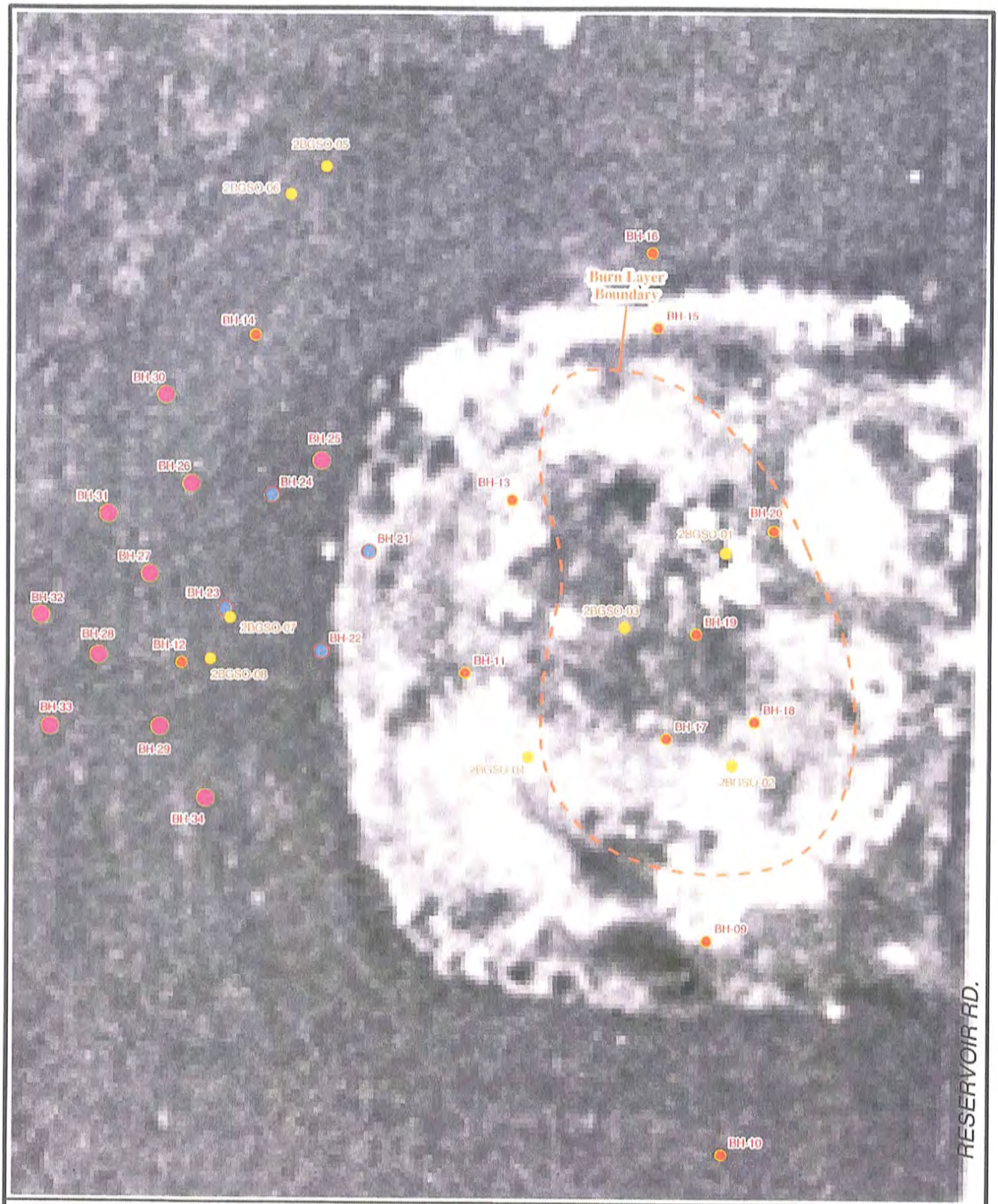
JACOBS

Trench Locations — 1958 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

01/11/06 NZ O:\GIS\P\umbrook\Projects\Final_Res2BG_RI\Final_1_6_05 Trenches_1958.mxd

Figure 3-1



Legend

- Surface Soil Only—Jacobs 2004
- Surface Soil Only—Jacobs 2005
- DPT Locations—Jacobs 2004
- DPT Locations—1996 SI
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

N
W E
S

0 25 50
Feet

Notes: *Data mapped to Ohio State Plane North NAD83, map units are feet*

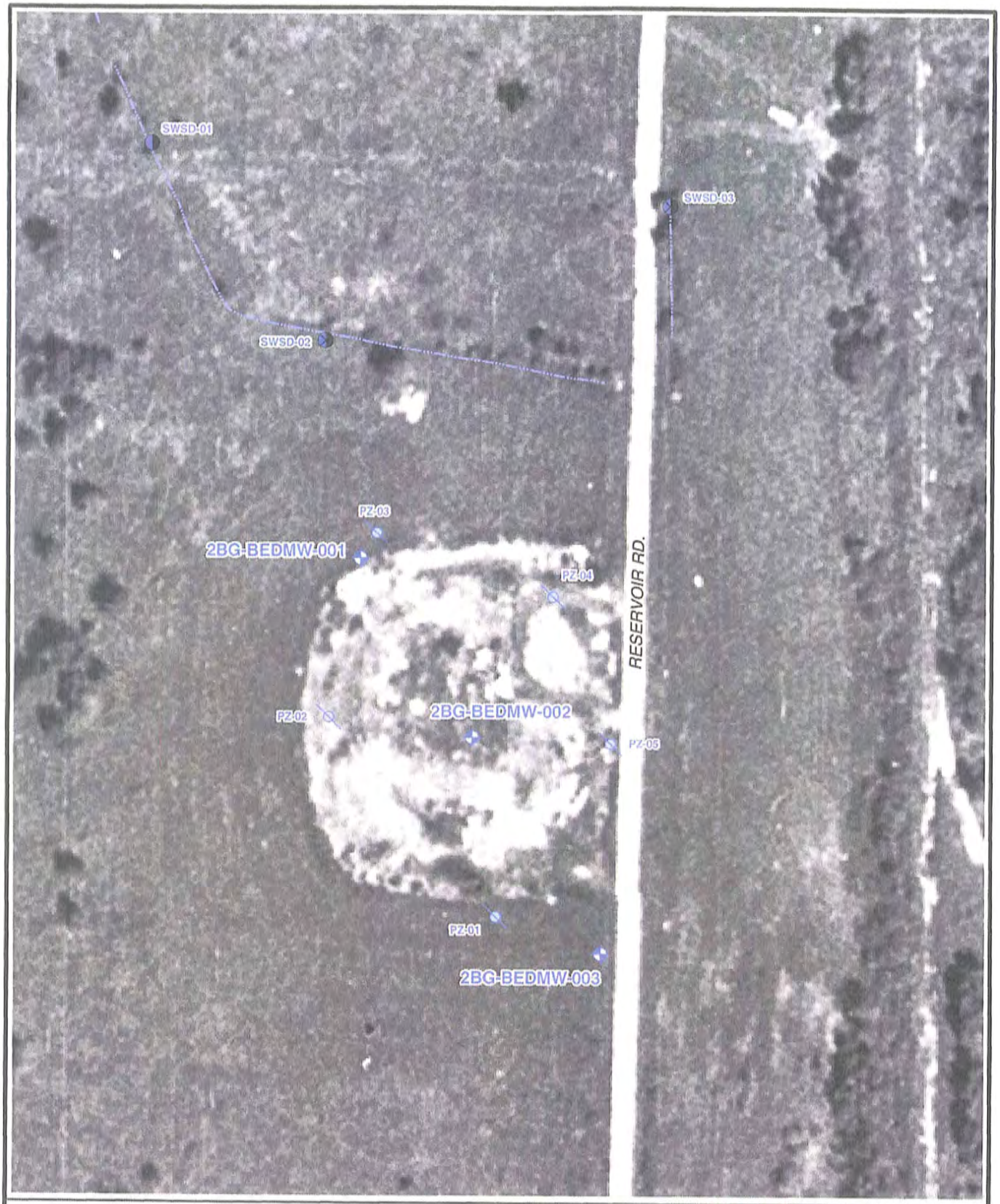
JE JACOBS

Soil Boring Locations — 1958 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

01/05/06 NZ D:/GIS/Plumbrook/Projects/Final_Res2BG_RI/ArcGIS/Final_1_6_06/DPT_1958.mxd

Figure 3-2



Legend

- Piezometer — Jacobs 2004
- Monitoring Well — Jacobs 2004
- Surface Water and Sediment Sample — Jacobs 2004
- Creek, Ditch, Conveyance

N

W E

S

0 50 100

Feet

Notes: *Data mapped to Ohio State Plane North NAD83, map units are feet*

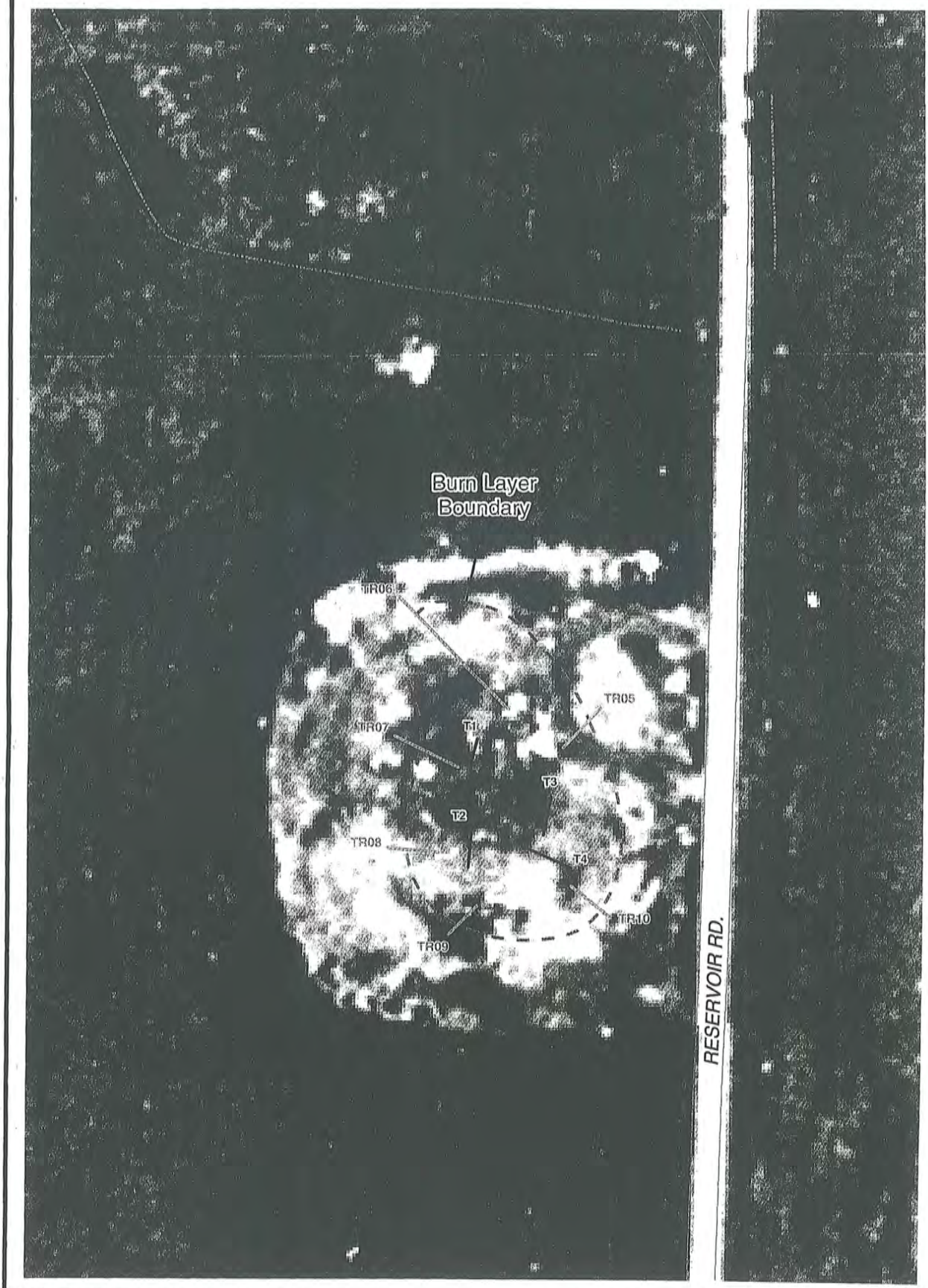
JE JACOBS

Piezometer, Monitoring Well, Surface Water, and Sediment Sampling Locations— 1958 Aerial Photography

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/06 NZ D:\GIS\Plumbrook\Projects\Final_Rie2BG_RI\ArcGIS\Final 1_6_05\Piezo_MW_SW_Sed.mxd

Figure 3-3



Area of Detail

Legend

- Interpreted Burn Pit Boundary Based on Trenching Data
- TR8 — Exploratory Trenches—Jacobs 2004
- T2 — Exploratory Trenches—1996 SI
- Creek, Ditch, Conveyance

N W E S

0 25 50
Feet

Notes: Data mapped to Ohio State Plane North NAD83, map units are feet. Aerial photography from 1998.

JACOBS

Burn Layer Boundary

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/06 NZ D:/GIS/PlumbrookProjects/Final_Res2BG_RI/ArcGIS/Final_1_6_06/Burn_Layer_Boundary.mxd

Figure 4-1

PBOW-96-SO-2BG-2BGSO06-1160-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
Lead (total)	189 mg/Kg	48.6	40

PBOW-96-SO-2BG-2BGSO05-1130-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
Lead (total)	83.3 mg/Kg	48.6	40

PBOW-04-SO-2BG-BH16A(0-1) - 05/22/04			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	65.1 NJ ug/Kg		62

PBOW-04-SO-2BG-BH15A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
Lead (total)	89.6 J mg/Kg	48.6	40
Field Duplicate Results			
2,4,6-Trinitrotoluene	47700 J ug/Kg		16000
Benzo(a)pyrene	62.7 NJ ug/Kg		62
Lead (total)	116 J mg/Kg	48.6	40

PBOW-05-SO-2BG-BH25-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	23000 ug/Kg		16000
Benzo(a)pyrene	310 J ug/Kg		62
Lead	590 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	3500 J ug/Kg		220

PBOW-04-SO-2BG-BH13A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
Lead (total)	148 J mg/Kg	48.6	40

PBOW-04-SO-2BG-BH20A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
Lead (total)	155 J mg/Kg	48.6	40

PBOW-04-SO-2BG-BH24A(0-1) - 05/22/04			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	89.5 NJ ug/Kg		62
Lead (total)	590 J mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	2630 J ug/Kg		220

PBOW-04-SO-2BG-BH19A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	3120000 ug/Kg		16000
Lead (total)	585 J mg/Kg	48.6	40
Naphthalene	9930 NJ ug/Kg		5600
PCB-1260 (Aroclor 1260)	8140 J ug/Kg		220

PBOW-05-SO-2BG-BH26-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Lead	55 mg/Kg	48.6	40
Field Duplicate Results			
Lead	68.3 mg/Kg	48.6	40

PBOW-96-SO-2BG-2BGSO01-1010-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	48 mg/Kg		16
Lead (total)	165 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	3300 ug/Kg		220
Thallium (total)	1.8 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-BH18A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	60300 ug/Kg		16000
Benzo(a)pyrene	108 NJ ug/Kg		62
Lead (total)	598 J mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	8940 J ug/Kg		220
Thallium (total)	1.52 J mg/Kg	1.3	0.52

PBOW-05-SO-2BG-BH27-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Lead	203 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1900 J ug/Kg		220

PBOW-04-SO-2BG-BH23A(0-1) - 05/22/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	2270000 ug/Kg		16000
Lead (total)	386 J mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	44400 J ug/Kg		220

PBOW-04-SO-2BG-BH17A(0-1) - 05/20/04			
Analyte	Value	Bkg.	PRG
2,3,7,8-TCDD	6.58 ng/Kg		3.9
Benzo(a)pyrene	62.7 NJ ug/Kg		62
Lead (total)	730 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	11600 J ug/Kg		220

PBOW-05-SO-2BG-BH28-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Lead	54.4 mg/Kg	48.6	40

PBOW-96-SO-2BG-2BGSO03-1070-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	910 mg/Kg		16
Lead (total)	391 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	6800 ug/Kg		220

PBOW-96-SO-2BG-2BGSO02-1040-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	140 mg/Kg		16
2,4-Dinitrotoluene	35 mg/Kg		12
Lead (total)	1000 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1700 ug/Kg		220
Thallium (total)	2.1 mg/Kg	1.3	0.52
Field Duplicate Results			
Lead (total)	555 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	2200 ug/Kg		220
Thallium (total)	1.8 mg/Kg	1.3	0.52

PBOW-05-SO-2BG-BH33-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Lead	128 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1500 J ug/Kg		220

PBOW-05-SO-2BG-BH29-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	110 J ug/Kg		62
Lead	388 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	830 ug/Kg		220

PBOW-96-SO-2BG-2BGSO07-1190-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	31 mg/Kg		16
2,4-Dinitrotoluene	21 mg/Kg		12
2,6-Dinitrotoluene	10 mg/Kg		6.1
Benzo(a)pyrene	150 J ug/Kg		62
Lead (total)	351 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1500 ug/Kg		220

PBOW-04-SO-2BG-BH21A(0-1) - 05/21/04			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.44 J mg/Kg	1.3	0.52
Field Duplicate Results			
Lead (total)	61.6 J mg/Kg	48.6	40

PBOW-05-SO-2BG-BH34-A-(0-0.5) - 04/22/05			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	360 J ug/Kg		62
Lead	341 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	3100 J ug/Kg		220

PBOW-04-SO-2BG-BH09A(0-1) - 05/20/04			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	103 NJ ug/Kg		62
Lead (total)	182 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	840 J ug/Kg		220

PBOW-96-SO-2BG-2BGSO08-1220-(0-.5) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	210 mg/Kg		16
2,4-Dinitrotoluene	40 mg/Kg		12
2,4-Dinitrotoluene	13000 ug/Kg		12000
2,6-Dinitrotoluene	7700 ug/Kg		6100
Benzo(a)pyrene	130 J ug/Kg		62
Benzo(b)fluoranthene	820 J ug/Kg		620
Lead (total)	603 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1400 ug/Kg		220

PBOW-04-SO-2BG-BH12A(0-1) - 05/22/04			
Analyte	Value	Bkg.	PRG
Benzo(a)pyrene	229 NJ ug/Kg		62
Dibenz(a,h)anthracene	124 NJ ug/Kg		62
Lead (total)	295 J mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	5330 ug/Kg		220

PBOW-04-SO-2BG-BH22A(0-1) - 05/22/04			
Analyte	Value	Bkg.	PRG
Lead (total)	50.5 J mg/Kg	48.6	40

PBOW-04-SO-2BG-BH10A(0-1) - 05/20/04			
Analyte	Value	Bkg.	PRG
2,3,7,8-TCDD	4.3 ng/Kg		3.9
Benzo(a)pyrene	73.0 NJ ug/Kg		62
Lead (total)	71.9 mg/Kg	48.6	40
Thallium (total)	1.39 J mg/Kg	1.3	0.52

2BGSO-05
2BGSO-06
BH-16
BH-15
BH-14
BH-30
BH-25
BH-24
BH-31
BH-26
BH-13
BH-20
BH-21
2BGSO-01
BH-27
BH-23
2BGSO-07
2BGSO-03
BH-32
BH-28
BH-12
2BGSO-08
BH-22
BH-19
BH-11
BH-18
BH-17
2BGSO-04
BH-33
BH-29
2BGSO-02
BH-34
BH-09
BH-10

Area of Detail

Legend

- DPT Locations—Jacobs 2004
- DPT Locations—1996 SI
- Surface Soil Only—Jacobs 2004
- Surface Soil Only—Jacobs 2005
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

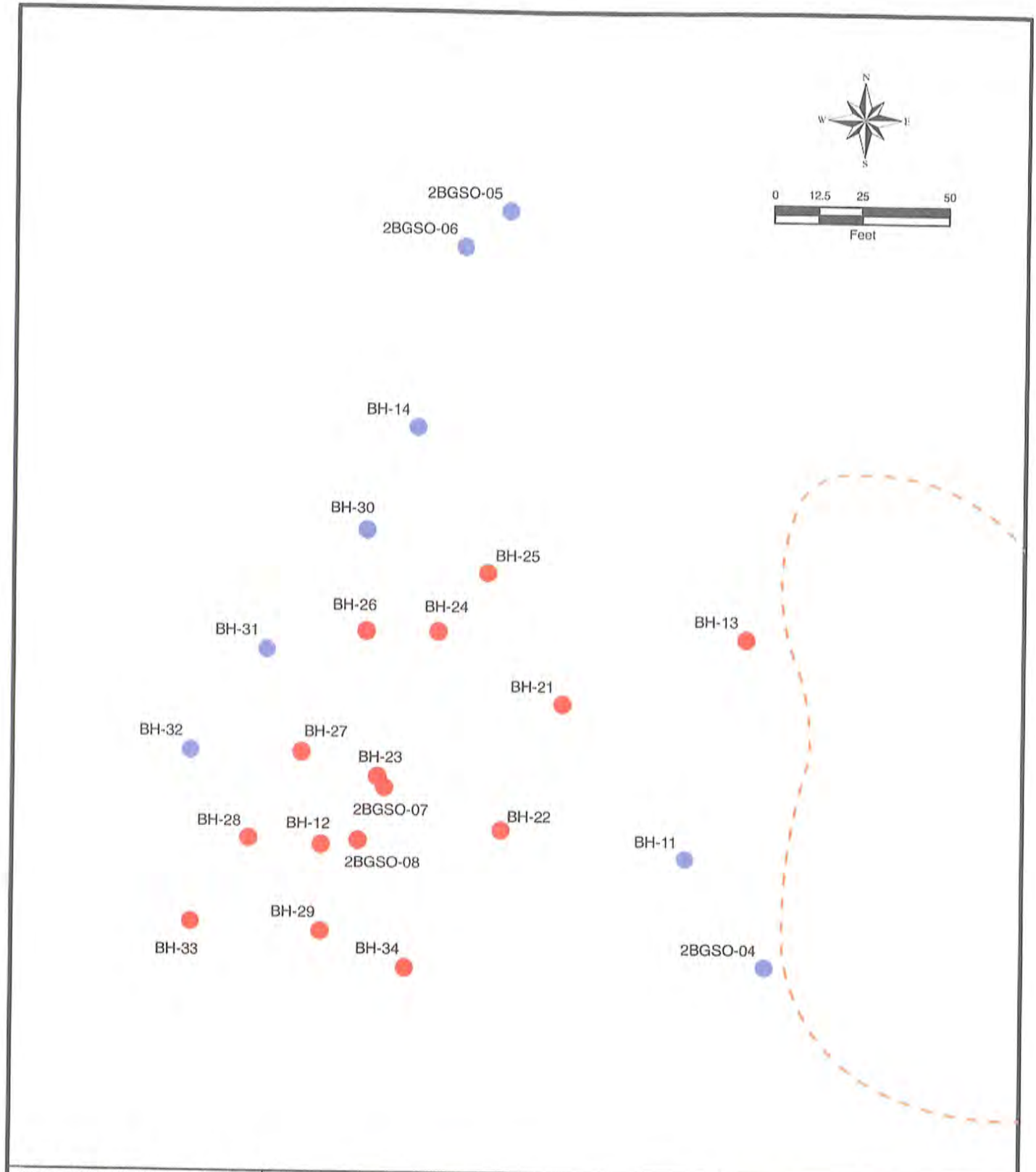
JE JACOBS

Distribution of Contaminants Exceeding PRG's in Surface Soil

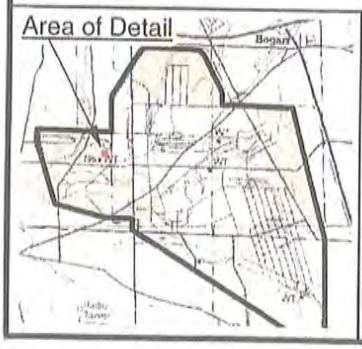
Plum Brook Ordnance Works
Sandusky, Ohio

01/12/06 NZ D:\GIS\Plumbrook\Projects\Final_Res2BG_RI\Final_1_6_05\Spiders\Fig4-2_Surface_Soil.mxd

Figure 4-2



Area of Detail



Legend

- Surface Soil Sample Above PRG's
- Surface Soil Sample Below PRG's
- Interpreted Burn Pit Boundary Based on Trenching Data

JACOBS

Delineation of Surface Soil Contamination West of Burn Area

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/05 NZ Y:/GIS/PlumBrook/Projects/Final_Res2BG_RI/ArcGIS/Final_1_6_06/Surface_Soil_Delineation.mxd

Figure 4-3

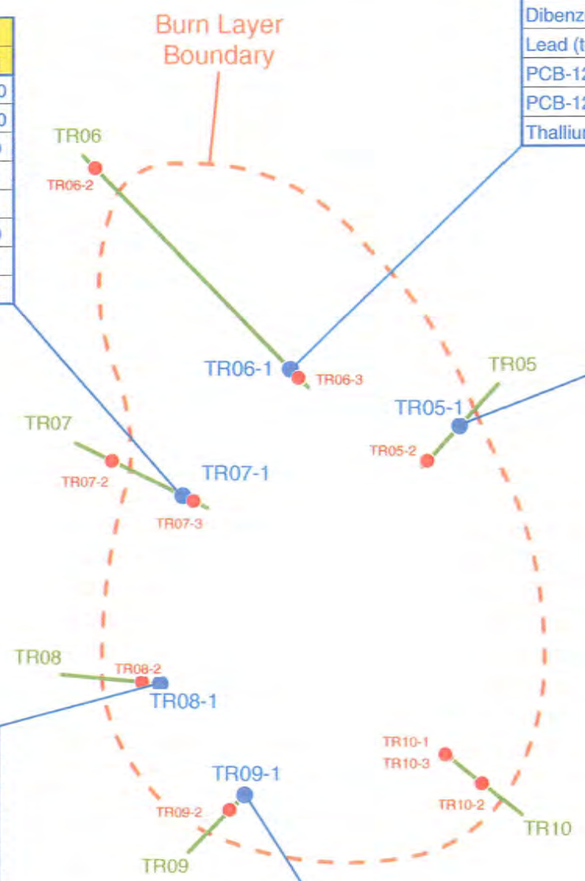
PBOW-04-SO-2BG-TR07-1 - 05/19/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	9580000 ug/Kg		16000
2,4-Dinitrotoluene	632000 ug/Kg		12000
2,6-Dinitrotoluene	402000 ug/Kg		6100
2-Nitrotoluene	7040 J ug/Kg		880
Lead (total)	891 mg/Kg	48.6	40
Naphthalene	20700 NJ ug/Kg		5600
PCB-1260 (Aroclor 1260)	632 J ug/Kg		220
Thallium (total)	2.13 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR06-1 - 05/19/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	74900 ug/Kg		16000
2,4-Dinitrotoluene	26200 J ug/Kg		12000
2,6-Dinitrotoluene	10800 ug/Kg		6100
Barium (total)	2490 J mg/Kg	826	540
Benzo(a)pyrene	108 NJ ug/Kg		62
Dibenz(a,h)anthracene	302 NJ ug/Kg		62
Lead (total)	3640 mg/Kg	48.6	40
PCB-1254 (Aroclor 1254)	1660 J ug/Kg		220
PCB-1260 (Aroclor 1260)	1870 ug/Kg		220
Thallium (total)	3.32 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR05-1 - 05/19/04			
Analyte	Value	Bkg.	PRG
1,3-Dinitrobenzene	4320 ug/Kg		610
2,4,6-Trinitrotoluene	885000 ug/Kg		16000
2,4-Dinitrotoluene	104000 J ug/Kg		12000
2,6-Dinitrotoluene	111000 ug/Kg		6100
2-Nitrotoluene	4500 J ug/Kg		880
Barium (total)	2730 J mg/Kg	826	540
Copper (total)	1320 J mg/Kg	56.2	310
Lead (total)	4510 J mg/Kg	48.6	40
Naphthalene	15900 NJ ug/Kg		5600
Thallium (total)	2.21 mg/Kg	1.3	0.52
Field Duplicate Results			
1,3-Dinitrobenzene	2770 J ug/Kg		610
2,4,6-Trinitrotoluene	1120000 ug/Kg		16000
2,4-Dinitrotoluene	88100 ug/Kg		12000
2,6-Dinitrotoluene	102000 ug/Kg		6100
2-Nitrotoluene	4280 J ug/Kg		880
Barium (total)	5200 J mg/Kg	826	540
Copper (total)	1840 J mg/Kg	56.2	310
Lead (total)	11930 J mg/Kg	48.6	40
Thallium (total)	1.79 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR08-1 - 05/19/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	35400000 ug/Kg		16000
2,4-Dinitrotoluene	9700000 J ug/Kg		12000
Lead (total)	560 mg/Kg	48.6	40
Naphthalene	51300 NJ ug/Kg		5600
PCB-1254 (Aroclor 1254)	3670 J ug/Kg		220
PCB-1260 (Aroclor 1260)	4010 ug/Kg		220
Thallium (total)	1.91 mg/Kg	1.3	0.52

PBOW-04-SO-2BG-TR09-1 - 05/19/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	28700000 ug/Kg		16000
2,4-Dinitrotoluene	6770000 J ug/Kg		12000
2,6-Dinitrotoluene	1400000 ug/Kg		6100
Lead (total)	551 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1220 J ug/Kg		220
Thallium (total)	2.44 mg/Kg	1.3	0.52



Legend

- Interpreted Burn Pit Boundary Based on Trenching Data
- T06 Exploratory Trenches—Jacobs 2004
- Creek, Ditch, Conveyance
- Sample Location—Full Suite Analytical
- Sample Location—Dioxin and Furan Only

N W E S

0 25 50
Feet

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS

Distribution of Contaminants Exceeding PRG's in the Burn layer

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/08 NZ D:/GIS/Plumbrook/Projects/Final_Res2BG_Rii/Final_1_6_05/Spiders/Fig4-4_Burn_layer.mxd

Figure 4-4

PBOW-96-SO-2BG-2BGSO05-1150-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Field Duplicate Results			
Aluminum (total)	16000 mg/Kg	15500	7600
Thallium (total)	2.1 mg/Kg	1.3	0.52

2BGSO-05

2BGSO-06

PBOW-04-SO-2BG-BH16A(3-5) - 05/25/04			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.8 J mg/Kg	1.3	0.52

BH-16

PBOW-96-SO-2BG-2BGSO01-1020-(2-3) - 10/01/96			
Analyte	Value	Bkg.	PRG
2,4-Dinitrotoluene	19000 ug/Kg		12000
Thallium (total)	1.9 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO01-1030-(6-7) - 10/01/96			
Thallium (total)	2.8 mg/Kg	1.3	0.52

BH-14

Burn Layer Boundary

BH-15

PBOW-96-SO-2BG-2BGSO07-1200-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.4 mg/Kg	1.3	0.52

BH-13

BH-20

2BGSO-01

PBOW-96-SO-2BG-2BGSO03-1080-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	94 mg/Kg		16
2,4-Dinitrotoluene	160 mg/Kg		12
Lead (total)	232 mg/Kg	48.6	40
PCB-1260 (Aroclor 1260)	1800 ug/Kg		220
Thallium (total)	3.3 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO03-1090-(6-7) - 10/02/96			
Aluminum (total)	17000 mg/Kg	15500	7600
Thallium (total)	2.3 mg/Kg	1.3	0.52

2BGSO-07

BH-12

2BGSO-08

2BGSO-03

BH-19

BH-11

PBOW-04-SO-2BG-BH19A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.63 J mg/Kg	1.3	0.52

BH-18

BH-17

2BGSO-02

PBOW-96-SO-2BG-2BGSO04-1110-(2-3) - 10/02/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.6 mg/Kg	1.3	0.52

2BGSO-04

PBOW-04-SO-2BG-BH18A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
2,4,6-Trinitrotoluene	17900 J ug/Kg		16000
2,4-Dinitrotoluene	19200 J ug/Kg		12000
2,6-Dinitrotoluene	15400 J ug/Kg		6100
Aluminum (total)	17390 mg/Kg	15500	7600
Lead (total)	103 mg/Kg	48.6	40
Thallium (total)	2.07 J mg/Kg	1.3	0.52

PBOW-04-SO-2BG-BH09A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	15750 mg/Kg	15500	7600
Manganese (total)	3870 J mg/Kg	3506	180

BH-09

PBOW-04-SO-2BG-BH10A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	16450 mg/Kg	15500	7600
Thallium (total)	1.44 J mg/Kg	1.3	0.52
PBOW-04-SO-2BG-BH10A(8-10) - 05/26/04			
Aluminum (total)	233600 mg/Kg	15500	7600
Arsenic (total)	131 J mg/Kg	36.5	0.39
Cadmium (total)	8.64 J mg/Kg		3.7
Cobalt (total)	166 J mg/Kg	116	90
Copper (total)	504 J mg/Kg	56.2	310
Iron (total)	412600 J mg/Kg	234000	2300
Lead (total)	227 J mg/Kg	48.6	40
Manganese (total)	8230 J mg/Kg	3506	180
Nickel (total)	475 J mg/Kg	55.1	160
Selenium (total)	51.8 mg/Kg	2	39

PBOW-04-SO-2BG-BH17A(3-5) - 05/26/04			
Analyte	Value	Bkg.	PRG
Aluminum (total)	15660 mg/Kg	15500	7600

BH-10

PBOW-96-SO-2BG-2BGSO02-1050-(2-3) - 10/01/96			
Analyte	Value	Bkg.	PRG
Thallium (total)	1.8 mg/Kg	1.3	0.52
PBOW-96-SO-2BG-2BGSO02-1060-(6-7) - 10/01/96			
Aluminum (total)	16100 mg/Kg	15500	7600
Thallium (total)	2.7 mg/Kg	1.3	0.52

Legend

- DPT Locations—Jacobs 2004
- DPT Locations—1996 SI
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

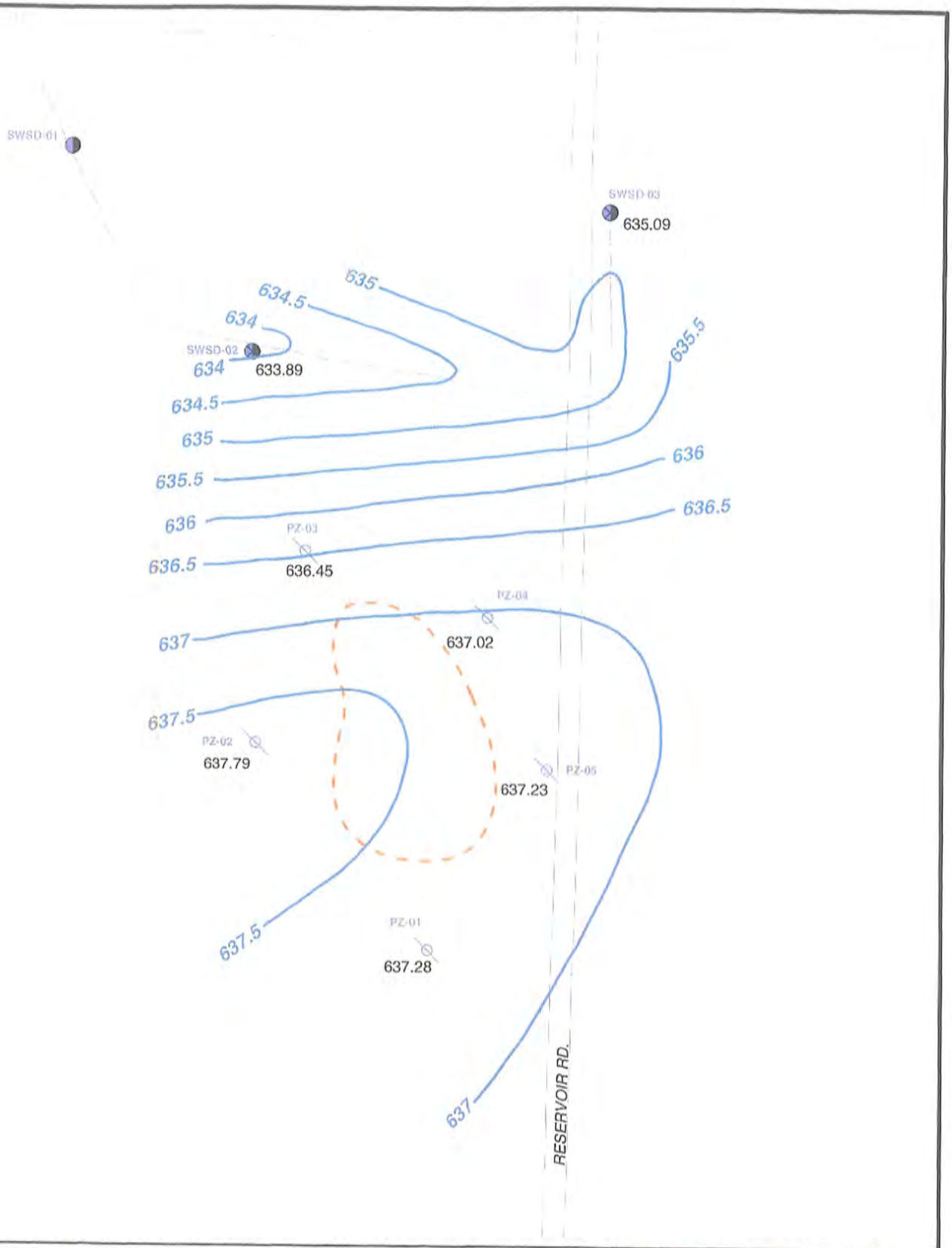
JE JACOBS

Distribution of Contaminants Exceeding PRG's in Subsurface Soil

Plum Brook Ordnance Works
Sandusky, Ohio

01/09/08 NZ D:/GIS/Plumbrook/Projects/Final_Res2BG_RI/Final_1_6_05/Spiders/Fig4-5_Sub_Surface_Soil.mxd

Figure 4-5



Legend

- Piezometer — Jacobs 2004
- Surface Water and Sediment Sample — Jacobs 2004
- 637.5 Groundwater Contour (feet above mean sea level)
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

N W E S

0 50 100
Feet

Notes: Data mapped to Ohio State Plane North NAD83, map units are feet.

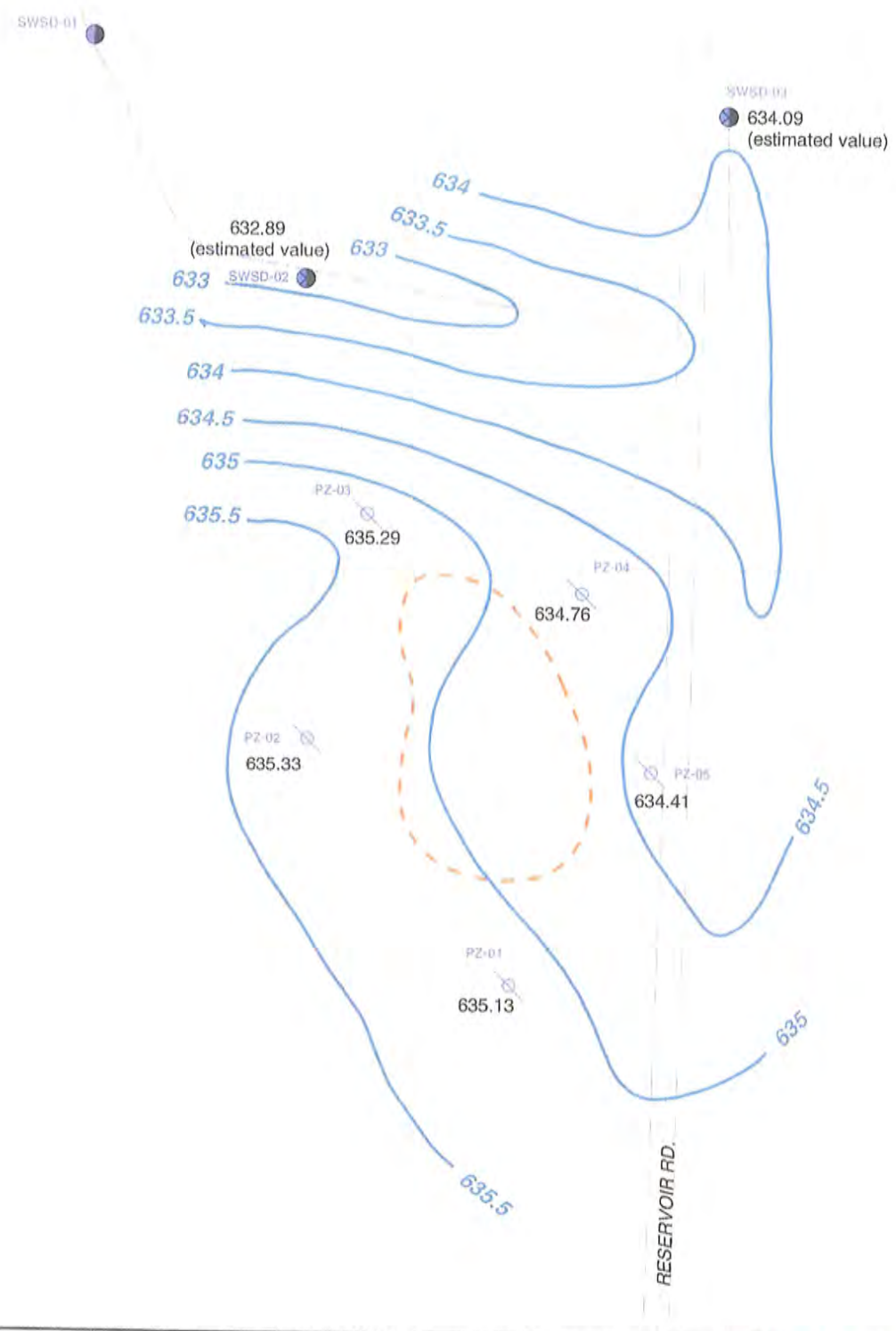
JE JACOBS

Shallow Groundwater Elevation Contour Map (June 2004 — High Point)

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/05 NZ O:/GIS/Plumbrook/Projects/Final_Rep2BG_RI/ArcGIS/Final 1_6_05/ShallowGW Hi.mxd

Figure 5-2



Legend

- Piezometer — Jacobs 2004
- Surface Water and Sediment Sample — Jacobs 2004
- 637.5 Groundwater Contour (feet above mean sea level)
- Interpreted Burn Pit Boundary Based on Trenching Data
- Creek, Ditch, Conveyance

N W E S

0 50 100
Feet

Notes: *Data mapped to Ohio State Plane North NAD83, map units are feet.*

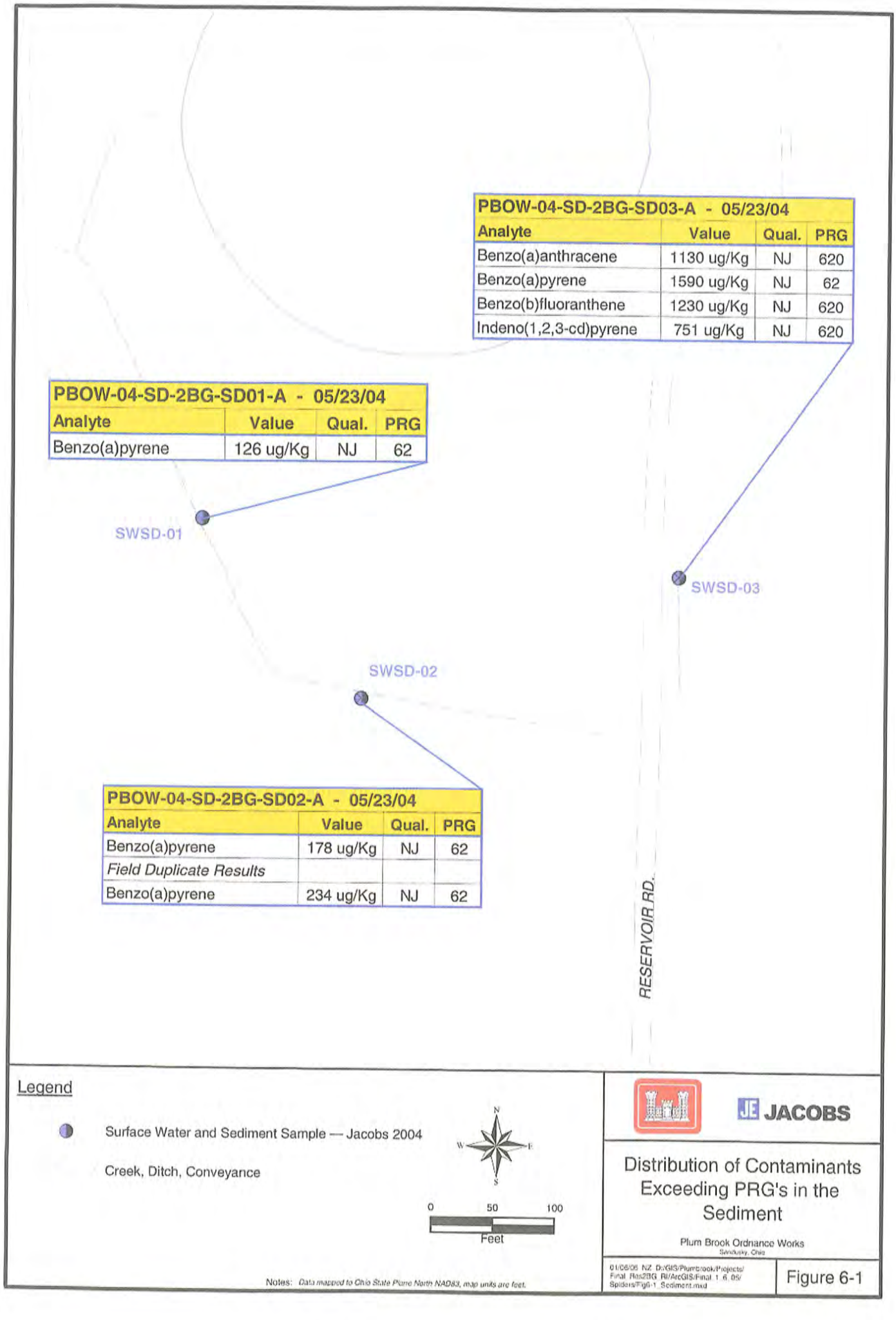
JACOBS

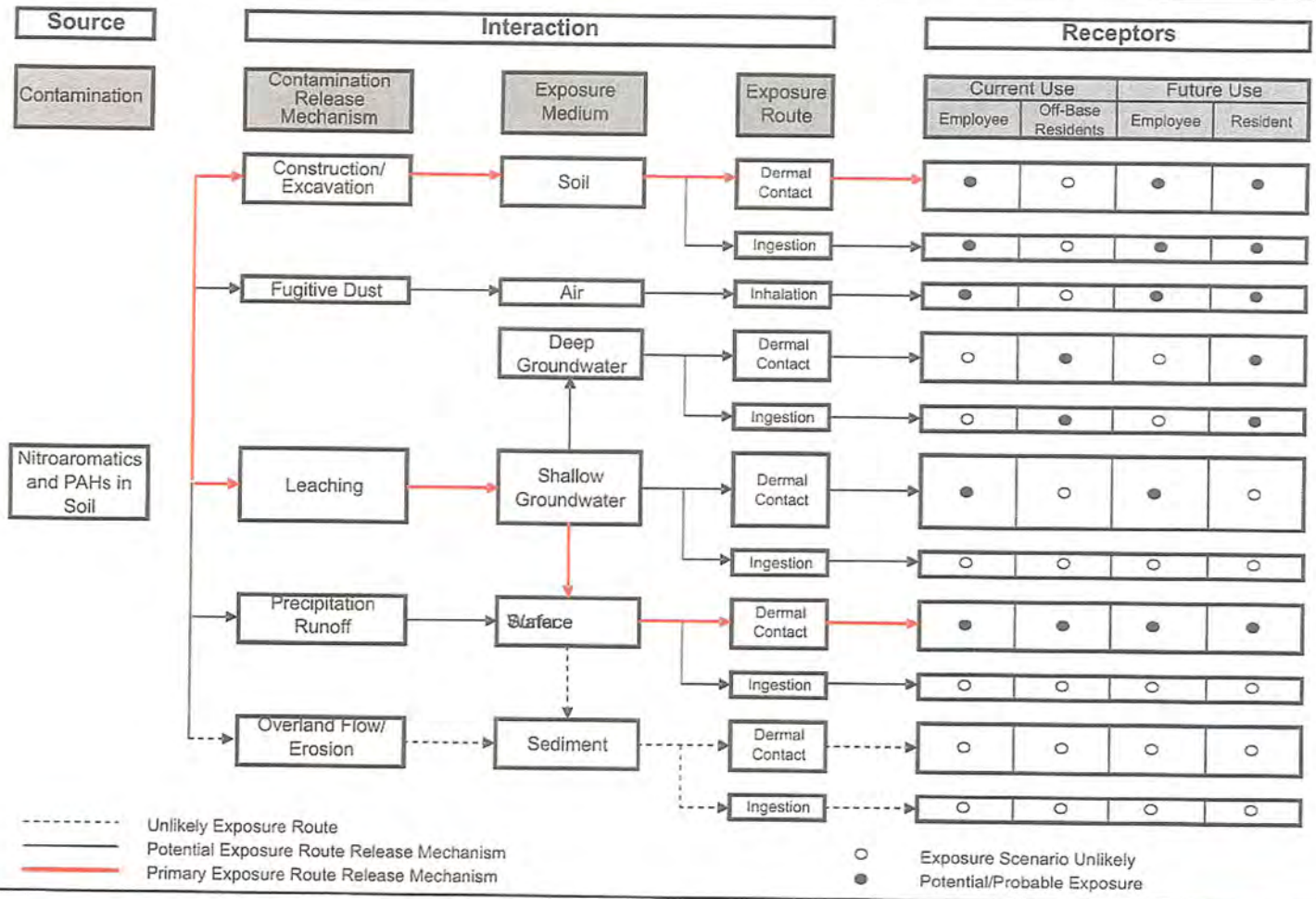
Shallow Groundwater Elevation Contour Map (July 2004 — Low Point)

Plum Brook Ordnance Works
Sandusky, Ohio

01/06/06 NZ O:\GIS\Plumbrook\Projects\Final Res2BG RI\ArcGIS\Final 1_0_05\ShallowGW_Lo.mxd

Figure 5-3


PBOW-04-SD-2BG-SD03-A - 05/23/04
Analyte | Value | Qual. | PRG
Benzo(a)anthracene | 1130 ug/Kg | NJ | 620
Benzo(a)pyrene | 1590 ug/Kg | NJ | 62
Benzo(b)fluoranthene | 1230 ug/Kg | NJ | 620
Indeno(1,2,3-cd)pyrene | 751 ug/Kg | NJ | 620
PBOW-04-SD-2BG-SD01-A - 05/23/04
Analyte | Value | Qual. | PRG
Benzo(a)pyrene | 126 ug/Kg | NJ | 62
SWSD-01
SWSD-03
SWSD-02
PBOW-04-SD-2BG-SD02-A - 05/23/04
Analyte | Value | Qual. | PRG
Benzo(a)pyrene | 178 ug/Kg | NJ | 62
Field Duplicate Results
Benzo(a)pyrene | 234 ug/Kg | NJ | 62
RESERVOIR RD.
Legend
Surface Water and Sediment Sample — Jacobs 2004
Creek, Ditch, Conveyance
N
W
E
S
0
50
100
Feet
Notes: Data mapped to Ohio State Plane North NAD83, map units are feet.
JACOBS
Distribution of Contaminants Exceeding PRG's in the Sediment
Plum Brook Ordnance Works
Sandusky, Ohio
01/06/06 NZ D:/GIS/Plumbrook/Projects/Final_Res2BG_RI/ArcGIS/Final_1_6_05/Spiders/Fig6-1_Sediment.mxd
Figure 6-1

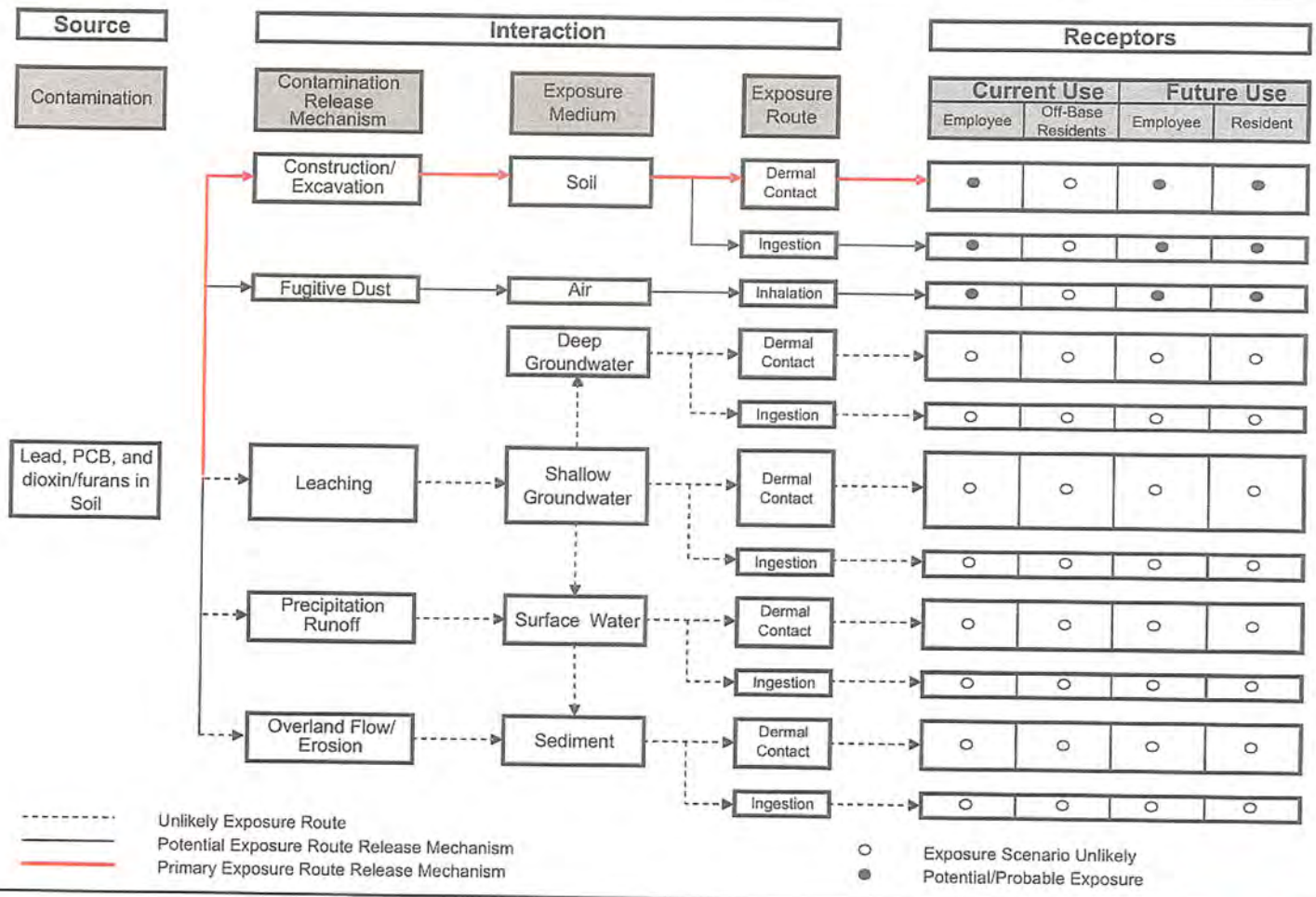


JACOBS

Release Profiles and Potential Exposure Scenarios Nitroaromatics and PAH

7/6/05 DMF
Fig7-1 Release nitro.cdr

Figure 7-1



JACOBS

Release Profiles and Potential Exposure Scenarios Lead, PCB, and Dioxins/Furans

7/6/05 DMF
Fig7-2 Release lead.cdr

Figure 7-2

TABLE 2-1
PRECIPITATION DATA FOR SANDUSKY, OHIO
1971 – 2000

Month	Mean (inches)	Extreme High (inches)	Year of Extreme High	Extreme Low (inches)	Year of Extreme Low	Mean Snowfall (inches)
January	1.87	6.58	1937	0.19	1961	8.8
February	1.72	4.53	1950	0.02	1987	6.0
March	2.51	8.69	1913	0.28	1910	3.0
April	3.03	7.19	1961	0.35	1915	0.6
May	3.42	9.04	1943	0.64	1934	0.0
June	4.19	12.51	1937	0.68	1988	0.0
July	3.34	12.60	1966	0.26	1916	0.0
August	3.65	9.93	1975	0.40	1996	0.0
September	3.16	7.72	1950	0.73	1928	0.0
October	2.30	6.22	1917	0.03	1963	0.0
November	2.73	6.53	1982	0.09	1904	0.3
December	2.54	6.44	1990	0.65	1943	4.6
Annual	34.46	50.50	1950	16.85	1901	23.3

Source: Midwestern Regional Climate Center, 2004

TABLE 2-2
TEMPERATURE DATA FOR SANDUSKY, OHIO
1971 – 2000

Month	Average Monthly Temperature			Mean Extreme High (°F)	Year of Extreme High	Mean Extreme Low (°F)	Year of Extreme Low
	Maximum (°F)	Minimum (°F)	Mean (°F)				
January	32.2	18.9	25.6	39.1	1932	11.9	1977
February	35.0	21.0	28.0	37.1	1954	14.9	1978
March	44.3	29.5	36.9	49.2	1945	26.7	1960
April	55.9	39.6	47.8	56.5	1955	40.4	1907
May	67.4	51.3	59.4	66.5	1962	52.1	1917
June	77.2	61.2	69.2	75.0	1934	63.6	1903
July	81.8	65.7	73.8	79.1	1949	70.2	2000
August	79.9	64.0	72.0	77.8	1947	67.1	1927
September	73.4	56.9	65.2	70.6	1931	58.4	1918
October	61.8	45.7	53.8	62.0	1900	45.5	1925
November	49.1	36.0	42.6	49.6	2001	34.9	1976
December	37.2	25.1	31.2	39.7	1982	17.2	1989
Annual	57.9	42.9	50.5	54.2	1921	45.6	1982

Source: Midwestern Regional Climate Center, 2004

Table 3-1
Subsurface Soil Samples Collected from Trench Excavations at 2BG

Trench	Sample ID	Media	Sample Depth	Analysis
TR05	TR05-1	burn layer	1' - 2'	VOC, PAH, PCB, nitroaromatics, metals, dioxins / furans
	TR05-2	burn layer	1' - 2'	dioxins / furans
TR06	TR06-1	burn layer	1' - 2'	VOC, PAH, PCB, nitroaromatics, metals, dioxins / furans
	TR06-2	soil outside burn layer	1' - 2'	dioxins / furans
	TR06-3	soil beneath burn layer	2.5' - 3'	dioxins / furans
TR07	TR07-1	burn layer	1' - 2'	VOC, PAH, PCB, nitroaromatics, metals, dioxins / furans
	TR07-2	soil outside burn layer	1' - 2'	dioxins / furans
	TR07-3	soil beneath burn layer	2.5' - 3'	dioxins / furans
TR08	TR08-1	burn layer	1' - 2'	VOC, PAH, PCB, nitroaromatics, metals, dioxins / furans
	TR08-2	burn layer	1' - 2'	dioxins / furans
TR09	TR09-1	burn layer	1' - 2'	VOC, PAH, PCB, nitroaromatics, metals, dioxins / furans
	TR09-2	burn layer	1' - 2'	dioxins / furans
TR10	TR10-1	burn layer	1' - 2'	dioxins / furans
	TR10-2	burn layer	1' - 2'	dioxins / furans
	TR10-3	soil beneath burn layer	2.5' - 3'	dioxins / furans

VOC = TCL Volatile organic compounds by EPA SW-846 5035/8260B

PAH = Polynuclear aromatic hydrocarbons by EPA SW-846 3540C/8310

PCB = Polychlorinated biphenyls by EPA SW-846 3540C/8082

Nitroaromatics = Nitroaromatics by EPA SW-846 8330

Metals = TAL Metals by EPA SW-846 3050B/6010B/7471A

Dioxins/furans = Dioxins / furans by EPA SW-846 8290

Table 3-2
Surface Soil Samples Collected at 2BG

Borehole	Location	Analytical
BH-09	inside of disturbed area, outside of burn layer	VOC, PAH, PCB, nitroaromatics, metals, dioxin / furans
BH-10	outside of disturbed area	VOC, PAH, PCB, nitroaromatics, metals, dioxin / furans
BH-11	inside of disturbed area, outside of burn layer	VOC, PAH, PCB, nitroaromatics, metals, dioxin / furans
BH-12	outside of disturbed area	VOC, PAH, PCB, nitroaromatics, metals
BH-13	inside of disturbed area, outside of burn layer	VOC, PAH, PCB, nitroaromatics, metals
BH-14	outside of disturbed area	VOC, PAH, PCB, nitroaromatics, metals
BH-15	inside of disturbed area, outside of burn layer	VOC, PAH, PCB, nitroaromatics, metals
BH-16	outside of disturbed area	VOC, PAH, PCB, nitroaromatics, metals
BH-17	inside burn area	VOC, PAH, PCB, nitroaromatics, metals, dioxin / furans
BH-18	inside burn area	VOC, PAH, PCB, nitroaromatics, metals
BH-19	inside burn area	VOC, PAH, PCB, nitroaromatics, metals
BH-20	inside burn area	VOC, PAH, PCB, nitroaromatics, metals
BH-21	PCB contamination area west side of site	VOC, PAH, PCB, nitroaromatics, metals
BH-22	PCB contamination area west side of site	VOC, PAH, PCB, nitroaromatics, metals
BH-23	PCB contamination area west side of site	VOC, PAH, PCB, nitroaromatics, metals
BH-24	PCB contamination area west side of site	VOC, PAH, PCB, nitroaromatics, metals
BH-25	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-26	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-27	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-28	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-29	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-30	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-31	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-32	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-33	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead
BH-34	PCB contamination area west side of site	PAH, PCB, nitroaromatics, lead

VOC = TCL Volatile organic compounds by EPA SW-846 5035/8260B

PAH = Polynuclear aromatic hydrocarbons by EPA SW-846 3540C/8310

PCB = Polychlorinated biphenyls by EPA SW-846 3540C/8082

Nitroaromatics = Nitroaromatics by EPA SW-846 8330

Metals = TAL Metals by EPA SW-846 3050B/6010B/7471A

Dioxins/furans = Dioxins / furans by EPA SW-846 8290

Lead = Lead by EPA SW-846 3050B/6020

Table 3-3
Subsurface Soil Samples Collected from Boreholes at 2BG

Borehole	Location	Depth	Analyte
BH-09	inside of disturbed area, outside of burn layer	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-10	outside of disturbed area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-11	inside of disturbed area, outside of burn layer	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-12	outside of disturbed area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-13	inside of disturbed area, outside of burn layer	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-14	outside of disturbed area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-15	inside of disturbed area, outside of burn layer	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-16	outside of disturbed area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, nitroaromatics, metals
BH-17	inside burn area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, PCB, nitroaromatics, metals
BH-18	inside burn area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, PCB, nitroaromatics, metals
BH-19	inside burn area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, PCB, nitroaromatics, metals
BH-20	inside burn area	3' - 5'	VOC, PAH, PCB, nitroaromatics, metals
		8' - 10'	VOC, PAH, PCB, nitroaromatics, metals

VOC = TCL Volatile organic compounds by EPA SW-846 5035/8260B

PAH = Polynuclear aromatic hydrocarbons by EPA SW-846 3540C/8310

PCB = Polychlorinated biphenyls by EPA SW-846 3540C/8082

Nitroaromatics = Nitroaromatics by EPA SW-846 8330

Metals = TAL Metals by EPA SW-846 3050B/6010B/7471A

Table 3-4
Round 1 Groundwater Samples Collected at 2BG

2BG-BEDMW-001
Analytes Sampled
Nitroaromatics
TAL Metals, Unfilterd
PCBs
VOCs

2BG-BEDMW-002
Analytes Sampled
Nitroaromatics
TAL Metals, Unfilterd
TAL Metals, Filtered
PCBs
Turbidity/Alkalinity
TDS/TSS
VOCs
PAHs
Cyanide
Anions
Hardness

2BG-BEDMW-003
Analytes Sampled
Nitroaromatics
TAL Metals, Unfilterd
TAL Metals, Filtered
PCBs
Turbidity/Alkalinity
TDS/TSS
VOCs
PAHs
Cyanide
Anions
Hardness

Nitroaromatics = EPA SW-846 8330
TAL Metals = EPA SW-846 3005A/6020/7470A
PCBs = Polychlorinated biphenyls by EPA SW-846 3520/8082
VOCs = TCL Volatile organic compounds by EPA SW-846 5030/8260B
PAHs = Polynuclear aromatic hydrocarbons by EPA SW-846 3520/8310
Cyanide = EPA SW-846 9012
Turbidity = EPA 180.1
Alkalinity = EPA 310.1
TDS = Total dissolved solids by EPA 160.1
TSS = Total suspended solids by EPA 160.2
Anions = Choride/Nitrate/Sulfate by EPA 300
Hardness = EPA 130.2

Table 4-1

Summary of Volatile Organic Compounds Detected in 2004 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH10	5/20/2004	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8260	Acetone	15.5	B	4.09	5.8	ug/Kg	1400000	N1
BH11	5/20/2004	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8260	Acetone	8.1	B	3.56	5	ug/Kg	1400000	N1
BH12	5/22/2004	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8260	1,1-Dichloroethene	0.66	J	0.554	1.1	ug/Kg	12000	N1
BH13	5/21/2004	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8260	Tetrachloroethene (PCE)	0.6	J	0.358	0.94	ug/Kg	480	N1
BH14	5/21/2004	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8260	Cyclohexane	0.72	J	0.533	2.2	ug/Kg	280000	N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8260	1,1-Dichloroethene	0.62	J	0.494	0.99	ug/Kg	12000	N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8260	Tetrachloroethene (PCE)	0.39	J	0.384	1	ug/Kg	480	FD1
BH16	5/22/2004	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8260	1,1-Dichloroethene	0.57	J	0.56	1.1	ug/Kg	12000	N1
BH16	5/22/2004	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8260	Tetrachloroethene (PCE)	0.43	J	0.426	1.1	ug/Kg	480	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	1,1-Dichloroethene	0.66	J	0.49	0.98	ug/Kg	12000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	Acetone	8.9	JB	3.45	4.9	ug/Kg	1400000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	Benzene	1.7	J	0.441	0.98	ug/Kg	640	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	Chloroform	2	J	0.51	0.98	ug/Kg	220	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	Methylcyclohexane	1.9	J	0.5	2	ug/Kg	260000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8260	Toluene	3.5	J	0.333	0.98	ug/Kg	66000	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8260	1,1,1-Trichloroethane	1.7		0.622	1.2	ug/Kg	200000	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8260	Acetone	17.8		4.13	5.9	ug/Kg	1400000	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8260	Benzene	20.6		0.529	1.2	ug/Kg	640	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8260	Toluene	1570		44	129	ug/Kg	66000	N1
BH22	5/22/2004	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8260	1,1-Dichloroethene	0.75	J	0.538	1.1	ug/Kg	12000	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8260	1,1,1-Trichloroethane	1.7	J	0.566	1.1	ug/Kg	200000	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8260	1,4-Dichlorobenzene	0.42	J	0.395	1.1	ug/Kg	3400	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8260	Acetone	4.6	J	3.78	5.3	ug/Kg	1400000	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8260	Tetrachloroethene (PCE)	3.4	J	0.406	1.1	ug/Kg	480	N1

J = Estimated

B= Contaminant found in Blank Sample

N1 = Regular Sample

FD1 = Field Duplicate

Table 4-2
Summary of Nitroaromatic Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/20/2004	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	2450		125	375	ug/Kg	16000	N1
BH09	5/20/2004	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	429	J	125	375	ug/Kg	12000	N1
BH10	5/20/2004	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	928	J	125	375	ug/Kg	16000	N1
BH10	5/20/2004	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8330	2-Amino-4,6-Dinitrotoluene	487	J	125	375	ug/Kg		N1
BH12	5/22/2004	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	4640		125	375	ug/Kg	16000	N1
BH12	5/22/2004	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	1040	J	125	375	ug/Kg	12000	N1
BH12	5/22/2004	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8330	2,6-Dinitrotoluene	152	J	125	375	ug/Kg	6100	N1
BH12	5/22/2004	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	2040	J	125	375	ug/Kg		N1
BH13	5/21/2004	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	2230	J	125	375	ug/Kg	16000	N1
BH13	5/21/2004	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	1370	J	125	375	ug/Kg	12000	N1
BH14	5/21/2004	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	364	J	125	375	ug/Kg	16000	N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	13600	J	125	375	ug/Kg	16000	N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	341	J	125	375	ug/Kg	12000	N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	1920	J	125	375	ug/Kg		N1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8330	1,3,5-Trinitrobenzene	441		125	375	ug/Kg	180000	FD1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	47700	J	125	375	ug/Kg	**16000**	FD1
BH15	5/21/2004	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8330	2,4-Dinitrotoluene	920	J	125	375	ug/Kg	12000	FD1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8330	1,3,5-Trinitrobenzene	686	J	125	375	ug/Kg	180000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	6540	J	125	375	ug/Kg	16000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	3040	J	125	375	ug/Kg	12000	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8330	2,6-Dinitrotoluene	977		125	375	ug/Kg	6100	N1
BH17	5/20/2004	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	3260	J	125	375	ug/Kg		N1
BH18	5/21/2004	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	60300		125	375	ug/Kg	**16000**	N1
BH18	5/21/2004	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	993	J	125	375	ug/Kg	12000	N1
BH18	5/21/2004	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	4170	J	125	375	ug/Kg		N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8330	1,3,5-Trinitrobenzene	5640	J	625	1880	ug/Kg	180000	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	3120000		12500	37500	ug/Kg	**16000**	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	10600	J	625	1880	ug/Kg	12000	N1
BH19	5/21/2004	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8330	2-Amino-4,6-Dinitrotoluene	28900		625	1880	ug/Kg		N1
BH20	5/21/2004	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	4750		125	375	ug/Kg	16000	N1
BH20	5/21/2004	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	1620	J	125	375	ug/Kg	12000	N1
BH20	5/21/2004	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8330	2,6-Dinitrotoluene	352	J	125	375	ug/Kg	6100	N1
BH20	5/21/2004	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8330	2-Amino-4,6-Dinitrotoluene	2960		125	375	ug/Kg		N1
BH20	5/21/2004	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	2180	J	125	375	ug/Kg		N1
BH21	5/21/2004	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	284	J	125	375	ug/Kg	16000	FD1
BH23	5/22/2004	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	2270000		12500	37500	ug/Kg	**16000**	N1
BH23	5/22/2004	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	2710	J	625	1880	ug/Kg	12000	N1

J = Estimated

N1 = Regular Sample, FD1 = Field Duplicate

Table 4-2
Summary of Nitroaromatic Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8330	2,4,6-Trinitrotoluene	1970	J	125	375	ug/Kg	16000	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8330	2,4-Dinitrotoluene	850	J	125	375	ug/Kg	12000	N1
BH24	5/22/2004	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8330	4-Amino-2,6-Dinitrotoluene	1570		125	375	ug/Kg		N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	1,3,5-Trinitrobenzene	740		87	430	ug/Kg	180000	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	1,3-Dinitrobenzene	220	J	87	430	ug/Kg	610	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	23000		87	430	ug/Kg	**16000**	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	2,4-Dinitrotoluene	2900		110	430	ug/Kg	12000	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	2,6-Dinitrotoluene	1300		110	430	ug/Kg	6100	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	2-Amino-4,6-Dinitrotoluene	4300		130	430	ug/Kg		N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	2-Nitrotoluene	130	J	87	430	ug/Kg	880	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	4-Amino-2,6-Dinitrotoluene	3300		87	430	ug/Kg		N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	HMX	160	J	87	430	ug/Kg	310000	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8330	RDX	270	J	87	430	ug/Kg	4400	N1
BH26	4/22/2005	10:00	ELAB	PBOW-05-SO-2BG-BH26-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	160	J	100	500	ug/Kg	16000	N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	1,3,5-Trinitrobenzene	210	J	87	430	ug/Kg	180000	N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	14000		87	430	ug/Kg	16000	N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	2,4-Dinitrotoluene	860		110	430	ug/Kg	12000	N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	2,6-Dinitrotoluene	350	J	110	430	ug/Kg	6100	N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	2-Amino-4,6-Dinitrotoluene	920		130	430	ug/Kg		N1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8330	4-Amino-2,6-Dinitrotoluene	900		87	430	ug/Kg		N1
BH28	4/22/2005	10:40	ELAB	PBOW-05-SO-2BG-BH28-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	160	J	87	430	ug/Kg	16000	N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	4600		91	450	ug/Kg	16000	N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8330	2,4-Dinitrotoluene	590		120	450	ug/Kg	12000	N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8330	2,6-Dinitrotoluene	190	J	120	450	ug/Kg	6100	N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8330	2-Amino-4,6-Dinitrotoluene	1300		140	450	ug/Kg		N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8330	4-Amino-2,6-Dinitrotoluene	990		91	450	ug/Kg		N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	1,3,5-Trinitrobenzene	300	J	83	420	ug/Kg	180000	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	4700		83	420	ug/Kg	16000	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	2,4-Dinitrotoluene	4700		110	420	ug/Kg	12000	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	2,6-Dinitrotoluene	860		110	420	ug/Kg	6100	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	2-Amino-4,6-Dinitrotoluene	2200		120	420	ug/Kg		N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	2-Nitrotoluene	110	J	83	420	ug/Kg	880	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	4-Amino-2,6-Dinitrotoluene	1300		83	420	ug/Kg		N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	HMX	210	J	83	420	ug/Kg	310000	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8330	RDX	540		83	420	ug/Kg	4400	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	1,3,5-Trinitrobenzene	460		91	450	ug/Kg	180000	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	5200		91	450	ug/Kg	16000	N1

J = Estimated

N1 = Regular Sample, FD1 = Field Duplicate

Table 4-2
Summary of Nitroaromatic Compounds Detected In 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	2,4-Dinitrotoluene	2000		120	450	ug/Kg	12000	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	2,6-Dinitrotoluene	830		120	450	ug/Kg	6100	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	2-Amino-4,6-Dinitrotoluene	1900		140	450	ug/Kg		N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	2-Nitrotoluene	120	J	91	450	ug/Kg	880	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8330	4-Amino-2,6-Dinitrotoluene	1800		91	450	ug/Kg		N1

J = Estimated

N1 = Regular Sample, FD1 = Field Duplicate

Table 4-3
Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Acenaphthene	376	NJ	144	215	ug/Kg	370000	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Acenaphthylene	1150	NJ	78.2	215	ug/Kg		N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Anthracene	17	J	8.92	21.5	ug/Kg	2200000	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Benzo(a)anthracene	80.5	NJ	15.8	21.5	ug/Kg	620	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Benzo(a)pyrene	103	NJ	19.5	43.1	ug/Kg	**62**	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	95.7	NJ	7.69	43.1	ug/Kg	620	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	84.6	J	28	108	ug/Kg		N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	98.9	NJ	7.31	43.1	ug/Kg	6200	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Chrysene	97.6	J	11.4	108	ug/Kg	62000	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Fluoranthene	151	J	45.3	215	ug/Kg	230000	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	49.7	NJ	6.92	43.1	ug/Kg	620	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Naphthalene	81.8	J	52.4	215	ug/Kg	5600	N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Phenanthrene	86.4	J	37.6	215	ug/Kg		N1
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8310	Pyrene	107	J	53.7	215	ug/Kg	230000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Acenaphthene	153	NJ	32.4	48.6	ug/Kg	370000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Acenaphthylene	708	NJ	17.7	48.6	ug/Kg		N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Anthracene	17.2	NJ	2.01	4.86	ug/Kg	2200000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Benzo(a)anthracene	46.2	NJ	3.56	4.86	ug/Kg	620	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Benzo(a)pyrene	73	NJ	4.39	9.73	ug/Kg	**62**	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	76.4	NJ	1.74	9.73	ug/Kg	620	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	30.3	NJ	6.32	24.4	ug/Kg		N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	35.4	NJ	1.65	9.73	ug/Kg	6200	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Chrysene	57.6	NJ	2.58	24.4	ug/Kg	62000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Fluoranthene	121	NJ	10.2	48.6	ug/Kg	230000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Fluorene	16.7	J	10.9	97.3	ug/Kg	270000	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	42.4	NJ	1.56	9.73	ug/Kg	620	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Naphthalene	150	NJ	11.8	48.6	ug/Kg	5600	N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Phenanthrene	80.1	NJ	8.49	48.6	ug/Kg		N1
BH10	5/20/2004	13:55	ECEN	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8310	Pyrene	59.3	NJ	12.1	48.6	ug/Kg	230000	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Acenaphthylene	26.8	J	17.5	48.1	ug/Kg		N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Anthracene	6.73	NJ	1.99	4.81	ug/Kg	2200000	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Benzo(a)anthracene	4.14	J	3.53	4.81	ug/Kg	620	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Benzo(a)pyrene	19.2	NJ	4.35	9.64	ug/Kg	62	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	29.6	NJ	1.72	9.64	ug/Kg	620	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	14	J	6.26	24.1	ug/Kg		N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	30.9	NJ	1.63	9.64	ug/Kg	6200	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Chrysene	18.8	J	2.56	24.1	ug/Kg	62000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

Table 4-3
Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Fluoranthene	44.5	J	10.1	48.1	ug/Kg	230000	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Fluorene	13.2	J	10.8	96.4	ug/Kg	270000	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	14.5	NJ	1.55	9.64	ug/Kg	620	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Naphthalene	25.4	J	11.7	48.1	ug/Kg	5600	N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Phenanthrene	21.3	J	8.41	48.1	ug/Kg		N1
BH11	5/20/2004	11:55	ECEN	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8310	Pyrene	20.5	J	12	48.1	ug/Kg	230000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Acenaphthene	697	NJ	88.5	133	ug/Kg	370000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Acenaphthylene	1960	NJ	48.2	133	ug/Kg		N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Anthracene	38.8	NJ	5.5	13.3	ug/Kg	2200000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Benzo(a)anthracene	186	NJ	9.73	13.3	ug/Kg	620	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Benzo(a)pyrene	229	NJ	12	26.6	ug/Kg	62	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	286	NJ	4.74	26.6	ug/Kg	620	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	220	NJ	17.3	66.6	ug/Kg		N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	283	NJ	4.51	26.6	ug/Kg	6200	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Chrysene	297	NJ	7.06	66.6	ug/Kg	62000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Dibenz(a,h)anthracene	124	NJ	10.4	26.6	ug/Kg	62	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Fluoranthene	350	NJ	27.9	133	ug/Kg	230000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Fluorene	91.3	J	29.9	266	ug/Kg	270000	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	152	NJ	4.27	26.6	ug/Kg	620	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Naphthalene	136	NJ	32.3	133	ug/Kg	5600	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Phenanthrene	171	NJ	23.2	133	ug/Kg		N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8310	Pyrene	295	NJ	33.1	133	ug/Kg	230000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Acenaphthene	251	NJ	28.3	42.5	ug/Kg	370000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Acenaphthylene	605	NJ	15.4	42.5	ug/Kg		N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Anthracene	11.8	NJ	1.76	4.25	ug/Kg	2200000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Benzo(a)anthracene	8.86	NJ	3.11	4.25	ug/Kg	620	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Benzo(a)pyrene	23.5	NJ	3.84	8.51	ug/Kg	62	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	36.3	NJ	1.52	8.51	ug/Kg	620	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	13.7	J	5.52	21.3	ug/Kg		N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	112	NJ	1.44	8.51	ug/Kg	6200	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Chrysene	26	NJ	2.26	21.3	ug/Kg	62000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Fluoranthene	78.8	NJ	8.94	42.5	ug/Kg	230000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Fluorene	40.4	J	9.57	85.1	ug/Kg	270000	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	23.5	NJ	1.36	8.51	ug/Kg	620	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Naphthalene	606	NJ	10.3	42.5	ug/Kg	5600	N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Phenanthrene	55.2	NJ	7.42	42.5	ug/Kg		N1
BH13	5/21/2004	10:10	ECEN	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW8310	Pyrene	24.9	J	10.6	42.5	ug/Kg	230000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

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Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Acenaphthene	78.8	NJ	29.3	44	ug/Kg	370000	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Acenaphthylene	97.7	NJ	16	44	ug/Kg		N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Anthracene	10.6	NJ	1.82	4.4	ug/Kg	2200000	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Benzo(a)anthracene	21.7	NJ	3.22	4.4	ug/Kg	620	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Benzo(a)pyrene	38.1	NJ	3.97	8.81	ug/Kg	62	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	34.1	NJ	1.57	8.81	ug/Kg	620	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	20	J	5.72	22.1	ug/Kg		N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	137	NJ	1.49	8.81	ug/Kg	6200	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Chrysene	43.6	NJ	2.34	22.1	ug/Kg	62000	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Fluoranthene	117	NJ	9.26	44	ug/Kg	230000	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Fluorene	13.3	J	9.9	88.1	ug/Kg	270000	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	13.1	NJ	1.41	8.81	ug/Kg	620	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Naphthalene	183	NJ	10.7	44	ug/Kg	5600	N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Phenanthrene	76.2	NJ	7.69	44	ug/Kg		N1
BH14	5/21/2004	11:20	ECEN	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW8310	Pyrene	36.8	J	11	44	ug/Kg	230000	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Acenaphthene	213	J	145	217	ug/Kg	370000	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Acenaphthylene	724	NJ	78.8	217	ug/Kg		N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Benzo(a)pyrene	32.3	J	19.6	43.4	ug/Kg	62	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	29.2	J	7.75	43.4	ug/Kg	620	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	44.1	NJ	7.36	43.4	ug/Kg	6200	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Chrysene	35.2	J	11.5	109	ug/Kg	62000	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Fluoranthene	50.5	J	45.7	217	ug/Kg	230000	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	9.62	J	6.97	43.4	ug/Kg	620	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Naphthalene	2680	NJ	52.8	217	ug/Kg	5600	N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW8310	Phenanthrene	39.5	J	37.9	217	ug/Kg		N1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Acenaphthene	1070	NJ	139	208	ug/Kg	370000	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Acenaphthylene	1630	NJ	75.6	208	ug/Kg		FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Anthracene	23.3	NJ	8.62	20.8	ug/Kg	2200000	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Benzo(a)anthracene	61.9	NJ	15.2	20.8	ug/Kg	620	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Benzo(a)pyrene	62.7	NJ	18.8	41.7	ug/Kg	62	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Benzo(b)fluoranthene	62.2	NJ	7.44	41.7	ug/Kg	620	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	60.3	J	27.1	104	ug/Kg		FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Benzo(k)fluoranthene	127	NJ	7.06	41.7	ug/Kg	6200	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Chrysene	89.9	J	11.1	104	ug/Kg	62000	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Fluoranthene	108	J	43.8	208	ug/Kg	230000	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Fluorene	64.2	J	46.9	417	ug/Kg	270000	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	27	J	6.69	41.7	ug/Kg	620	FD1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

Table 4-3
Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Naphthalene	795	NJ	50.7	208	ug/Kg	5600	FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Phenanthrene	78.2	J	36.4	208	ug/Kg		FD1
BH15	5/21/2004	14:10	ECEN	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW8310	Pyrene	62.8	J	51.9	208	ug/Kg	230000	FD1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Acenaphthene	127	NJ	79.3	119	ug/Kg	370000	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Acenaphthylene	166	NJ	43.2	119	ug/Kg		N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Benzo(a)pyrene	65.1	NJ	10.8	23.8	ug/Kg	**62**	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	24.5	NJ	4.25	23.8	ug/Kg	620	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	39.6	J	15.5	59.7	ug/Kg		N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	59.7	NJ	4.04	23.8	ug/Kg	6200	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Fluoranthene	39.4	J	25.1	119	ug/Kg	230000	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	27.8	NJ	3.82	23.8	ug/Kg	620	N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Phenanthrene	58.7	J	20.8	119	ug/Kg		N1
BH16	5/22/2004	13:37	ECEN	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW8310	Pyrene	40.1	J	29.7	119	ug/Kg	230000	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Acenaphthene	772	NJ	157	235	ug/Kg	370000	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Acenaphthylene	614	NJ	85.4	235	ug/Kg		N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Anthracene	21.4	J	9.74	23.5	ug/Kg	2200000	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Benzo(a)anthracene	31.3	NJ	17.2	23.5	ug/Kg	620	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Benzo(a)pyrene	62.7	NJ	21.2	47.1	ug/Kg	**62**	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	101	NJ	8.4	47.1	ug/Kg	620	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	94.7	J	30.6	118	ug/Kg		N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	75.5	NJ	7.98	47.1	ug/Kg	6200	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Chrysene	38.9	J	12.5	118	ug/Kg	62000	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Fluoranthene	139	J	49.5	235	ug/Kg	230000	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	33.9	J	7.55	47.1	ug/Kg	620	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Naphthalene	3210	NJ	57.2	235	ug/Kg	5600	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8310	Phenanthrene	68.8	J	41.1	235	ug/Kg		N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Acenaphthene	783	NJ	133	199	ug/Kg	370000	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Acenaphthylene	1730	NJ	72.4	199	ug/Kg		N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Anthracene	21.8	NJ	8.26	19.9	ug/Kg	2200000	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Benzo(a)anthracene	83.8	NJ	14.6	19.9	ug/Kg	620	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Benzo(a)pyrene	108	NJ	18	39.9	ug/Kg	**62**	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	140	NJ	7.12	39.9	ug/Kg	620	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	103	NJ	25.9	100	ug/Kg		N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	209	NJ	6.76	39.9	ug/Kg	6200	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Chrysene	56.8	J	10.6	100	ug/Kg	62000	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Fluoranthene	164	J	42	199	ug/Kg	230000	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	58.7	NJ	6.4	39.9	ug/Kg	620	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

Table 4-3
Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Naphthalene	2200	NJ	48.5	199	ug/Kg	5600	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Phenanthrene	70.5	J	34.8	199	ug/Kg		N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8310	Pyrene	203	NJ	49.7	199	ug/Kg	230000	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Acenaphthene	11000	NJ	578	866	ug/Kg	370000	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Acenaphthylene	4140	NJ	315	866	ug/Kg		N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	83.5	J	31	174	ug/Kg	620	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Chrysene	193	J	46	434	ug/Kg	62000	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Fluoranthene	192	J	182	866	ug/Kg	230000	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Naphthalene	9930	NJ	211	866	ug/Kg	**5600**	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8310	Phenanthrene	404	J	151	866	ug/Kg		N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Acenaphthene	978	NJ	27.1	40.6	ug/Kg	370000	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Acenaphthylene	1630	NJ	14.8	40.6	ug/Kg		N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Anthracene	24.6	NJ	1.68	4.06	ug/Kg	2200000	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Benzo(a)anthracene	68.7	NJ	2.97	4.06	ug/Kg	620	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Benzo(a)pyrene	61.3	NJ	3.67	8.13	ug/Kg	62	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	75.9	NJ	1.45	8.13	ug/Kg	620	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	47.4	NJ	5.28	20.4	ug/Kg		N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	136	NJ	1.38	8.13	ug/Kg	6200	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Chrysene	60.9	NJ	2.16	20.4	ug/Kg	62000	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Fluoranthene	126	NJ	8.55	40.6	ug/Kg	230000	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Fluorene	66.3	J	9.14	81.3	ug/Kg	270000	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	40.4	NJ	1.3	8.13	ug/Kg	620	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Naphthalene	835	NJ	9.89	40.6	ug/Kg	5600	N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Phenanthrene	78.7	NJ	7.09	40.6	ug/Kg		N1
BH20	5/21/2004	9:45	ECEN	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW8310	Pyrene	68.4	NJ	10.1	40.6	ug/Kg	230000	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Acenaphthylene	41.6	J	16.2	44.6	ug/Kg		N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Anthracene	3.35	J	1.85	4.46	ug/Kg	2200000	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Benzo(a)anthracene	18.1	NJ	3.27	4.46	ug/Kg	620	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Benzo(a)pyrene	30.3	NJ	4.03	8.94	ug/Kg	62	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	23.9	NJ	1.59	8.94	ug/Kg	620	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	14.4	J	5.8	22.4	ug/Kg		N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	90.4	NJ	1.51	8.94	ug/Kg	6200	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Chrysene	22.2	J	2.37	22.4	ug/Kg	62000	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Fluoranthene	26	J	9.39	44.6	ug/Kg	230000	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	14.9	NJ	1.43	8.94	ug/Kg	620	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Naphthalene	30.1	J	10.9	44.6	ug/Kg	5600	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Phenanthrene	13.1	J	7.8	44.6	ug/Kg		N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

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Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW8310	Pyrene	30.9	J	11.1	44.6	ug/Kg	230000	N1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Acenaphthene	44.7	NJ	27.4	41.1	ug/Kg	370000	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Acenaphthylene	161	NJ	14.9	41.1	ug/Kg		FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Anthracene	2.4	J	1.7	4.11	ug/Kg	2200000	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Benzo(a)anthracene	8.83	NJ	3.01	4.11	ug/Kg	620	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Benzo(a)pyrene	19.4	NJ	3.71	8.22	ug/Kg	62	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Benzo(b)fluoranthene	17.6	NJ	1.47	8.22	ug/Kg	620	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	11.7	J	5.34	20.6	ug/Kg		FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Benzo(k)fluoranthene	133	NJ	1.39	8.22	ug/Kg	6200	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Chrysene	13.2	J	2.18	20.6	ug/Kg	62000	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Dibenz(a,h)anthracene	14.7	NJ	3.22	8.22	ug/Kg	62	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Fluoranthene	21.7	J	8.64	41.1	ug/Kg	230000	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Fluorene	10.7	J	9.25	82.2	ug/Kg	270000	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	12.7	J	1.32	8.22	ug/Kg	620	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Naphthalene	63.9	NJ	10	41.1	ug/Kg	5600	FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Phenanthrene	14.3	J	7.18	41.1	ug/Kg		FD1
BH21	5/21/2004	15:00	ECEN	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW8310	Pyrene	28	J	10.2	41.1	ug/Kg	230000	FD1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Acenaphthene	34.2	J	29	43.5	ug/Kg	370000	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Acenaphthylene	69.9	NJ	15.8	43.5	ug/Kg		N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Anthracene	2.74	J	1.8	4.35	ug/Kg	2200000	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Benzo(a)anthracene	5.61	NJ	3.18	4.35	ug/Kg	620	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Benzo(a)pyrene	12.5	NJ	3.93	8.7	ug/Kg	62	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	12.1	NJ	1.55	8.7	ug/Kg	620	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	87.1	NJ	1.47	8.7	ug/Kg	6200	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Chrysene	8.3	J	2.31	21.8	ug/Kg	62000	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Dibenz(a,h)anthracene	10.4	NJ	3.41	8.7	ug/Kg	62	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Fluoranthene	21.3	J	9.15	43.5	ug/Kg	230000	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Naphthalene	47.4	NJ	10.6	43.5	ug/Kg	5600	N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Phenanthrene	12.8	J	7.6	43.5	ug/Kg		N1
BH22	5/22/2004	11:20	ECEN	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW8310	Pyrene	13	J	10.8	43.5	ug/Kg	230000	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Acenaphthene	57.7	NJ	30.6	45.9	ug/Kg	370000	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Anthracene	3.8	J	1.9	4.59	ug/Kg	2200000	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Benzo(a)anthracene	4.08	J	3.37	4.59	ug/Kg	620	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Benzo(a)pyrene	13.6	NJ	4.15	9.2	ug/Kg	62	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	14.3	NJ	1.64	9.2	ug/Kg	620	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	100	NJ	1.56	9.2	ug/Kg	6200	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Chrysene	12.5	J	2.44	23	ug/Kg	62000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

Table 4-3
Summary of PAH Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Dibenz(a,h)anthracene	12.3	NJ	3.6	9.2	ug/Kg	62	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Fluoranthene	23.8	J	9.67	45.9	ug/Kg	230000	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Fluorene	13.6	J	10.3	92	ug/Kg	270000	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	8.2	J	1.48	9.2	ug/Kg	620	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8310	Naphthalene	23.4	J	11.2	45.9	ug/Kg	5600	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Acenaphthene	377	NJ	28.5	42.8	ug/Kg	370000	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Acenaphthylene	490	NJ	15.5	42.8	ug/Kg		N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Anthracene	20	NJ	1.77	4.28	ug/Kg	2200000	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Benzo(a)anthracene	76.1	NJ	3.13	4.28	ug/Kg	620	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Benzo(a)pyrene	89.5	NJ	3.86	8.56	ug/Kg	62	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Benzo(b)fluoranthene	108	NJ	1.53	8.56	ug/Kg	620	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Benzo(g,h,i)perylene	75.9	NJ	5.56	21.4	ug/Kg		N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Benzo(k)fluoranthene	95	NJ	1.45	8.56	ug/Kg	6200	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Chrysene	136	NJ	2.27	21.4	ug/Kg	62000	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Dibenz(a,h)anthracene	43.9	NJ	3.35	8.56	ug/Kg	62	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Fluoranthene	193	NJ	9	42.8	ug/Kg	230000	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Fluorene	33.3	J	9.63	85.6	ug/Kg	270000	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Indeno(1,2,3-cd)pyrene	50.1	NJ	1.37	8.56	ug/Kg	620	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Naphthalene	190	NJ	10.4	42.8	ug/Kg	5600	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Phenanthrene	72.3	NJ	7.47	42.8	ug/Kg		N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8310	Pyrene	229	NJ	10.7	42.8	ug/Kg	230000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = Regular sample, FD1 = field duplicate

Table 4-4
Summary of PCB Compounds Detected In 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/20/2004	14:25	ECEN	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	840	J	452	915	ug/Kg	**220**	N1
BH12	5/22/2004	13:15	ECEN	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	5330		1310	2660	ug/Kg	**220**	N1
BH17	5/20/2004	15:35	ECEN	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	11600	J	7330	14800	ug/Kg	**220**	N1
BH18	5/21/2004	8:55	ECEN	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	8940	J	5060	10200	ug/Kg	**220**	N1
BH19	5/21/2004	9:25	ECEN	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	8140	J	5350	10800	ug/Kg	**220**	N1
BH23	5/22/2004	11:38	ECEN	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	44400	J	28500	57600	ug/Kg	**220**	N1
BH24	5/22/2004	11:55	ECEN	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW8082	PCB-1260 (Aroclor 1260)	2630	J	1160	2350	ug/Kg	**220**	N1
BH25	4/22/2005	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	3500	J	100	420	ug/Kg	**220**	N1
BH26	4/22/2005	10:00	ELAB	PBOW-05-SO-2BG-BH26-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	210		5.3	21	ug/Kg	220	N1
BH26	4/22/2005	10:00	ELAB	PBOW-05-SO-2BG-BH26-D-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	200		5.2	21	ug/Kg	220	FD1
BH27	4/22/2005	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	1900	J	52	210	ug/Kg	**220**	N1
BH28	4/22/2005	10:40	ELAB	PBOW-05-SO-2BG-BH28-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	150		5.2	21	ug/Kg	220	N1
BH29	4/22/2005	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	830		27	110	ug/Kg	**220**	N1
BH30	4/22/2005	11:15	ELAB	PBOW-05-SO-2BG-BH30-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	81		5.3	21	ug/Kg	220	N1
BH31	4/22/2005	11:30	ELAB	PBOW-05-SO-2BG-BH31-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	30		5.6	22	ug/Kg	220	N1
BH32	4/22/2005	11:45	ELAB	PBOW-05-SO-2BG-BH32-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	13		5.8	23	ug/Kg	220	N1
BH33	4/22/2005	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	1500	J	53	210	ug/Kg	**220**	N1
BH34	4/22/2005	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW8082	PCB-1260 (Aroclor 1260)	3100	J	120	470	ug/Kg	**220**	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-5
Summary of Dioxin/Furan Compounds Detected in 2004 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDD	8.29		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDF	5.68	J	0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,4,7,8,9-HpCDF	0.593	J	0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDD	1.29	J	0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDF	7.35	J	0.299	0.299	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDD	1.64	J	0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDF	4.49	J	0.264	0.264	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDD	1.32	J	0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDF	0.375	J	0.349	0.349	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDD	2.67		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDF	3.7	J	0.351	0.351	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	2,3,4,6,7,8-HxCDF	3.79	J	0.286	0.286	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	2,3,4,7,8-PeCDF	8.25	J	0.326	0.326	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	2,3,7,8-TCDD	1.79		0.103	0.103	ng/Kg	3.9	N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	2,3,7,8-TCDF	7.14	J	0.116	0.116	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	OCDD	35.8		0.515	0.515	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	OCDF	5.29		0.515	0.515	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total HpCDD	15.7		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total HpCDF	8.78		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total HxCDD	13.6		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total HxCDF	34		0.297	0.297	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total PeCDD	7.51		0.258	0.258	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total PeCDF	51.6		0.338	0.338	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total TCDD	3.49		0.371	0.371	ng/Kg		N1
BH09	5/20/2004	14:25	PDMW	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW8290	Total TCDF	40.8		0.103	0.103	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDD	22.7		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDF	7.49	J	0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,4,7,8,9-HpCDF	0.715	J	0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDD	4.52		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDF	8.35	J	0.404	0.404	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDD	4.89		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDF	4.11	J	0.356	0.356	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDD	3.56		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDF	0.54	J	0.471	0.471	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDD	8.88		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDF	4.41	J	0.312	0.312	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	2,3,4,6,7,8-HxCDF	4.98	J	0.386	0.386	ng/Kg		N1

J = estimated

N1 = regular sample

Table 4-5
Summary of Dioxin/Furan Compounds Detected in 2004 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	2,3,4,7,8-PeCDF	11.8	J	0.291	0.291	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	2,3,7,8-TCDD	4.3		0.103	0.103	ng/Kg	3.9	N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	2,3,7,8-TCDF	12.2	J	0.156	0.156	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	OCDD	86.4		0.514	0.514	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	OCDF	5.31		0.514	0.514	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total HpCDD	40.8		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total HpCDF	11.3		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total HxCDD	36.1		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total HxCDF	40.8		0.4	0.4	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total PeCDD	17.5		0.257	0.257	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total PeCDF	68.2		0.302	0.302	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total TCDD	10.5		0.341	0.341	ng/Kg		N1
BH10	5/20/2004	13:55	PDMW	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW8290	Total TCDF	65		0.103	0.103	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDD	9.98		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDF	4.51	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDD	1.89	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDF	3.85	J	0.407	0.407	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDD	2.16	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDF	1.97	J	0.359	0.359	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDD	1.73	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDD	3.76		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDF	1.83	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	2,3,4,6,7,8-HxCDF	2.46	J	0.389	0.389	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	2,3,4,7,8-PeCDF	5	J	0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	2,3,7,8-TCDD	2		0.0955	0.0955	ng/Kg	3.9	N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	2,3,7,8-TCDF	5.74	J	0.319	0.319	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	OCDD	43.4		0.477	0.477	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	OCDF	7.3		0.477	0.477	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total HpCDD	18.6		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total HpCDF	6.76		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total HxCDD	17.5		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total HxCDF	18.9		0.403	0.403	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total PeCDD	10.6		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total PeCDF	27.3		0.239	0.239	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total TCDD	4.35		0.256	0.256	ng/Kg		N1
BH11	5/20/2004	11:55	PDMW	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW8290	Total TCDF	23.4		0.0955	0.0955	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDD	28.5		0.255	0.255	ng/Kg		N1

J = estimated

N1 = regular sample

Table 4-5
Summary of Dioxin/Furan Compounds Detected in 2004 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,4,6,7,8-HpCDF	79.1	J	0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,4,7,8,9-HpCDF	12		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDD	4.34		0.286	0.286	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,4,7,8-HxCDF	152	J	3	3	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDD	5.55		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,6,7,8-HxCDF	87.6	J	2.65	2.65	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDD	4.21		0.275	0.275	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,7,8,9-HxCDF	5.55		3.5	3.5	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDD	11.4		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	1,2,3,7,8-PeCDF	84.8	J	3.61	3.61	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	2,3,4,6,7,8-HxCDF	72.8	J	2.87	2.87	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	2,3,4,7,8-PeCDF	187	J	3.36	3.36	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	2,3,7,8-TCDD	6.58		0.102	0.102	ng/Kg	**3.9**	N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	2,3,7,8-TCDF	165	J	0.226	0.226	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	OCDD	119		0.509	0.509	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	OCDF	85.4		0.509	0.509	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total HpCDD	51.4		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total HpCDF	117		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total HxCDD	43.8		0.27	0.27	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total HxCDF	678		2.97	2.97	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total PeCDD	36.1		0.255	0.255	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total PeCDF	1090		3.48	3.48	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total TCDD	20.5		0.365	0.365	ng/Kg		N1
BH17	5/20/2004	15:35	PDMW	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW8290	Total TCDF	909		0.102	0.102	ng/Kg		N1

J = estimated

N1 = regular sample

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Aluminum (total)	10910	J	0.979	12.3	mg/Kg	7600	15500	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Arsenic (total)	8.68	J	0.255	0.617	mg/Kg	0.39	36.5	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Barium (total)	76.3	J	0.0824	0.617	mg/Kg	540	826	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Beryllium (total)	0.644		0.0617	0.617	mg/Kg		1	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Cadmium (total)	0.276	J	0.059	0.617	mg/Kg	3.7		N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Calcium (total)	4480	J	1.61	12.3	mg/Kg		52300	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Chromium (total)	16.6		0.199	0.617	mg/Kg		29	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Cobalt (total)	5.79		0.0985	0.617	mg/Kg	90	116	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Copper (total)	23.4		0.251	0.617	mg/Kg	310	56.2	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Iron (total)	17630		1.93	12.3	mg/Kg	2300	234000	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Lead (total)	182		0.35	0.617	mg/Kg	40	48.6	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Magnesium (total)	2830	J	0.722	12.3	mg/Kg		10400	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Manganese (total)	245	J	0.161	1.23	mg/Kg	180	3506	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW7471A	Mercury (total)	0.518	J	0.00124	0.0126	mg/Kg	2.3	0.1	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Nickel (total)	17.2		0.105	0.617	mg/Kg	160	55.1	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Potassium (total)	1290	J	4.42	12.3	mg/Kg		3390	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Selenium (total)	1.02		0.2	0.617	mg/Kg	39	2	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Sodium (total)	90.3		4.48	12.3	mg/Kg			N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Vanadium (total)	30.1		0.112	0.617	mg/Kg		40.9	N1
BH09	5/20/04	14:25	GEL	PBOW-04-SO-2BG-BH09A(0-1)	0	1	SW6010B	Zinc (total)	89.4		0.208	0.617	mg/Kg	2300	322	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Aluminum (total)	10910	J	0.988	12.5	mg/Kg	7600	15500	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Arsenic (total)	7.15	J	0.257	0.623	mg/Kg	0.39	36.5	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Barium (total)	82.5	J	0.0831	0.623	mg/Kg	540	826	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Beryllium (total)	0.805		0.0623	0.623	mg/Kg		1	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Cadmium (total)	0.284	J	0.0595	0.623	mg/Kg	3.7		N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Calcium (total)	4170	J	1.62	12.5	mg/Kg		52300	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Chromium (total)	16.9		0.201	0.623	mg/Kg		29	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Cobalt (total)	7.52		0.0994	0.623	mg/Kg	90	116	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Copper (total)	24.5		0.253	0.623	mg/Kg	310	56.2	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Iron (total)	16220		1.95	12.5	mg/Kg	2300	234000	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Lead (total)	71.9		0.353	0.623	mg/Kg	40	48.6	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Magnesium (total)	1840	J	0.728	12.5	mg/Kg		10400	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Manganese (total)	252	J	0.163	1.25	mg/Kg	180	3506	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW7471A	Mercury (total)	0.503	J	0.00119	0.0121	mg/Kg	2.3	0.1	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Nickel (total)	24.1		0.106	0.623	mg/Kg	160	55.1	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Potassium (total)	1280	J	4.45	12.5	mg/Kg		3390	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Sodium (total)	54.1		4.52	12.5	mg/Kg			N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Thallium (total)	1.39	J	1.25	2.49	mg/Kg	**0.52**	1.3	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Vanadium (total)	31.3		0.113	0.623	mg/Kg		40.9	N1
BH10	5/20/04	13:55	GEL	PBOW-04-SO-2BG-BH10A(0-1)	0	1	SW6010B	Zinc (total)	71.7		0.21	0.623	mg/Kg	2300	322	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Aluminum (total)	8840	J	0.987	12.4	mg/Kg	7600	15500	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Arsenic (total)	5.13	J	0.257	0.622	mg/Kg	0.39	36.5	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Barium (total)	47.1	J	0.083	0.622	mg/Kg	540	826	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Beryllium (total)	0.515	J	0.0622	0.622	mg/Kg		**1**	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Cadmium (total)	0.168	J	0.0595	0.622	mg/Kg	3.7		N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Calcium (total)	2430	J	1.62	12.4	mg/Kg		52300	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Chromium (total)	11.5		0.201	0.622	mg/Kg		29	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Cobalt (total)	4.02		0.0993	0.622	mg/Kg	90	116	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Copper (total)	13		0.253	0.622	mg/Kg	310	56.2	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Iron (total)	11660		1.95	12.4	mg/Kg	2300	234000	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Lead (total)	31.9		0.353	0.622	mg/Kg	40	48.6	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Magnesium (total)	1560	J	0.728	12.4	mg/Kg		10400	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Manganese (total)	147	J	0.163	1.24	mg/Kg	180	3506	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW7471A	Mercury (total)	0.0308	J	0.00121	0.0123	mg/Kg	2.3	0.1	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Nickel (total)	11.6		0.106	0.622	mg/Kg	160	55.1	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Potassium (total)	938	J	4.45	12.4	mg/Kg		3390	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Sodium (total)	47.8		4.52	12.4	mg/Kg			N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Vanadium (total)	21.3		0.113	0.622	mg/Kg		40.9	N1
BH11	5/20/04	11:55	GEL	PBOW-04-SO-2BG-BH11A(0-1)	0	1	SW6010B	Zinc (total)	38.8		0.21	0.622	mg/Kg	2300	322	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Aluminum (total)	11330		1.06	13.4	mg/Kg	7600	15500	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Arsenic (total)	7.73	J	0.276	0.668	mg/Kg	0.39	36.5	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Barium (total)	142		0.0891	0.668	mg/Kg	540	826	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Beryllium (total)	0.59	J	0.0668	0.668	mg/Kg		1	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Cadmium (total)	0.704		0.0639	0.668	mg/Kg	3.7		N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Calcium (total)	25090		1.74	13.4	mg/Kg		52300	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Chromium (total)	26.7		0.215	0.668	mg/Kg		29	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Cobalt (total)	6.06		0.107	0.668	mg/Kg	90	116	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Copper (total)	61.5		0.271	0.668	mg/Kg	310	56.2	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Iron (total)	29960		2.09	13.4	mg/Kg	2300	234000	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Lead (total)	295	J	0.379	0.668	mg/Kg	**40**	48.6	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Magnesium (total)	5910	J	0.781	13.4	mg/Kg		10400	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Manganese (total)	317	J	0.175	1.34	mg/Kg	180	3506	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW7471A	Mercury (total)	0.121	J	0.00129	0.0131	mg/Kg	2.3	0.1	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Nickel (total)	25.8		0.114	0.668	mg/Kg	160	55.1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Potassium (total)	1870	J	4.78	13.4	mg/Kg		3390	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Selenium (total)	1.8	J	0.217	0.668	mg/Kg	39	2	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Sodium (total)	99.3		4.85	13.4	mg/Kg			N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Vanadium (total)	28.6		0.121	0.668	mg/Kg		40.9	N1
BH12	5/22/04	13:15	GEL	PBOW-04-SO-2BG-BH12A(0-1)	0	1	SW6010B	Zinc (total)	221		0.225	0.668	mg/Kg	2300	322	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Aluminum (total)	10500		1.01	12.8	mg/Kg	7600	15500	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Arsenic (total)	5.72	J	0.283	0.638	mg/Kg	0.39	36.5	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Barium (total)	98.6	J	0.0851	0.638	mg/Kg	540	826	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Beryllium (total)	0.596	J	0.0638	0.638	mg/Kg		1	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Cadmium (total)	0.269	J	0.061	0.638	mg/Kg	3.7		N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Calcium (total)	4400	J	1.66	12.8	mg/Kg		52300	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Chromium (total)	15.5		0.206	0.638	mg/Kg		29	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Cobalt (total)	5.22	J	0.102	0.638	mg/Kg	90	116	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Copper (total)	27.4	J	0.259	0.638	mg/Kg	310	56.2	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Iron (total)	15080	J	2	12.8	mg/Kg	2300	234000	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Lead (total)	148	J	0.362	0.638	mg/Kg	40	48.6	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Magnesium (total)	2610	J	0.746	12.8	mg/Kg		10400	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Manganese (total)	244	J	0.167	1.28	mg/Kg	180	3506	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW7471A	Mercury (total)	0.0565	J	0.00127	0.0129	mg/Kg	2.3	0.1	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Nickel (total)	17.3		0.109	0.638	mg/Kg	160	55.1	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Potassium (total)	1500	J	4.56	12.8	mg/Kg		3390	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Selenium (total)	0.586	J	0.207	0.638	mg/Kg	39	2	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Silver (total)	0.153	J	0.115	0.638	mg/Kg	39	11.1	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Sodium (total)	62.5	J	4.63	12.8	mg/Kg			N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Vanadium (total)	24.6		0.116	0.638	mg/Kg		40.9	N1
BH13	5/21/04	10:10	GEL	PBOW-04-SO-2BG-BH13A(0-1)	0	1	SW6010B	Zinc (total)	81.7	J	0.215	0.638	mg/Kg	2300	322	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Aluminum (total)	11310		0.986	12.4	mg/Kg	7600	15500	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Arsenic (total)	6.13	J	0.257	0.622	mg/Kg	0.39	36.5	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Barium (total)	69.1	J	0.0829	0.622	mg/Kg	540	826	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Beryllium (total)	0.555	J	0.0622	0.622	mg/Kg		1	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Cadmium (total)	0.163	J	0.0594	0.622	mg/Kg	3.7		N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Calcium (total)	4400	J	1.62	12.4	mg/Kg		52300	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Chromium (total)	15.5		0.2	0.622	mg/Kg		29	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Cobalt (total)	5.25	J	0.0992	0.622	mg/Kg	90	116	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Copper (total)	19.1	J	0.252	0.622	mg/Kg	310	56.2	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Iron (total)	15660	J	1.95	12.4	mg/Kg	2300	234000	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Lead (total)	41.9	J	0.353	0.622	mg/Kg	40	48.6	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Magnesium (total)	3080	J	0.727	12.4	mg/Kg		10400	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Manganese (total)	206	J	0.163	1.24	mg/Kg	180	3506	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW7471A	Mercury (total)	0.0468	J	0.00124	0.0126	mg/Kg	2.3	0.1	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Nickel (total)	14.2		0.106	0.622	mg/Kg	160	55.1	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Potassium (total)	1240	J	4.45	12.4	mg/Kg		3390	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Selenium (total)	1.32	J	0.202	0.622	mg/Kg	39	2	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Silver (total)	0.152	J	0.112	0.622	mg/Kg	39	11.1	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Sodium (total)	60.5	J	4.51	12.4	mg/Kg			N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Vanadium (total)	25.6		0.113	0.622	mg/Kg		40.9	N1
BH14	5/21/04	11:20	GEL	PBOW-04-SO-2BG-BH14A(0-1)	0	1	SW6010B	Zinc (total)	53.9	J	0.209	0.622	mg/Kg	2300	322	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Aluminum (total)	12320		0.991	12.5	mg/Kg	7600	15500	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Arsenic (total)	14.2	J	0.258	0.625	mg/Kg	0.39	36.5	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Barium (total)	128	J	0.0834	0.625	mg/Kg	540	826	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Beryllium (total)	0.989		0.0625	0.625	mg/Kg		1	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Cadmium (total)	0.191	J	0.0597	0.625	mg/Kg	3.7		N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Calcium (total)	3090	J	1.63	12.5	mg/Kg		52300	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Chromium (total)	15.2		0.201	0.625	mg/Kg		29	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Cobalt (total)	13.1	J	0.0997	0.625	mg/Kg	90	116	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Copper (total)	38.9	J	0.254	0.625	mg/Kg	310	56.2	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Iron (total)	24280	J	1.96	12.5	mg/Kg	2300	234000	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Lead (total)	89.6	J	0.355	0.625	mg/Kg	40	48.6	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Magnesium (total)	2190	J	0.731	12.5	mg/Kg		10400	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Manganese (total)	611	J	0.163	1.25	mg/Kg	180	3506	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW7471A	Mercury (total)	0.0555		0.00117	0.0119	mg/Kg	2.3	0.1	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Nickel (total)	27.5		0.107	0.625	mg/Kg	160	55.1	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Potassium (total)	1580	J	4.47	12.5	mg/Kg		3390	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Selenium (total)	0.638	J	0.203	0.625	mg/Kg	39	2	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Silver (total)	0.185	J	0.113	0.625	mg/Kg	39	11.1	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Sodium (total)	59.7	J	4.54	12.5	mg/Kg			N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Vanadium (total)	27.9		0.113	0.625	mg/Kg		40.9	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15A(0-1)	0	1	SW6010B	Zinc (total)	70.3	J	0.21	0.625	mg/Kg	2300	322	N1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Aluminum (total)	10550		0.95	12	mg/Kg	7600	15500	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Antimony (total)	0.534	J	0.411	1.2	mg/Kg	3.1	9.3	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Arsenic (total)	8.04	J	0.247	0.599	mg/Kg	0.39	36.5	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Barium (total)	96	J	0.0799	0.599	mg/Kg	540	826	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Beryllium (total)	0.712		0.0599	0.599	mg/Kg		1	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Cadmium (total)	0.166	J	0.0573	0.599	mg/Kg	3.7		FD1

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N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Calcium (total)	4400	J	1.56	12	mg/Kg		52300	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Chromium (total)	14.3		0.193	0.599	mg/Kg		29	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Cobalt (total)	6.84	J	0.0956	0.599	mg/Kg	90	116	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Copper (total)	31.7	J	0.243	0.599	mg/Kg	310	56.2	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Iron (total)	15070	J	1.88	12	mg/Kg	2300	234000	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Lead (total)	116	J	0.34	0.599	mg/Kg	**40**	48.6	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Magnesium (total)	2210	J	0.701	12	mg/Kg		10400	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Manganese (total)	261	J	0.157	1.2	mg/Kg	180	3506	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW7471A	Mercury (total)	0.0617	J	0.00113	0.0115	mg/Kg	2.3	0.1	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Nickel (total)	18.3		0.102	0.599	mg/Kg	160	55.1	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Potassium (total)	1140	J	4.29	12	mg/Kg		3390	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Silver (total)	0.191	J	0.108	0.599	mg/Kg	39	11.1	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Sodium (total)	106	J	4.35	12	mg/Kg			FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Tin (total)	3.78		0.457	1.2	mg/Kg	4700		FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Vanadium (total)	24.3		0.109	0.599	mg/Kg		40.9	FD1
BH15	5/21/04	14:10	GEL	PBOW-04-SO-2BG-BH15D(0-1)	0	1	SW6010B	Zinc (total)	161	J	0.202	0.599	mg/Kg	2300	322	FD1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Aluminum (total)	9250		0.973	12.3	mg/Kg	7600	15500	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Arsenic (total)	6.39	J	0.253	0.614	mg/Kg	0.39	36.5	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Barium (total)	66.2		0.0819	0.614	mg/Kg	540	826	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Beryllium (total)	0.549	J	0.0614	0.614	mg/Kg		1	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Cadmium (total)	0.0771	J	0.0587	0.614	mg/Kg	3.7		N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Calcium (total)	2550		1.6	12.3	mg/Kg		52300	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Chromium (total)	10.7		0.198	0.614	mg/Kg		29	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Cobalt (total)	4.85		0.0979	0.614	mg/Kg	90	116	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Copper (total)	14.7		0.249	0.614	mg/Kg	310	56.2	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Iron (total)	11550		1.92	12.3	mg/Kg	2300	234000	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Lead (total)	37.4	J	0.348	0.614	mg/Kg	40	48.6	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Magnesium (total)	1380	J	0.718	12.3	mg/Kg		10400	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Manganese (total)	197	J	0.161	1.23	mg/Kg	180	3506	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW7471A	Mercury (total)	0.046	J	0.00112	0.0114	mg/Kg	2.3	0.1	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Nickel (total)	13.5		0.105	0.614	mg/Kg	160	55.1	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Potassium (total)	1060	J	4.39	12.3	mg/Kg		3390	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Selenium (total)	0.546	J	0.199	0.614	mg/Kg	39	2	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Sodium (total)	45.9		4.46	12.3	mg/Kg			N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Vanadium (total)	20.3		0.111	0.614	mg/Kg		40.9	N1
BH16	5/22/04	13:37	GEL	PBOW-04-SO-2BG-BH16A(0-1)	0	1	SW6010B	Zinc (total)	38.4		0.207	0.614	mg/Kg	2300	322	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Aluminum (total)	9210	J	0.948	11.9	mg/Kg	7600	15500	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

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Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Arsenic (total)	8.45	J	0.247	0.597	mg/Kg	0.39	36.5	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Barium (total)	314	J	0.0797	0.597	mg/Kg	540	826	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Beryllium (total)	0.588	J	0.0597	0.597	mg/Kg		1	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Cadmium (total)	0.611		0.0571	0.597	mg/Kg	3.7		N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Calcium (total)	9540	J	1.56	11.9	mg/Kg		52300	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Chromium (total)	26.6		0.192	0.597	mg/Kg		29	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Cobalt (total)	7.57		0.0953	0.597	mg/Kg	90	116	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Copper (total)	94.9		0.243	0.597	mg/Kg	310	56.2	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Iron (total)	23170		1.87	11.9	mg/Kg	2300	234000	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Lead (total)	730		0.339	0.597	mg/Kg	**40**	48.6	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Magnesium (total)	5520	J	0.699	11.9	mg/Kg		10400	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Manganese (total)	290	J	0.156	1.19	mg/Kg	180	3506	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW7471A	Mercury (total)	0.409	J	0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Nickel (total)	56.3		0.102	0.597	mg/Kg	160	55.1	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Potassium (total)	1350	J	4.27	11.9	mg/Kg		3390	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Selenium (total)	1.75		0.194	0.597	mg/Kg	39	2	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Sodium (total)	250		4.34	11.9	mg/Kg			N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Vanadium (total)	25.9		0.108	0.597	mg/Kg		40.9	N1
BH17	5/20/04	15:35	GEL	PBOW-04-SO-2BG-BH17A(0-1)	0	1	SW6010B	Zinc (total)	339		0.201	0.597	mg/Kg	2300	322	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Aluminum (total)	9750		0.971	12.2	mg/Kg	7600	15500	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Antimony (total)	0.963	J	0.42	1.22	mg/Kg	3.1	9.3	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Arsenic (total)	4.91	J	0.253	0.612	mg/Kg	0.39	36.5	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Barium (total)	138	J	0.0817	0.612	mg/Kg	540	826	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Beryllium (total)	0.627		0.0612	0.612	mg/Kg		1	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Cadmium (total)	0.61	J	0.0585	0.612	mg/Kg	3.7		N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Calcium (total)	9870	J	1.6	12.2	mg/Kg		52300	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Chromium (total)	22.1		0.197	0.612	mg/Kg		29	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Cobalt (total)	9.07	J	0.0977	0.612	mg/Kg	90	116	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Copper (total)	49.4	J	0.249	0.612	mg/Kg	310	56.2	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Iron (total)	15820	J	1.92	12.2	mg/Kg	2300	234000	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Lead (total)	598	J	0.347	0.612	mg/Kg	**40**	48.6	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Magnesium (total)	6600	J	0.716	12.2	mg/Kg		10400	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Manganese (total)	277	J	0.16	1.22	mg/Kg	180	3506	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW7471A	Mercury (total)	0.39	J	0.00115	0.0117	mg/Kg	2.3	0.1	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Nickel (total)	31		0.105	0.612	mg/Kg	160	55.1	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Potassium (total)	985	J	4.38	12.2	mg/Kg		3390	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Selenium (total)	1.54	J	0.198	0.612	mg/Kg	39	2	N1

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Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Silver (total)	0.222	J	0.11	0.612	mg/Kg	39	11.1	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Sodium (total)	135	J	4.45	12.2	mg/Kg			N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Thallium (total)	1.52	J	1.22	2.45	mg/Kg	**0.52**	1.3	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Vanadium (total)	24		0.111	0.612	mg/Kg		40.9	N1
BH18	5/21/04	8:55	GEL	PBOW-04-SO-2BG-BH18A(0-1)	0	1	SW6010B	Zinc (total)	489	J	0.206	0.612	mg/Kg	2300	322	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Aluminum (total)	8940		0.996	12.6	mg/Kg	7600	15500	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Arsenic (total)	6.6	J	0.259	0.628	mg/Kg	0.39	36.5	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Barium (total)	290	J	0.0838	0.628	mg/Kg	540	826	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Beryllium (total)	0.548	J	0.0628	0.628	mg/Kg		1	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Cadmium (total)	0.421	J	0.06	0.628	mg/Kg	3.7		N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Calcium (total)	7390	J	1.64	12.6	mg/Kg		52300	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Chromium (total)	19.1		0.202	0.628	mg/Kg		29	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Cobalt (total)	6.23	J	0.1	0.628	mg/Kg	90	116	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Copper (total)	66.6	J	0.255	0.628	mg/Kg	310	56.2	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Iron (total)	16940	J	1.97	12.6	mg/Kg	2300	234000	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Lead (total)	585	J	0.356	0.628	mg/Kg	**40**	48.6	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Magnesium (total)	4930	J	0.734	12.6	mg/Kg		10400	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Manganese (total)	274	J	0.164	1.26	mg/Kg	180	3506	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW7471A	Mercury (total)	0.282	J	0.00124	0.0127	mg/Kg	2.3	0.1	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Nickel (total)	27.2		0.107	0.628	mg/Kg	160	55.1	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Potassium (total)	1270	J	4.49	12.6	mg/Kg		3390	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Selenium (total)	1.38	J	0.204	0.628	mg/Kg	39	2	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Silver (total)	0.313	J	0.113	0.628	mg/Kg	39	11.1	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Sodium (total)	212	J	4.56	12.6	mg/Kg			N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Tin (total)	5.31		0.479	1.26	mg/Kg	4700		N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Vanadium (total)	23.8		0.114	0.628	mg/Kg		40.9	N1
BH19	5/21/04	9:25	GEL	PBOW-04-SO-2BG-BH19A(0-1)	0	1	SW6010B	Zinc (total)	365	J	0.211	0.628	mg/Kg	2300	322	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Aluminum (total)	9280		0.982	12.4	mg/Kg	7600	15500	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Arsenic (total)	5.88	J	0.255	0.619	mg/Kg	0.39	36.5	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Barium (total)	79.7	J	0.0826	0.619	mg/Kg	540	826	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Beryllium (total)	0.568	J	0.0619	0.619	mg/Kg		1	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Cadmium (total)	0.279	J	0.0592	0.619	mg/Kg	3.7		N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Calcium (total)	5830	J	1.61	12.4	mg/Kg		52300	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Chromium (total)	14.6		0.199	0.619	mg/Kg		29	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Cobalt (total)	6.36	J	0.0988	0.619	mg/Kg	90	116	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Copper (total)	30.5	J	0.251	0.619	mg/Kg	310	56.2	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Iron (total)	15000	J	1.94	12.4	mg/Kg	2300	234000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6

Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Lead (total)	155	J	0.351	0.619	mg/Kg	**40**	48.6	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Magnesium (total)	3120	J	0.724	12.4	mg/Kg		10400	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Manganese (total)	319	J	0.162	1.24	mg/Kg	180	3506	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW7471A	Mercury (total)	0.185	J	0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Nickel (total)	19.1		0.106	0.619	mg/Kg	160	55.1	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Potassium (total)	1280	J	4.43	12.4	mg/Kg		3390	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Selenium (total)	1.34	J	0.201	0.619	mg/Kg	39	2	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Silver (total)	0.132	J	0.112	0.619	mg/Kg	39	**11.1**	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Sodium (total)	64.7	J	4.49	12.4	mg/Kg			N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Vanadium (total)	23.3		0.112	0.619	mg/Kg		40.9	N1
BH20	5/21/04	9:45	GEL	PBOW-04-SO-2BG-BH20A(0-1)	0	1	SW6010B	Zinc (total)	75	J	0.208	0.619	mg/Kg	2300	322	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Aluminum (total)	13050		0.986	12.4	mg/Kg	7600	15500	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Arsenic (total)	6.78		0.257	0.622	mg/Kg	0.39	36.5	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Barium (total)	79.1	J	0.0829	0.622	mg/Kg	540	826	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Beryllium (total)	0.685		0.0622	0.622	mg/Kg		1	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Cadmium (total)	0.204	J	0.0594	0.622	mg/Kg	3.7		N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Calcium (total)	4290	J	1.62	12.4	mg/Kg		52300	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Chromium (total)	17.6		0.2	0.622	mg/Kg		29	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Cobalt (total)	4.72		0.0992	0.622	mg/Kg	90	116	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Copper (total)	21	J	0.252	0.622	mg/Kg	310	56.2	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Iron (total)	17550		1.95	12.4	mg/Kg	2300	234000	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Lead (total)	41.1	J	0.353	0.622	mg/Kg	40	48.6	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Magnesium (total)	3030	J	0.727	12.4	mg/Kg		10400	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Manganese (total)	164		0.163	1.24	mg/Kg	180	3506	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW7471A	Mercury (total)	0.0588		0.00122	0.0125	mg/Kg	2.3	0.1	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Nickel (total)	16.8		0.106	0.622	mg/Kg	160	55.1	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Potassium (total)	1640	J	4.45	12.4	mg/Kg		3390	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Selenium (total)	1.2	J	0.202	0.622	mg/Kg	39	2	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Sodium (total)	61.9	J	4.52	12.4	mg/Kg			N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Thallium (total)	1.44	J	1.24	2.49	mg/Kg	**0.52**	1.3	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Vanadium (total)	29.3		0.113	0.622	mg/Kg		40.9	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21A(0-1)	0	1	SW6010B	Zinc (total)	58.8	J	0.209	0.622	mg/Kg	2300	322	N1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Aluminum (total)	11370		1.02	12.9	mg/Kg	7600	15500	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Arsenic (total)	6.57		0.267	0.646	mg/Kg	0.39	36.5	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Barium (total)	77.1	J	0.0862	0.646	mg/Kg	540	826	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Beryllium (total)	0.633	J	0.0646	0.646	mg/Kg		1	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Cadmium (total)	0.277	J	0.0617	0.646	mg/Kg	3.7		FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Calcium (total)	4080	J	1.68	12.9	mg/Kg		52300	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Chromium (total)	16.2		0.208	0.646	mg/Kg		29	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Cobalt (total)	5.19	J	0.103	0.646	mg/Kg	90	116	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Copper (total)	22.2	J	0.262	0.646	mg/Kg	310	56.2	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Iron (total)	16550		2.02	12.9	mg/Kg	2300	234000	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Lead (total)	61.6	J	0.366	0.646	mg/Kg	**40**	48.6	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Magnesium (total)	2650	J	0.755	12.9	mg/Kg		10400	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Manganese (total)	223		0.169	1.29	mg/Kg	180	3506	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW7471A	Mercury (total)	0.0459	J	0.00118	0.012	mg/Kg	2.3	0.1	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Nickel (total)	17.4		0.11	0.646	mg/Kg	160	55.1	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Potassium (total)	1530	J	4.62	12.9	mg/Kg		3390	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Selenium (total)	0.518	J	0.209	0.646	mg/Kg	39	2	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Sodium (total)	120	J	4.69	12.9	mg/Kg			FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Vanadium (total)	26.5		0.117	0.646	mg/Kg		40.9	FD1
BH21	5/21/04	15:00	GEL	PBOW-04-SO-2BG-BH21D(0-1)	0	1	SW6010B	Zinc (total)	63.9	J	0.217	0.646	mg/Kg	2300	322	FD1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Aluminum (total)	12610		1	12.6	mg/Kg	7600	15500	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Arsenic (total)	7.85	J	0.261	0.632	mg/Kg	0.39	36.5	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Barium (total)	84.5		0.0843	0.632	mg/Kg	540	826	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Beryllium (total)	0.683		0.0632	0.632	mg/Kg		1	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Cadmium (total)	0.222	J	0.0604	0.632	mg/Kg	3.7		N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Calcium (total)	5960		1.65	12.6	mg/Kg		52300	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Chromium (total)	18.1		0.204	0.632	mg/Kg		29	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Cobalt (total)	6.04		0.101	0.632	mg/Kg	90	116	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Copper (total)	22.3		0.257	0.632	mg/Kg	310	56.2	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Iron (total)	19060		1.98	12.6	mg/Kg	2300	234000	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Lead (total)	50.5	J	0.359	0.632	mg/Kg	**40**	48.6	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Magnesium (total)	3960	J	0.739	12.6	mg/Kg		10400	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Manganese (total)	245	J	0.165	1.26	mg/Kg	180	3506	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW7471A	Mercury (total)	0.0437	J	0.00117	0.012	mg/Kg	2.3	0.1	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Nickel (total)	18.7		0.108	0.632	mg/Kg	160	55.1	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Potassium (total)	1720	J	4.52	12.6	mg/Kg		3390	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Selenium (total)	1.55	J	0.205	0.632	mg/Kg	39	2	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Sodium (total)	66.2		4.59	12.6	mg/Kg			N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Vanadium (total)	29.7		0.115	0.632	mg/Kg		40.9	N1
BH22	5/22/04	11:20	GEL	PBOW-04-SO-2BG-BH22A(0-1)	0	1	SW6010B	Zinc (total)	64.8		0.213	0.632	mg/Kg	2300	322	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Aluminum (total)	10160		1.13	14.2	mg/Kg	7600	15500	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Antimony (total)	0.649	J	0.487	1.42	mg/Kg	3.1	9.3	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6

Summary of Metals Compounds Detected in 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Arsenic (total)	7.54	J	0.293	0.71	mg/Kg	0.39	36.5	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Barium (total)	154		0.0947	0.71	mg/Kg	540	826	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Beryllium (total)	0.572	J	0.071	0.71	mg/Kg		1	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Cadmium (total)	0.778		0.0679	0.71	mg/Kg	3.7		N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Calcium (total)	5710		1.85	14.2	mg/Kg		52300	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Chromium (total)	20		0.229	0.71	mg/Kg		29	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Cobalt (total)	6.86		0.113	0.71	mg/Kg	90	116	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Copper (total)	92.4		0.288	0.71	mg/Kg	310	56.2	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Iron (total)	17770		2.23	14.2	mg/Kg	2300	234000	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Lead (total)	386	J	0.403	0.71	mg/Kg	**40**	48.6	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Magnesium (total)	3380	J	0.83	14.2	mg/Kg		10400	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Manganese (total)	320	J	0.186	1.42	mg/Kg	180	3506	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW7471A	Mercury (total)	0.154	J	0.00135	0.0136	mg/Kg	2.3	0.1	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Nickel (total)	24.3		0.121	0.71	mg/Kg	160	55.1	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Potassium (total)	1850	J	5.08	14.2	mg/Kg		3390	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Selenium (total)	2.06	J	0.23	0.71	mg/Kg	39	2	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Silver (total)	0.471	J	0.128	0.71	mg/Kg	39	11.1	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Sodium (total)	96.6		5.16	14.2	mg/Kg			N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Vanadium (total)	25.6		0.129	0.71	mg/Kg		40.9	N1
BH23	5/22/04	11:38	GEL	PBOW-04-SO-2BG-BH23A(0-1)	0	1	SW6010B	Zinc (total)	247		0.239	0.71	mg/Kg	2300	322	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Aluminum (total)	10990		1.09	13.7	mg/Kg	7600	15500	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Antimony (total)	0.782	J	0.471	1.37	mg/Kg	3.1	9.3	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Arsenic (total)	8.44	J	0.283	0.686	mg/Kg	0.39	36.5	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Barium (total)	168		0.0915	0.686	mg/Kg	540	826	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Beryllium (total)	0.615	J	0.0686	0.686	mg/Kg		1	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Cadmium (total)	0.629	J	0.0656	0.686	mg/Kg	3.7		N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Calcium (total)	11090		1.79	13.7	mg/Kg		52300	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Chromium (total)	25		0.221	0.686	mg/Kg		29	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Cobalt (total)	6.85		0.11	0.686	mg/Kg	90	116	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Copper (total)	151		0.279	0.686	mg/Kg	310	56.2	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Iron (total)	19040		2.15	13.7	mg/Kg	2300	234000	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Lead (total)	590	J	0.389	0.686	mg/Kg	**40**	48.6	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Magnesium (total)	4490	J	0.802	13.7	mg/Kg		10400	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Manganese (total)	305	J	0.179	1.37	mg/Kg	180	3506	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW7471A	Mercury (total)	0.115	J	0.00136	0.0138	mg/Kg	2.3	0.1	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Nickel (total)	25.3		0.117	0.686	mg/Kg	160	55.1	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Potassium (total)	1950	J	4.91	13.7	mg/Kg		3390	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-6
Summary of Metals Compounds Detected In 2004-2005 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Selenium (total)	0.774	J	0.222	0.686	mg/Kg	39	2	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Silver (total)	0.138	J	0.124	0.686	mg/Kg	39	11.1	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Sodium (total)	137		4.98	13.7	mg/Kg			N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Vanadium (total)	27.9		0.125	0.686	mg/Kg		40.9	N1
BH24	5/22/04	11:55	GEL	PBOW-04-SO-2BG-BH24A(0-1)	0	1	SW6010B	Zinc (total)	299		0.231	0.686	mg/Kg	2300	322	N1
BH25	4/22/05	9:55	ELAB	PBOW-05-SO-2BG-BH25-A-(0-0.5)	0	0.5	SW6010B	Lead	590		0.38	0.77	mg/Kg	**40**	48.6	N1
BH26	4/22/05	10:00	ELAB	PBOW-05-SO-2BG-BH26-A-(0-0.5)	0	0.5	SW6010B	Lead	55		0.38	0.76	mg/Kg	**40**	48.6	N1
BH26	4/22/05	10:00	ELAB	PBOW-05-SO-2BG-BH26-D-(0-0.5)	0	0.5	SW6010B	Lead	68.3		0.4	0.79	mg/Kg	**40**	48.6	FD1
BH27	4/22/05	10:20	ELAB	PBOW-05-SO-2BG-BH27-A-(0-0.5)	0	0.5	SW6010B	Lead	203		0.41	0.82	mg/Kg	**40**	48.6	N1
BH28	4/22/05	10:40	ELAB	PBOW-05-SO-2BG-BH28-A-(0-0.5)	0	0.5	SW6010B	Lead	54.4		0.4	0.8	mg/Kg	**40**	48.6	N1
BH29	4/22/05	10:50	ELAB	PBOW-05-SO-2BG-BH29-A-(0-0.5)	0	0.5	SW6010B	Lead	388		0.51	1	mg/Kg	**40**	48.6	N1
BH30	4/22/05	11:15	ELAB	PBOW-05-SO-2BG-BH30-A-(0-0.5)	0	0.5	SW6010B	Lead	37.8		0.37	0.74	mg/Kg	40	48.6	N1
BH31	4/22/05	11:30	ELAB	PBOW-05-SO-2BG-BH31-A-(0-0.5)	0	0.5	SW6010B	Lead	25.3		0.41	0.82	mg/Kg	40	48.6	N1
BH32	4/22/05	11:45	ELAB	PBOW-05-SO-2BG-BH32-A-(0-0.5)	0	0.5	SW6010B	Lead	22.9		0.43	0.85	mg/Kg	40	48.6	N1
BH33	4/22/05	13:00	ELAB	PBOW-05-SO-2BG-BH33-A-(0-0.5)	0	0.5	SW6010B	Lead	128		0.38	0.76	mg/Kg	**40**	48.6	N1
BH34	4/22/05	13:15	ELAB	PBOW-05-SO-2BG-BH34-A-(0-0.5)	0	0.5	SW6010B	Lead	341		0.42	0.85	mg/Kg	**40**	48.6	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-7
Summary of Organic Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	48		5	5	mg/Kg	**16**	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	3300		830	830	ug/Kg	**220**	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	1700		410	410	ug/Kg	12000	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	810		410	410	ug/Kg	6100	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8270	Fluoranthene	56	J	56	410	ug/Kg	230000	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW8270	Pyrene	44	J	44	410	ug/Kg	230000	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	140		12	12	mg/Kg	**16**	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW8330	2,4-Dinitrotoluene	35		12	12	mg/Kg	**12**	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	1700		400	400	ug/Kg	**220**	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	1000		400	400	ug/Kg	12000	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	290	J	290	400	ug/Kg	6100	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	9.5		1.2	1.2	mg/Kg	16	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8330	2,4-Dinitrotoluene	2.5		1.2	1.2	mg/Kg	12	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	2200		420	420	ug/Kg	**220**	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	870		420	420	ug/Kg	12000	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	300	J	300	420	ug/Kg	6100	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW8260	Benzene	12	J	12	32	ug/Kg	640	FD1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	910		50	50	mg/Kg	**16**	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	6800		2100	2100	ug/Kg	**220**	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	6100		840	840	ug/Kg	12000	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	3300		840	840	ug/Kg	6100	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	Anthracene	55	J	55	420	ug/Kg	2200000	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	Chrysene	64	J	64	420	ug/Kg	62000	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	Fluoranthene	91	J	91	420	ug/Kg	230000	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW8270	Pyrene	77	J	77	420	ug/Kg	230000	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	80		42	42	ug/Kg	220	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	64	J	64	420	ug/Kg	12000	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW8270	bis(2-Ethylhexyl)phthalate	61	J	61	420	ug/Kg	35000	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	0.5		0.25	0.25	mg/Kg	16	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	170		85	85	ug/Kg	220	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	160	J	160	430	ug/Kg	12000	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	65	J	65	430	ug/Kg	6100	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	31		5	5	mg/Kg	**16**	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8330	2,4-Dinitrotoluene	21		5	5	mg/Kg	**12**	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8330	2,6-Dinitrotoluene	10		5	5	mg/Kg	**6.1**	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	1500		410	410	ug/Kg	**220**	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	1500		410	410	ug/Kg	12000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-7
Summary of Organic Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	630		410	410	ug/Kg	6100	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Benzo(a)pyrene	150	J	150	410	ug/Kg	**62**	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Benzo(b)fluoranthene	180	J	180	410	ug/Kg	620	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Benzo(g,h,i)perylene	95	J	95	410	ug/Kg		N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Chrysene	85	J	85	410	ug/Kg	62000	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Fluoranthene	110	J	110	410	ug/Kg	230000	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Indeno(1,2,3-cd)pyrene	74	J	74	410	ug/Kg	620	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Phenanthrene	55	J	55	410	ug/Kg		N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW8270	Pyrene	95	J	95	410	ug/Kg	230000	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8330	1,3,5-Trinitrobenzene	15		12	12	mg/Kg	180	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8330	2,4,6-Trinitrotoluene	210		12	12	mg/Kg	**16**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8330	2,4-Dinitrotoluene	40		12	12	mg/Kg	**12**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8081	PCB-1260 (Aroclor 1260)	1400		400	400	ug/Kg	**220**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	2,4-Dinitrotoluene	13000		2800	2800	ug/Kg	**12000**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	2,6-Dinitrotoluene	7700		2800	2800	ug/Kg	**6100**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Anthracene	55	J	55	400	ug/Kg	2200000	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Benzo(a)anthracene	63	J	63	400	ug/Kg	620	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Benzo(a)pyrene	130	J	130	400	ug/Kg	**62**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Benzo(b)fluoranthene	820	J	400	400	ug/Kg	**620**	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Benzo(g,h,i)perylene	200	J	200	400	ug/Kg		N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Benzo(k)fluoranthene	430	J	400	400	ug/Kg	6200	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Chrysene	120	J	120	400	ug/Kg	62000	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Fluoranthene	160	J	160	400	ug/Kg	230000	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW8270	Pyrene	120	J	120	400	ug/Kg	230000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-8
Summary of Metals Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Aluminum (total)	6780		25	25	mg/Kg	7600	15500	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Arsenic (total)	5.1		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Barium (total)	73.4		25	25	mg/Kg	540	826	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Calcium (total)	6490		626	626	mg/Kg		52300	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Chromium (total)	11.8		1.3	1.3	mg/Kg		29	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Copper (total)	23.1		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Iron (total)	15500		12.5	12.5	mg/Kg	2300	234000	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Lead (total)	165		0.38	0.38	mg/Kg	**40**	48.6	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Magnesium (total)	2300		626	626	mg/Kg		10400	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Manganese (total)	224	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Nickel (total)	16.4		5	5	mg/Kg	160	55.1	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Selenium (total)	0.68		0.63	0.63	mg/Kg	39	2	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Thallium (total)	1.8		1.3	1.3	mg/Kg	**0.52**	1.3	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Vanadium (total)	18.4		6.3	6.3	mg/Kg		40.9	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW6010	Zinc (total)	80.9		2.5	2.5	mg/Kg	2300	322	N1
2BGSO01	10/1/96	12:45	KNX	PBOW-96-SO-2BG-2BGSO01-1010-(0-.5)	0	0.5	SW7471	Mercury (total)	0.078		0.041	0.041	mg/Kg	2.3	0.1	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Aluminum (total)	9200		24.4	24.4	mg/Kg	7600	15500	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Arsenic (total)	9.5		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Barium (total)	170		24.4	24.4	mg/Kg	540	826	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Beryllium (total)	0.65		0.61	0.61	mg/Kg		1	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Calcium (total)	16600		610	610	mg/Kg		52300	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Chromium (total)	20.1		1.2	1.2	mg/Kg		29	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Cobalt (total)	9.2		6.1	6.1	mg/Kg	90	116	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Copper (total)	60		3	3	mg/Kg	310	56.2	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Iron (total)	19900		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Lead (total)	1000		0.37	0.37	mg/Kg	**40**	48.6	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Magnesium (total)	5900		610	610	mg/Kg		10400	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Manganese (total)	191	J	1.8	1.8	mg/Kg	180	3506	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Nickel (total)	38.5		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Potassium (total)	1270		610	610	mg/Kg		3390	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Selenium (total)	1		0.61	0.61	mg/Kg	39	2	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Silver (total)	1.2		1.2	1.2	mg/Kg	39	11.1	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Thallium (total)	2.1		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Vanadium (total)	27.2		6.1	6.1	mg/Kg		40.9	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW6010	Zinc (total)	267		2.4	2.4	mg/Kg	2300	322	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-SO-2BG-2BGSO02-1040-(0-.5)	0	0.5	SW7471	Mercury (total)	0.18		0.04	0.04	mg/Kg	2.3	0.1	N1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Aluminum (total)	8600		25.4	25.4	mg/Kg	7600	15500	FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-8
Summary of Metals Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Arsenic (total)	8.7		1.3	1.3	mg/Kg	0.39	36.5	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Barium (total)	158		25.4	25.4	mg/Kg	540	826	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Beryllium (total)	0.68		0.64	0.64	mg/Kg		1	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Calcium (total)	9810		635	635	mg/Kg		52300	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Chromium (total)	18.2		1.3	1.3	mg/Kg		29	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Cobalt (total)	10.1		6.4	6.4	mg/Kg	90	116	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Copper (total)	138		3.2	3.2	mg/Kg	310	56.2	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Iron (total)	19100		12.7	12.7	mg/Kg	2300	234000	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Lead (total)	555		0.38	0.38	mg/Kg	**40**	48.6	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Magnesium (total)	4720		635	635	mg/Kg		10400	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Manganese (total)	174	J	1.9	1.9	mg/Kg	180	3506	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Nickel (total)	42.1		5.1	5.1	mg/Kg	160	55.1	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Potassium (total)	1360		635	635	mg/Kg		3390	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Selenium (total)	0.71		0.64	0.64	mg/Kg	39	2	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Thallium (total)	1.8		1.3	1.3	mg/Kg	**0.52**	1.3	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Vanadium (total)	24.1		6.4	6.4	mg/Kg		40.9	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW6010	Zinc (total)	246		2.5	2.5	mg/Kg	2300	322	FD1
2BGSO02	10/1/96	13:00	KNX	PBOW-96-FD-2BG-2BGSO02-1041-(0-.5)	0	0.5	SW7471	Mercury (total)	0.23		0.042	0.042	mg/Kg	2.3	0.1	FD1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Aluminum (total)	8620		25.6	25.6	mg/Kg	7600	15500	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Arsenic (total)	5.3		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Barium (total)	156		25.6	25.6	mg/Kg	540	826	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Calcium (total)	7930		639	639	mg/Kg		52300	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Chromium (total)	18.2		1.3	1.3	mg/Kg		29	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Cobalt (total)	10.6		6.4	6.4	mg/Kg	90	116	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Copper (total)	47.4		3.2	3.2	mg/Kg	310	56.2	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Iron (total)	18400		12.8	12.8	mg/Kg	2300	234000	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Lead (total)	391		0.38	0.38	mg/Kg	**40**	48.6	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Magnesium (total)	5160		639	639	mg/Kg		10400	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Manganese (total)	295	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Nickel (total)	33.8		5.1	5.1	mg/Kg	160	55.1	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Potassium (total)	1540		639	639	mg/Kg		3390	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Selenium (total)	0.76		0.64	0.64	mg/Kg	39	2	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Thallium (total)	1.3		1.3	1.3	mg/Kg	0.52	1.3	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Vanadium (total)	20		6.4	6.4	mg/Kg		40.9	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW6010	Zinc (total)	141		2.6	2.6	mg/Kg	2300	322	N1
2BGSO03	10/1/96	13:10	KNX	PBOW-96-SO-2BG-2BGSO03-1070-(0-.5)	0	0.5	SW7471	Mercury (total)	0.17		0.042	0.042	mg/Kg	2.3	0.1	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Aluminum (total)	10100		25.6	25.6	mg/Kg	7600	15500	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-8
Summary of Metals Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Arsenic (total)	6.1		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Barium (total)	70.3		25.6	25.6	mg/Kg	540	826	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Calcium (total)	3260		641	641	mg/Kg		52300	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Chromium (total)	12.8		1.3	1.3	mg/Kg		29	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Cobalt (total)	6.4		6.4	6.4	mg/Kg	90	116	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Copper (total)	17.6		3.2	3.2	mg/Kg	310	56.2	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Iron (total)	16700		12.8	12.8	mg/Kg	2300	234000	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Lead (total)	39.6		0.38	0.38	mg/Kg	40	48.6	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Magnesium (total)	2490		641	641	mg/Kg		10400	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Manganese (total)	315	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Nickel (total)	15.8		5.1	5.1	mg/Kg	160	55.1	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Potassium (total)	1160		641	641	mg/Kg		3390	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Selenium (total)	0.76		0.64	0.64	mg/Kg	39	2	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Vanadium (total)	22.1		6.4	6.4	mg/Kg		40.9	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW6010	Zinc (total)	55.2		2.6	2.6	mg/Kg	2300	322	N1
2BGSO04	10/1/96	13:20	KNX	PBOW-96-SO-2BG-2BGSO04-1100-(0-.5)	0	0.5	SW7471	Mercury (total)	0.047		0.042	0.042	mg/Kg	2.3	0.1	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Aluminum (total)	10300		25.8	25.8	mg/Kg	7600	15500	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Arsenic (total)	7.4		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Barium (total)	80.9		25.8	25.8	mg/Kg	540	826	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Calcium (total)	22600		646	646	mg/Kg		52300	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Chromium (total)	15.3		1.3	1.3	mg/Kg		29	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Cobalt (total)	9.5		6.5	6.5	mg/Kg	90	116	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Copper (total)	23.7		3.2	3.2	mg/Kg	310	56.2	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Iron (total)	20000		12.9	12.9	mg/Kg	2300	234000	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Lead (total)	83.3		0.39	0.39	mg/Kg	40	48.6	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Magnesium (total)	4880		646	646	mg/Kg		10400	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Manganese (total)	467	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Nickel (total)	18		5.2	5.2	mg/Kg	160	55.1	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Potassium (total)	1350		646	646	mg/Kg		3390	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Vanadium (total)	23.4		6.5	6.5	mg/Kg		40.9	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW6010	Zinc (total)	79.4		2.6	2.6	mg/Kg	2300	322	N1
2BGSO05	10/1/96	13:30	KNX	PBOW-96-SO-2BG-2BGSO05-1130-(0-.5)	0	0.5	SW7471	Mercury (total)	0.067		0.043	0.043	mg/Kg	2.3	0.1	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Aluminum (total)	10300		24.3	24.3	mg/Kg	7600	15500	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Arsenic (total)	7.9		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Barium (total)	67.6		24.3	24.3	mg/Kg	540	826	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Calcium (total)	4950		608	608	mg/Kg		52300	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Chromium (total)	14.8		1.2	1.2	mg/Kg		29	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-8
Summary of Metals Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Cobalt (total)	9		6.1	6.1	mg/Kg	90	116	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Copper (total)	15.8		3	3	mg/Kg	310	56.2	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Iron (total)	17700		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Lead (total)	189		0.36	0.36	mg/Kg	**40**	48.6	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Magnesium (total)	3700		608	608	mg/Kg		10400	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Manganese (total)	300	J	1.8	1.8	mg/Kg	180	3506	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Nickel (total)	18		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Potassium (total)	1170		608	608	mg/Kg		3390	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Vanadium (total)	22.2		6.1	6.1	mg/Kg		40.9	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW6010	Zinc (total)	57.3		2.4	2.4	mg/Kg	2300	322	N1
2BGSO06	10/1/96	13:40	KNX	PBOW-96-SO-2BG-2BGSO06-1160-(0-.5)	0	0.5	SW7471	Mercury (total)	0.044		0.04	0.04	mg/Kg	2.3	0.1	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Aluminum (total)	14900		24.9	24.9	mg/Kg	7600	15500	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Arsenic (total)	9.6		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Barium (total)	212		24.9	24.9	mg/Kg	540	826	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Beryllium (total)	0.66		0.62	0.62	mg/Kg		1	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Cadmium (total)	0.65		0.62	0.62	mg/Kg	3.7		N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Calcium (total)	9570		622	622	mg/Kg		52300	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Chromium (total)	24.3		1.2	1.2	mg/Kg		29	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Cobalt (total)	16.4		6.2	6.2	mg/Kg	90	116	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Copper (total)	104		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Iron (total)	25100		12.4	12.4	mg/Kg	2300	234000	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Lead (total)	351		0.37	0.37	mg/Kg	**40**	48.6	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Magnesium (total)	4390		622	622	mg/Kg		10400	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Manganese (total)	600	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Nickel (total)	33.1		5	5	mg/Kg	160	55.1	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Potassium (total)	1490		622	622	mg/Kg		3390	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Selenium (total)	0.99		0.62	0.62	mg/Kg	39	2	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Thallium (total)	1.2		1.2	1.2	mg/Kg	0.52	1.3	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Vanadium (total)	30		6.2	6.2	mg/Kg		40.9	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW6010	Zinc (total)	445		2.5	2.5	mg/Kg	2300	322	N1
2BGSO07	10/1/96	13:45	KNX	PBOW-96-SO-2BG-2BGSO07-1190-(0-.5)	0	0.5	SW7471	Mercury (total)	0.15		0.041	0.041	mg/Kg	2.3	0.1	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Aluminum (total)	9700		24.5	24.5	mg/Kg	7600	15500	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Arsenic (total)	9		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Barium (total)	204		24.5	24.5	mg/Kg	540	826	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Beryllium (total)	0.78		0.61	0.61	mg/Kg		1	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Cadmium (total)	0.78		0.61	0.61	mg/Kg	3.7		N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Calcium (total)	35800		612	612	mg/Kg		52300	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-8
Summary of Metals Compounds Detected in 1996 Surface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Chromium (total)	21.1		1.2	1.2	mg/Kg		29	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Cobalt (total)	12.4		6.1	6.1	mg/Kg	90	116	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Copper (total)	124		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Iron (total)	24500		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Lead (total)	603		0.37	0.37	mg/Kg	**40**	48.6	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Magnesium (total)	6370		612	612	mg/Kg		10400	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Manganese (total)	284	J	1.8	1.8	mg/Kg	180	3506	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Nickel (total)	35.7		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Potassium (total)	2520		612	612	mg/Kg		3390	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Selenium (total)	0.95		0.61	0.61	mg/Kg	39	2	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Thallium (total)	1.3		1.2	1.2	mg/Kg	0.52	1.3	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Vanadium (total)	28.3		6.1	6.1	mg/Kg		40.9	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW6010	Zinc (total)	349		2.4	2.4	mg/Kg	2300	322	N1
2BGSO08	10/1/96	13:50	KNX	PBOW-96-SO-2BG-2BGSO08-1220-(0-.5)	0	0.5	SW7471	Mercury (total)	0.14		0.04	0.04	mg/Kg	2.3	0.1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-9

Summary of Volatile Organic Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	1,1,1-Trichloroethane	106	J	1.31	2.5	ug/Kg	200000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	1,1-Dichloroethane	8.8		1.16	2.5	ug/Kg	51000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	1,1-Dichloroethene	2.6		1.24	2.5	ug/Kg	12000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	Benzene	2.8	J	1.11	2.5	ug/Kg	640	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	Cyclohexane	24.9	J	1.19	5	ug/Kg	280000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	Methylcyclohexane	1.4	J	1.26	5	ug/Kg	260000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8260	Toluene	0.99	J	0.842	2.5	ug/Kg	66000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8260	1,1,1-Trichloroethane	174	J	1.31	2.5	ug/Kg	200000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8260	1,1-Dichloroethane	11.4		1.16	2.5	ug/Kg	51000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8260	1,1-Dichloroethene	2.5		1.23	2.5	ug/Kg	12000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8260	Benzene	1.6	J	1.11	2.5	ug/Kg	640	FD1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8260	1,1-Dichloroethene	1.2	J	0.832	1.7	ug/Kg	12000	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8260	Cyclohexane	11.9	J	0.799	3.3	ug/Kg	280000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Acetone	8.7	B	6.99	9.9	ug/Kg	1400000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Benzene	2.8		0.893	2	ug/Kg	640	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Cyclohexane	16.6	J	0.953	4	ug/Kg	280000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Ethylbenzene	2.3		0.754	2	ug/Kg	190000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Isopropylbenzene (Cumene)	1.3	J	0.893	2	ug/Kg	57000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Methylcyclohexane	23.9		1.01	4	ug/Kg	260000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Toluene	79.5		0.675	2	ug/Kg	66000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8260	Xylenes, Total	12.5		0.774	2	ug/Kg	27000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8260	Benzene	1.4	J	0.778	1.7	ug/Kg	640	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8260	Methylcyclohexane	1.1	J	0.882	3.4	ug/Kg	260000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8260	Toluene	1.1	J	0.588	1.7	ug/Kg	66000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8260	Xylenes, Total	0.78	J	0.675	1.7	ug/Kg	27000	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8260	Benzene	2.6		0.985	2.2	ug/Kg	640	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8260	Toluene	1.7	J	0.744	2.2	ug/Kg	66000	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-10

Summary of Nitroaromatic Compounds Detected In 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	1,3,5-Trinitrobenzene	53600	J	125	375	ug/Kg	180000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	1,3-Dinitrobenzene	4320		125	375	ug/Kg	**610**	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	2,4,6-Trinitrotoluene	885000		1250	3750	ug/Kg	**16000**	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	2,4-Dinitrotoluene	104000	J	1250	3750	ug/Kg	**12000**	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	2,6-Dinitrotoluene	111000		1250	3750	ug/Kg	**6100**	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	2-Amino-4,6-Dinitrotoluene	49800		125	375	ug/Kg		N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	2-Nitrotoluene	4500	J	125	375	ug/Kg	**880**	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	3-Nitrotoluene	612	J	125	375	ug/Kg	73000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8330	4-Nitrotoluene	4110	J	125	375	ug/Kg	12000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	1,3,5-Trinitrobenzene	56100	J	125	375	ug/Kg	180000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	1,3-Dinitrobenzene	2770	J	125	375	ug/Kg	**610**	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	2,4,6-Trinitrotoluene	1120000		2500	7500	ug/Kg	**16000**	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	2,4-Dinitrotoluene	88100		2500	7500	ug/Kg	**12000**	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	2,6-Dinitrotoluene	102000		2500	7500	ug/Kg	**6100**	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	2-Amino-4,6-Dinitrotoluene	59000		125	375	ug/Kg		FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	2-Nitrotoluene	4280	J	125	375	ug/Kg	**880**	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	3-Nitrotoluene	942	J	125	375	ug/Kg	73000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8330	4-Nitrotoluene	3730	J	125	375	ug/Kg	12000	FD1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	2,4,6-Trinitrotoluene	74900		125	375	ug/Kg	**16000**	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	2,4-Dinitrotoluene	26200	J	125	375	ug/Kg	**12000**	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	2,6-Dinitrotoluene	10800		125	375	ug/Kg	**6100**	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	2-Nitrotoluene	782	J	125	375	ug/Kg	880	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	4-Amino-2,6-Dinitrotoluene	10600	J	125	375	ug/Kg		N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8330	4-Nitrotoluene	444	J	125	375	ug/Kg	12000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	1,3,5-Trinitrobenzene	85400	J	625	1880	ug/Kg	180000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	2,4,6-Trinitrotoluene	9580000		25000	75000	ug/Kg	**16000**	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	2,4-Dinitrotoluene	632000		25000	75000	ug/Kg	**12000**	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	2,6-Dinitrotoluene	402000		625	1880	ug/Kg	**6100**	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	2-Amino-4,6-Dinitrotoluene	56600		625	1880	ug/Kg		N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	2-Nitrotoluene	7040	J	625	1880	ug/Kg	**880**	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8330	4-Nitrotoluene	6670	J	625	1880	ug/Kg	12000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8330	1,3,5-Trinitrobenzene	46100		12500	37500	ug/Kg	180000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8330	2,4,6-Trinitrotoluene	35400000		62500	188000	ug/Kg	**16000**	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8330	2,4-Dinitrotoluene	9700000	J	12500	37500	ug/Kg	**12000**	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8330	2-Amino-4,6-Dinitrotoluene	342000		12500	37500	ug/Kg		N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8330	2,4,6-Trinitrotoluene	28700000		62500	188000	ug/Kg	**16000**	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8330	2,4-Dinitrotoluene	6770000	J	12500	37500	ug/Kg	**12000**	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-10
Summary of Nitroaromatic Compounds Detected In 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8330	2,6-Dinitrotoluene	1400000		12500	37500	ug/Kg	**6100**	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8330	2-Amino-4,6-Dinitrotoluene	95500		12500	37500	ug/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-11
Summary of PAH Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Acenaphthene	4550	NJ	271	407	ug/Kg	370000	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Acenaphthylene	4550	NJ	148	407	ug/Kg		N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Benzo(a)anthracene	44.5	NJ	29.8	40.7	ug/Kg	620	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Benzo(b)fluoranthene	24.8	J	14.5	81.5	ug/Kg	620	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Chrysene	113	J	21.6	204	ug/Kg	62000	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Fluoranthene	140	J	85.7	407	ug/Kg	230000	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Fluorene	306	J	91.6	815	ug/Kg	270000	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Naphthalene	15900	NJ	99.1	407	ug/Kg	**5600**	N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8310	Phenanthrene	163	J	71.1	407	ug/Kg		N1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Acenaphthene	4810	NJ	278	418	ug/Kg	370000	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Acenaphthylene	6190	NJ	152	418	ug/Kg		FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Benzo(a)anthracene	59.4	NJ	30.6	41.8	ug/Kg	620	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Benzo(b)fluoranthene	31	J	14.9	83.6	ug/Kg	620	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Chrysene	67.1	J	22.2	209	ug/Kg	62000	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Fluoranthene	133	J	87.9	418	ug/Kg	230000	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Fluorene	328	J	94	836	ug/Kg	270000	FD1
TR05-1	5/19/2004	8:50	ECEN	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8310	Phenanthrene	175	J	73	418	ug/Kg		FD1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Acenaphthene	1440	NJ	282	422	ug/Kg	370000	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Acenaphthylene	226	J	153	422	ug/Kg		N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Anthracene	73.2	NJ	17.5	42.2	ug/Kg	2200000	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Benzo(a)pyrene	108	NJ	38.2	84.6	ug/Kg	**62**	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Benzo(b)fluoranthene	212	NJ	15.1	84.6	ug/Kg	620	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Benzo(k)fluoranthene	469	NJ	14.3	84.6	ug/Kg	6200	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Chrysene	128	J	22.5	212	ug/Kg	62000	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Dibenz(a,h)anthracene	302	NJ	33.1	84.6	ug/Kg	**62**	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Fluoranthene	718	NJ	88.9	422	ug/Kg	230000	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Fluorene	166	J	95.1	846	ug/Kg	270000	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Naphthalene	2400	NJ	103	422	ug/Kg	5600	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8310	Phenanthrene	418	J	73.8	422	ug/Kg		N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Acenaphthene	40700	NJ	574	860	ug/Kg	370000	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Acenaphthylene	19600	NJ	313	860	ug/Kg		N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Benzo(a)anthracene	275	NJ	63	86	ug/Kg	620	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Benzo(b)fluoranthene	36.5	J	30.7	172	ug/Kg	620	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Benzo(k)fluoranthene	42.3	J	29.2	172	ug/Kg	6200	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Chrysene	119	J	45.7	431	ug/Kg	62000	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Fluoranthene	720	J	181	860	ug/Kg	230000	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Naphthalene	20700	NJ	210	860	ug/Kg	**5600**	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-11
Summary of PAH Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8310	Phenanthrene	1010	NJ	150	860	ug/Kg		N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Acenaphthene	67400	NJ	3080	4620	ug/Kg	370000	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Acenaphthylene	131000	NJ	1680	4620	ug/Kg		N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Benzo(a)anthracene	501	NJ	339	462	ug/Kg	620	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Benzo(b)fluoranthene	188	J	165	925	ug/Kg	620	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Chrysene	928	J	246	2320	ug/Kg	62000	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Naphthalene	51300	NJ	1130	4620	ug/Kg	**5600**	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8310	Phenanthrene	1390	J	807	4620	ug/Kg		N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8310	Acenaphthene	20700	NJ	2730	4090	ug/Kg	370000	N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8310	Acenaphthylene	115000	NJ	1490	4090	ug/Kg		N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8310	Chrysene	308	J	218	2050	ug/Kg	62000	N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8310	Naphthalene	4310	NJ	997	4090	ug/Kg	5600	N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8310	Phenanthrene	1550	J	716	4090	ug/Kg		N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-12
Summary of PCB Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8082	PCB-1254 (Aroclor 1254)	1660	J	1440	2520	ug/Kg	**220**	N1
TR06-1	5/19/2004	11:15	ECEN	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8082	PCB-1260 (Aroclor 1260)	1870		872	1760	ug/Kg	**220**	N1
TR07-1	5/19/2004	14:26	ECEN	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8082	PCB-1260 (Aroclor 1260)	832	J	462	936	ug/Kg	**220**	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8082	PCB-1254 (Aroclor 1254)	3670	J	3120	5480	ug/Kg	**220**	N1
TR08-1	5/19/2004	15:45	ECEN	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8082	PCB-1260 (Aroclor 1260)	4010		1900	3840	ug/Kg	**220**	N1
TR09-1	5/19/2004	16:35	ECEN	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8082	PCB-1260 (Aroclor 1260)	1220	J	860	1740	ug/Kg	**220**	N1

J = estimated N1 = regular sample

Table 4-13

Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	6.91	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	8.34	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	0.932	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,4,7,8-HxCDF	20.5	J	1.36	1.36	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,6,7,8-HxCDD	0.579	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,6,7,8-HxCDF	7.27	J	1.2	1.2	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,7,8,9-HxCDD	0.585	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,7,8-PeCDD	0.587	J	0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	1,2,3,7,8-PeCDF	14.2	J	0.831	0.831	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	2,3,4,6,7,8-HxCDF	12.6	J	1.3	1.3	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	2,3,4,7,8-PeCDF	41.4	J	0.774	0.774	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	2,3,7,8-TCDD	0.452	J	0.138	0.138	ng/Kg	3.9	N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	2,3,7,8-TCDF	44	J	0.141	0.141	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	OCDD	33.6	J	0.689	0.689	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	OCDF	2.12	J	0.689	0.689	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total HpCDD	12.2		0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total HpCDF	13		0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total HxCDD	4.33		0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total HxCDF	99.3		1.35	1.35	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total PeCDD	3.02		0.345	0.345	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total PeCDF	227		0.802	0.802	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total TCDD	0.717		0.469	0.469	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-A	1	2	SW8290	Total TCDF	278		0.221	0.221	ng/Kg		N1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	12.1	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	16	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	1.95	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,4,7,8-HxCDF	37.3	J	0.984	0.984	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,6,7,8-HxCDD	0.944	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,6,7,8-HxCDF	15.2	J	0.868	0.868	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,7,8,9-HxCDD	0.782	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,7,8,9-HxCDF	4.21	J	1.15	1.15	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,7,8-PeCDD	0.39	J	0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	1,2,3,7,8-PeCDF	24.8	J	2.91	2.91	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	2,3,4,6,7,8-HxCDF	26.1	J	0.942	0.942	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	2,3,4,7,8-PeCDF	75.4	J	2.71	2.71	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	2,3,7,8-TCDD	0.263	J	0.148	0.148	ng/Kg	3.9	FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	2,3,7,8-TCDF	77.3	J	0.198	0.198	ng/Kg		FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	OCDD	66.7	J	0.738	0.738	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	OCDF	4.69	J	0.738	0.738	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total HpCDD	22.1		0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total HpCDF	25.7		0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total HxCDD	6.2		0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total HxCDF	189		0.976	0.976	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total PeCDD	1.43		0.369	0.369	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total PeCDF	409		2.81	2.81	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total TCDD	1.13		0.567	0.567	ng/Kg		FD1
TR05-1	5/19/2004	8:50	PDMW	PBOW-04-SO-2BG-TR05-1-D	1	2	SW8290	Total TCDF	512		0.148	0.148	ng/Kg		FD1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	29	J	0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	20.8		0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	3.02		0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDD	0.74	J	0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDF	48.5		1.43	1.43	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDD	2.14	J	0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDF	15.3		1.26	1.26	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDD	2.09	J	0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDF	3.82	J	1.68	1.68	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,7,8-PeCDD	0.7	J	0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	1,2,3,7,8-PeCDF	27.4		0.363	0.363	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	2,3,4,6,7,8-HxCDF	27.2	J	1.37	1.37	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	2,3,4,7,8-PeCDF	77.5	J	0.338	0.338	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	2,3,7,8-TCDF	85.8	J	0.179	0.179	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	OCDD	93.9	J	0.587	0.587	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	OCDF	12.9		0.587	0.587	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total HpCDD	49.9		0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total HpCDF	35.1		0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total HxCDD	18.6		0.294	0.294	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total HxCDF	225		1.42	1.42	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total PeCDD	2.84		0.298	0.298	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total PeCDF	444		0.35	0.35	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total TCDD	1.12		0.308	0.308	ng/Kg		N1
TR05-2	5/19/2004	9:47	PDMW	PBOW-04-SO-2BG-TR05-2-A	1	2	SW8290	Total TCDF	586		0.159	0.159	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDD	39.8	J	0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDF	30.2		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,4,7,8,9-HpCDF	3.43		0.291	0.291	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

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Summary of Dioxin/Furan Compounds Detected In 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDD	1.29	J	0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDF	40.8		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDD	3.87		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDF	15.4		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDD	3.49		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDF	2.38	J	0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDD	1.39	J	0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDF	21.1	J	1.57	1.57	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	2,3,4,6,7,8-HxCDF	25.5	J	0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	2,3,4,7,8-PeCDF	67.5	J	1.46	1.46	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	2,3,7,8-TCDD	0.481	J	0.116	0.116	ng/Kg	3.9	N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	2,3,7,8-TCDF	75.4	J	0.16	0.16	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	OCDD	177	J	0.581	0.581	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	OCDF	32.6		0.581	0.581	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total HpCDD	71.5		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total HpCDF	47.2		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total HxCDD	39.6		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total HxCDF	186		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total PeCDD	16.4		0.291	0.291	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total PeCDF	328		1.51	1.51	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total TCDD	7.56		0.402	0.402	ng/Kg		N1
TR06-1	5/19/2004	11:15	PDMW	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW8290	Total TCDF	391		0.116	0.116	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	1,2,3,7,8,9-HxCDD	0.441	J	0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	1,2,3,7,8-PeCDD	0.319	J	0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	2,3,7,8-TCDD	1.39		0.109	0.109	ng/Kg	3.9	N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	OCDD	2.99	J	0.543	0.543	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total HpCDD	0.791		0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total HpCDF	0.287		0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total HxCDD	5.14		0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total HxCDF	0.404		0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total PeCDD	5.76		0.517	0.517	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total PeCDF	0.485		0.272	0.272	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total TCDD	1.93		0.396	0.396	ng/Kg		N1
TR06-2	5/19/2004	11:24	PDMW	PBOW-04-SO-2BG-TR06-2-A	1.5	2	SW8290	Total TCDF	0.528		0.109	0.109	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,4,6,7,8-HpCDD	1.57	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,4,6,7,8-HpCDF	0.737	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,4,7,8-HxCDF	0.64	J	0.288	0.288	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,6,7,8-HxCDF	0.391	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,7,8,9-HxCDD	0.292	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	1,2,3,7,8-PeCDF	0.357	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	2,3,4,6,7,8-HxCDF	0.414	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	2,3,4,7,8-PeCDF	0.817	J	0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	2,3,7,8-TCDD	0.361	J	0.115	0.115	ng/Kg	3.9	N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	2,3,7,8-TCDF	0.842	J	0.115	0.115	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	OCDD	20.7	J	0.575	0.575	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	OCDF	0.626	J	0.575	0.575	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total HpCDD	3.08		0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total HpCDF	0.958		0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total HxCDD	1.44		0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total HxCDF	4.02		0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total PeCDD	1.22		0.571	0.571	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total PeCDF	6.16		0.288	0.288	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total TCDD	0.509		0.394	0.394	ng/Kg		N1
TR06-3	5/19/2004	12:08	PDMW	PBOW-04-SO-2BG-TR06-3-A	3	3.5	SW8290	Total TCDF	4.35		0.115	0.115	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,4,6,7,8-HpCDD	27.9	J	0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,4,6,7,8-HpCDF	10.8		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,4,7,8,9-HpCDF	1.22		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,4,7,8-HxCDF	19		0.411	0.411	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,6,7,8-HxCDD	1.7	J	0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,6,7,8-HxCDF	8.29		0.363	0.363	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,7,8,9-HxCDD	1.34	J	0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,7,8,9-HxCDF	1.55	J	0.48	0.48	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,7,8-PeCDD	0.924	J	0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	1,2,3,7,8-PeCDF	12.7		0.9	0.9	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	2,3,4,6,7,8-HxCDF	12.7	J	0.394	0.394	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	2,3,4,7,8-PeCDF	36.7	J	0.839	0.839	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	2,3,7,8-TCDD	0.554	J	0.0915	0.0915	ng/Kg	3.9	N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	2,3,7,8-TCDF	39.3	J	0.101	0.101	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	OCDD	208	J	0.457	0.457	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	OCDF	4.49	J	0.457	0.457	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total HpCDD	50.6		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total HpCDF	17.4		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total HxCDD	13.4		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total HxCDF	92.6		0.408	0.408	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total PeCDD	4.54		0.229	0.229	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total PeCDF	199		0.869	0.869	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total TCDD	2.89		0.326	0.326	ng/Kg		N1
TR07-1	5/19/2004	14:26	PDMW	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW8290	Total TCDF	248		0.0915	0.0915	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	1.23	J	0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	0.364	J	0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	2,3,7,8-TCDD	0.461	J	0.103	0.103	ng/Kg	3.9	N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	2,3,7,8-TCDF	0.23	J	0.103	0.103	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	OCDD	14.3	J	0.517	0.517	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total HpCDD	2.48		0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total HpCDF	0.488		0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total HxCDD	2.88		0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total HxCDF	0.999		0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total PeCDD	1.59		0.486	0.486	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total PeCDF	1.49		0.258	0.258	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total TCDD	0.461		0.337	0.337	ng/Kg		N1
TR07-2	5/19/2004	14:58	PDMW	PBOW-04-SO-2BG-TR07-2-A	1	2	SW8290	Total TCDF	2.16		0.103	0.103	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	1,2,3,4,6,7,8-HpCDD	0.573	J	0.249	0.249	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	2,3,7,8-TCDD	0.826	J	0.0995	0.0995	ng/Kg	3.9	N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	OCDD	2.29	J	0.498	0.498	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	Total HpCDD	1.2		0.249	0.249	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	Total HxCDD	2.68		0.249	0.249	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	Total PeCDD	3.71		0.396	0.396	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	Total TCDD	1.27		0.352	0.352	ng/Kg		N1
TR07-3	5/19/2004	14:45	PDMW	PBOW-04-SO-2BG-TR07-3-A	3	3.5	SW8290	Total TCDF	0.587		0.0995	0.0995	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	117	J	0.298	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	73.8		0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	9.97		0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,4,7,8-HxCDD	1.94	J	0.5	0.5	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,4,7,8-HxCDF	181		1.83	1.83	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,6,7,8-HxCDD	5.78		0.441	0.441	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,6,7,8-HxCDF	55.8		1.61	1.61	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,7,8,9-HxCDD	6.78		0.48	0.48	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,7,8,9-HxCDF	15.7	J	2.14	2.14	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,7,8-PeCDD	1.82	J	0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	1,2,3,7,8-PeCDF	89.4		12	12	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	2,3,4,7,8-PeCDF	287	J	11.2	11.2	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13

Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	2,3,7,8-TCDD	0.651	J	0.118	0.118	ng/Kg	3.9	N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	2,3,7,8-TCDF	299	J	0.178	0.178	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	OCDD	816	J	0.592	0.592	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	OCDF	39.5		0.592	0.592	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total HpCDD	217		0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total HpCDF	130		0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total HxCDD	56.9		0.472	0.472	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total HxCDF	719		1.82	1.82	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total PeCDD	18.3		0.296	0.296	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total PeCDF	1520		11.6	11.6	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total TCDD	9.58		0.118	0.118	ng/Kg		N1
TR08-1	5/19/2004	15:45	PDMW	PBOW-04-SO-2BG-TR08-1-A	1	2	SW8290	Total TCDF	1840		0.118	0.118	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	46.8	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	5.71		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	0.915	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDD	1.01	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDF	11.8		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDD	3.11	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDF	4.51		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDD	3.08	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDF	1.48	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,7,8-PeCDD	0.81	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	1,2,3,7,8-PeCDF	17.7		0.809	0.809	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	2,3,4,6,7,8-HxCDF	7.3	J	0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	2,3,4,7,8-PeCDF	23	J	0.753	0.753	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	2,3,7,8-TCDD	0.495	J	0.125	0.125	ng/Kg	3.9	N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	2,3,7,8-TCDF	67.6	J	0.164	0.164	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	OCDD	136	J	0.625	0.625	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	OCDF	3.47	J	0.625	0.625	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total HpCDD	81.3		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total HpCDF	11.5		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total HxCDD	28.6		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total HxCDF	55.9		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total PeCDD	8.02		0.312	0.312	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total PeCDF	167		0.78	0.78	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total TCDD	2.98		0.397	0.397	ng/Kg		N1
TR08-2	5/19/2004	15:50	PDMW	PBOW-04-SO-2BG-TR08-2-A	1	2	SW8290	Total TCDF	493		0.125	0.125	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDD	68.1	J	0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDF	50		0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,4,7,8,9-HpCDF	6.8		0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDD	1.64	J	0.296	0.296	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDF	107		3.38	3.38	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDD	5.25		0.261	0.261	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDF	41.9		2.98	2.98	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDD	4.92		0.284	0.284	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDF	14.9	J	3.95	3.95	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDD	1.53	J	0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDF	70.8		3.91	3.91	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	2,3,4,6,7,8-HxCDF	77.2	J	3.24	3.24	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	2,3,4,7,8-PeCDF	222	J	3.64	3.64	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	2,3,7,8-TCDD	1.03		0.103	0.103	ng/Kg	3.9	N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	2,3,7,8-TCDF	225	J	0.131	0.131	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	OCDD	426	J	0.517	0.517	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	OCDF	17.6		0.517	0.517	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total HpCDD	122		0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total HpCDF	83.5		0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total HxCDD	48.8		0.28	0.28	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total HxCDF	556		3.35	3.35	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total PeCDD	14.5		0.259	0.259	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total PeCDF	1120		3.77	3.77	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total TCDD	5.02		0.404	0.404	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW8290	Total TCDF	1430		0.103	0.103	ng/Kg		N1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDD	62.2	J	0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDF	51.5		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,4,7,8,9-HpCDF	6.92		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,4,7,8-HxCDD	1.47	J	0.322	0.322	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,4,7,8-HxCDF	116		2.77	2.77	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,6,7,8-HxCDD	5.43		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,6,7,8-HxCDF	45.9		2.44	2.44	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,7,8,9-HxCDD	5.17		0.309	0.309	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,7,8,9-HxCDF	12.9	J	3.23	3.23	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,7,8-PeCDD	1.36	J	0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	1,2,3,7,8-PeCDF	70.2		7.47	7.47	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	2,3,4,6,7,8-HxCDF	79.6	J	2.65	2.65	ng/Kg		FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	2,3,4,7,8-PeCDF	208	J	6.96	6.96	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	2,3,7,8-TCDD	1.05	J	0.127	0.127	ng/Kg	3.9	FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	2,3,7,8-TCDF	218	J	0.353	0.353	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	OCDD	412	J	0.584	0.584	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	OCDF	22		0.584	0.584	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total HpCDD	113		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total HpCDF	84.5		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total HxCDD	49.4		0.304	0.304	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total HxCDF	590		2.75	2.75	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total PeCDD	15.4		0.292	0.292	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total PeCDF	1120		7.21	7.21	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total TCDD	7.21		0.386	0.386	ng/Kg		FD1
TR09-1	5/19/2004	16:35	PDMW	PBOW-04-SO-2BG-TR09-1-D	1	1.5	SW8290	Total TCDF	1390		0.117	0.117	ng/Kg		FD1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDD	70.2	J	0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDF	36.1		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,4,7,8,9-HpCDF	8.31		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDD	1.79	J	0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDF	65		2.02	2.02	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDD	6.2		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDF	24.1		1.78	1.78	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDD	5.85		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDF	5.72	J	2.36	2.36	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,7,8-PeCDD	1.38	J	0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	1,2,3,7,8-PeCDF	42.3		5.52	5.52	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	2,3,4,6,7,8-HxCDF	48.4	J	1.93	1.93	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	2,3,4,7,8-PeCDF	121	J	5.14	5.14	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	2,3,7,8-TCDD	0.586	J	0.127	0.127	ng/Kg	3.9	N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	2,3,7,8-TCDF	145	J	0.283	0.283	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	OCDD	278	J	0.637	0.637	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	OCDF	64.2		0.637	0.637	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total HpCDD	124		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total HpCDF	68.8		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total HxCDD	55		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total HxCDF	326		2	2	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total PeCDD	14		0.318	0.318	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total PeCDF	651		5.32	5.32	ng/Kg		N1
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total TCDD	2.95		0.461	0.461	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-13

Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR09-2	5/19/2004	16:56	PDMW	PBOW-04-SO-2BG-TR09-2-A	1	1.5	SW8290	Total TCDF	936		0.127	0.127	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDD	9.43	J	0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,4,6,7,8-HpCDF	23.6		0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,4,7,8,9-HpCDF	2.32	J	0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,4,7,8-HxCDF	30.3		0.587	0.587	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDD	0.757	J	0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,6,7,8-HxCDF	14.1		0.518	0.518	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDD	0.537	J	0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,7,8,9-HxCDF	2.64	J	0.686	0.686	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDD	0.316	J	0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	1,2,3,7,8-PeCDF	19.9		1.06	1.06	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	2,3,4,6,7,8-HxCDF	15.1	J	0.562	0.562	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	2,3,4,7,8-PeCDF	42.1	J	0.984	0.984	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	2,3,7,8-TCDF	53	J	0.189	0.189	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	OCDD	60.7	J	0.548	0.548	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	OCDF	15.1		0.548	0.548	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total HpCDD	16.9		0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total HpCDF	33.2		0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total HxCDD	6.25		0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total HxCDF	139		0.582	0.582	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total PeCDD	3.03		0.274	0.274	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total PeCDF	260		1.02	1.02	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total TCDD	4.14		0.432	0.432	ng/Kg		N1
TR10-1	5/19/2004	8:15	PDMW	PBOW-04-SO-2BG-TR10-1-A	1	1.5	SW8290	Total TCDF	300		0.117	0.117	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDD	24.1	J	0.255	0.255	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,4,6,7,8-HpCDF	708		0.456	0.456	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,4,7,8,9-HpCDF	75.8		0.583	0.583	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDD	1.68	J	0.454	0.454	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,4,7,8-HxCDF	693	J	2.37	2.37	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDD	3.49		0.401	0.401	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,6,7,8-HxCDF	569	J	2.09	2.09	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDD	2.84		0.436	0.436	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,7,8,9-HxCDF	121	J	2.77	2.77	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	1,2,3,7,8-PeCDF	792		67.8	67.8	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	2,3,4,6,7,8-HxCDF	980	J	2.27	2.27	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	2,3,4,7,8-PeCDF	2430	J	63.2	63.2	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	2,3,7,8-TCDF	1880	J	0.245	0.245	ng/Kg		N1

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Table 4-13
Summary of Dioxin/Furan Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	OCDD	89.8	J	0.51	0.51	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	OCDF	358		0.51	0.51	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total HpCDD	43.6		0.255	0.255	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total HpCDF	999		0.512	0.512	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total HxCDD	37		0.429	0.429	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total HxCDF	7180		2.35	2.35	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total PeCDD	22.3		2.74	2.74	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total PeCDF	12600		65.4	65.4	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total TCDD	22.9		0.112	0.112	ng/Kg		N1
TR10-2	5/20/2004	8:40	PDMW	PBOW-04-SO-2BG-TR10-2-A	1	2	SW8290	Total TCDF	12500		2.83	2.83	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	1,2,3,4,6,7,8-HpCDD	0.452	J	0.242	0.242	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	2,3,7,8-TCDD	0.444	J	0.0969	0.0969	ng/Kg	3.9	N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	2,3,7,8-TCDF	0.136	J	0.0969	0.0969	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	OCDD	2.25	J	0.485	0.485	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	Total HpCDD	0.942		0.242	0.242	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	Total PeCDD	1.22		0.436	0.436	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	Total TCDD	0.539		0.386	0.386	ng/Kg		N1
TR10-3	5/20/2004	8:25	PDMW	PBOW-04-SO-2BG-TR10-3-A	3	3.5	SW8290	Total TCDF	0.393		0.0969	0.0969	ng/Kg		N1

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Table 4-14
Summary of Metals Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Aluminum (total)	6000	J	0.963	12.1	mg/Kg	7600	15500	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Antimony (total)	4.08	J	0.417	1.21	mg/Kg	3.1	9.3	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Arsenic (total)	14.6	J	0.251	0.607	mg/Kg	0.39	36.5	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Barium (total)	2730	J	0.405	3.04	mg/Kg	**540**	826	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Beryllium (total)	0.541	J	0.0607	0.607	mg/Kg		1	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Cadmium (total)	0.658	J	0.0581	0.607	mg/Kg	3.7		N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Calcium (total)	11140	J	1.58	12.1	mg/Kg		52300	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Chromium (total)	114	J	0.196	0.607	mg/Kg		29	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Cobalt (total)	10.7	J	0.0969	0.607	mg/Kg	90	116	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Copper (total)	1320	J	0.247	0.607	mg/Kg	**310**	56.2	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Iron (total)	27690	J	1.9	12.1	mg/Kg	2300	234000	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Lead (total)	4510	J	0.345	0.607	mg/Kg	**40**	48.6	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Magnesium (total)	6300		0.71	12.1	mg/Kg		10400	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Manganese (total)	213	J	0.159	1.21	mg/Kg	180	3506	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW7471A	Mercury (total)	0.0371	J	0.00116	0.0118	mg/Kg	2.3	0.1	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Nickel (total)	89.9		0.104	0.607	mg/Kg	160	55.1	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Potassium (total)	1580	J	4.34	12.1	mg/Kg		3390	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Selenium (total)	3.39	J	0.197	0.607	mg/Kg	39	2	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Silver (total)	1.14		0.11	0.607	mg/Kg	39	11.1	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Sodium (total)	730	J	22.1	60.7	mg/Kg			N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Thallium (total)	2.21		1.21	2.43	mg/Kg	**0.52**	1.3	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Vanadium (total)	15.2		0.11	0.607	mg/Kg		40.9	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-A	1	2	SW6010B	Zinc (total)	482	J	0.204	0.607	mg/Kg	2300	322	N1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Aluminum (total)	7150	J	1.18	14.9	mg/Kg	7600	15500	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Antimony (total)	7.02	J	0.511	1.49	mg/Kg	3.1	9.3	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Arsenic (total)	8.29	J	0.307	0.745	mg/Kg	0.39	36.5	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Barium (total)	5200	J	0.993	7.45	mg/Kg	**540**	826	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Beryllium (total)	0.659	J	0.0745	0.745	mg/Kg		1	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Cadmium (total)	1.13	J	0.0712	0.745	mg/Kg	3.7		FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Calcium (total)	6690	J	1.94	14.9	mg/Kg		52300	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Chromium (total)	48.9	J	0.24	0.745	mg/Kg		29	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Cobalt (total)	18.3	J	0.119	0.745	mg/Kg	90	116	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Copper (total)	1840	J	0.302	0.745	mg/Kg	**310**	56.2	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Iron (total)	40460	J	2.33	14.9	mg/Kg	2300	234000	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Lead (total)	11930	J	4.22	7.45	mg/Kg	**40**	48.6	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Magnesium (total)	9360		0.871	14.9	mg/Kg		10400	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Manganese (total)	551	J	0.195	1.49	mg/Kg	180	3506	FD1

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N1 = regular sample, FD1 = field duplicate

Table 4-14

Summary of Metals Compounds Detected In 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW7471A	Mercury (total)	0.0562	J	0.00147	0.0149	mg/Kg	2.3	0.1	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Nickel (total)	113		0.127	0.745	mg/Kg	160	55.1	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Potassium (total)	2290	J	5.33	14.9	mg/Kg		3390	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Selenium (total)	5.55	J	0.241	0.745	mg/Kg	39	2	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Silver (total)	1.43		0.134	0.745	mg/Kg	39	11.1	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Sodium (total)	1270	J	5.41	14.9	mg/Kg			FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Thallium (total)	1.79		1.49	2.98	mg/Kg	**0.52**	1.3	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Vanadium (total)	20.1		0.135	0.745	mg/Kg		40.9	FD1
TR05-1	5/19/2004	8:50	GEL	PBOW-04-SO-2BG-TR05-1-D	1	2	SW6010B	Zinc (total)	834	J	0.251	0.745	mg/Kg	2300	322	FD1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Aluminum (total)	11350	J	0.993	12.5	mg/Kg	7600	15500	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Antimony (total)	2.34	J	0.43	1.25	mg/Kg	3.1	9.3	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Arsenic (total)	12.7	J	0.258	0.626	mg/Kg	0.39	36.5	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Barium (total)	2490	J	0.418	3.13	mg/Kg	**540**	826	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Beryllium (total)	1.27		0.0626	0.626	mg/Kg		1	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Cadmium (total)	2.04		0.0598	0.626	mg/Kg	3.7		N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Calcium (total)	21120	J	1.63	12.5	mg/Kg		52300	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Chromium (total)	32		0.202	0.626	mg/Kg		29	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Cobalt (total)	13.4	J	0.0999	0.626	mg/Kg	90	116	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Copper (total)	297	J	0.254	0.626	mg/Kg	310	56.2	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Iron (total)	25460	J	1.96	12.5	mg/Kg	2300	234000	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Lead (total)	3640		0.355	0.626	mg/Kg	**40**	48.6	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Magnesium (total)	7050		0.732	12.5	mg/Kg		10400	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Manganese (total)	462	J	0.164	1.25	mg/Kg	180	3506	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW7471A	Mercury (total)	0.207	J	0.00121	0.0123	mg/Kg	2.3	0.1	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Nickel (total)	83.4		0.107	0.626	mg/Kg	160	55.1	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Potassium (total)	2390	J	4.48	12.5	mg/Kg		3390	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Selenium (total)	2.46	J	0.203	0.626	mg/Kg	39	2	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Silver (total)	0.989		0.113	0.626	mg/Kg	39	11.1	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Sodium (total)	1390	J	4.55	12.5	mg/Kg			N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Thallium (total)	3.32		1.25	2.5	mg/Kg	**0.52**	1.3	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Vanadium (total)	24.2		0.114	0.626	mg/Kg		40.9	N1
TR06-1	5/19/2004	11:15	GEL	PBOW-04-SO-2BG-TR06-1-A	1	1.5	SW6010B	Zinc (total)	1540	J	1.05	3.13	mg/Kg	2300	322	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Aluminum (total)	4640	J	0.945	11.9	mg/Kg	7600	15500	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Antimony (total)	1.77	J	0.409	1.19	mg/Kg	3.1	9.3	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Arsenic (total)	8.43	J	0.246	0.596	mg/Kg	0.39	36.5	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Barium (total)	176	J	0.0795	0.596	mg/Kg	540	826	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Beryllium (total)	0.859		0.0596	0.596	mg/Kg		1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-14
Summary of Metals Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Cadmium (total)	1.83		0.0569	0.596	mg/Kg	3.7		N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Calcium (total)	13930	J	1.55	11.9	mg/Kg		52300	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Chromium (total)	8.86		0.192	0.596	mg/Kg		29	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Cobalt (total)	25.2	J	0.0951	0.596	mg/Kg	90	116	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Copper (total)	187	J	0.242	0.596	mg/Kg	310	56.2	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Iron (total)	13130	J	1.87	11.9	mg/Kg	2300	234000	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Lead (total)	891		0.338	0.596	mg/Kg	**40**	48.6	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Magnesium (total)	2550		0.697	11.9	mg/Kg		10400	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Manganese (total)	152	J	0.156	1.19	mg/Kg	180	3506	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW7471A	Mercury (total)	0.104	J	0.00111	0.0113	mg/Kg	2.3	0.1	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Nickel (total)	103		0.102	0.596	mg/Kg	160	55.1	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Potassium (total)	1140	J	4.26	11.9	mg/Kg		3390	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Selenium (total)	0.564	J	0.193	0.596	mg/Kg	39	2	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Silver (total)	0.437	J	0.107	0.596	mg/Kg	39	11.1	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Sodium (total)	592	J	4.33	11.9	mg/Kg			N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Thallium (total)	2.13		1.19	2.38	mg/Kg	**0.52**	1.3	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Vanadium (total)	10.5		0.108	0.596	mg/Kg		40.9	N1
TR07-1	5/19/2004	14:26	GEL	PBOW-04-SO-2BG-TR07-1-A	1.5	2	SW6010B	Zinc (total)	710	J	0.2	0.596	mg/Kg	2300	322	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Aluminum (total)	8990	J	1.01	12.7	mg/Kg	7600	15500	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Antimony (total)	1.29	J	0.436	1.27	mg/Kg	3.1	9.3	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Arsenic (total)	27.8	J	0.262	0.634	mg/Kg	0.39	36.5	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Barium (total)	164	J	0.0846	0.634	mg/Kg	540	826	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Beryllium (total)	0.849		0.0634	0.634	mg/Kg		1	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Cadmium (total)	0.0657	J	0.0607	0.634	mg/Kg	3.7		N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Calcium (total)	3430	J	1.65	12.7	mg/Kg		52300	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Chromium (total)	18.2		0.204	0.634	mg/Kg		29	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Cobalt (total)	12.8	J	0.101	0.634	mg/Kg	90	116	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Copper (total)	159	J	0.258	0.634	mg/Kg	310	56.2	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Iron (total)	36260	J	1.99	12.7	mg/Kg	2300	234000	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Lead (total)	560		0.36	0.634	mg/Kg	**40**	48.6	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Magnesium (total)	2910		0.742	12.7	mg/Kg		10400	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Manganese (total)	184	J	0.166	1.27	mg/Kg	180	3506	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW7471A	Mercury (total)	0.12	J	0.00128	0.013	mg/Kg	2.3	0.1	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Nickel (total)	48		0.108	0.634	mg/Kg	160	55.1	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Potassium (total)	2450	J	4.54	12.7	mg/Kg		3390	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Selenium (total)	3.81	J	0.206	0.634	mg/Kg	39	2	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Silver (total)	0.58	J	0.114	0.634	mg/Kg	39	**11.1**	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-14
Summary of Metals Compounds Detected in 2004 Burn Layer Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Sodium (total)	800	J	23	63.4	mg/Kg			N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Thallium (total)	1.91		1.27	2.54	mg/Kg	**0.52**	1.3	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Vanadium (total)	21.3		0.115	0.634	mg/Kg		40.9	N1
TR08-1	5/19/2004	15:45	GEL	PBOW-04-SO-2BG-TR08-1-A	1	2	SW6010B	Zinc (total)	250	J	0.214	0.634	mg/Kg	2300	322	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Aluminum (total)	8320	J	1.04	13.1	mg/Kg	7600	15500	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Antimony (total)	2.21	J	0.45	1.31	mg/Kg	3.1	9.3	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Arsenic (total)	8.13	J	0.271	0.655	mg/Kg	0.39	36.5	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Barium (total)	256	J	0.0874	0.655	mg/Kg	540	826	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Beryllium (total)	0.828	J	0.0655	0.655	mg/Kg		1	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Cadmium (total)	0.568	J	0.0627	0.655	mg/Kg	3.7		N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Calcium (total)	10910	J	1.71	13.1	mg/Kg		52300	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Chromium (total)	18.4		0.211	0.655	mg/Kg		29	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Cobalt (total)	7.71	J	0.105	0.655	mg/Kg	90	116	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Copper (total)	69.7	J	0.266	0.655	mg/Kg	310	56.2	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Iron (total)	23690	J	2.05	13.1	mg/Kg	2300	234000	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Lead (total)	551		0.372	0.655	mg/Kg	**40**	48.6	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Magnesium (total)	4110		0.767	13.1	mg/Kg		10400	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Manganese (total)	294	J	0.171	1.31	mg/Kg	180	3506	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW7471A	Mercury (total)	0.184	J	0.00127	0.013	mg/Kg	2.3	0.1	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Nickel (total)	29.1		0.112	0.655	mg/Kg	160	55.1	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Potassium (total)	1500	J	4.69	13.1	mg/Kg		3390	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Selenium (total)	1.57	J	0.212	0.655	mg/Kg	39	2	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Silver (total)	0.52	J	0.118	0.655	mg/Kg	39	11.1	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Sodium (total)	764	J	4.76	13.1	mg/Kg			N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Thallium (total)	2.44		1.31	2.62	mg/Kg	**0.52**	1.3	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Vanadium (total)	23.4		0.119	0.655	mg/Kg		40.9	N1
TR09-1	5/19/2004	16:35	GEL	PBOW-04-SO-2BG-TR09-1-A	1	1.5	SW6010B	Zinc (total)	267	J	0.221	0.655	mg/Kg	2300	322	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-15

Summary of Volatile Organic Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/26/2004	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8260	1,1-Dichloroethene	1		0.434	0.87	ug/Kg	12000	N1
BH09	5/26/2004	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8260	Acetone	6.4		3.06	4.3	ug/Kg	1400000	N1
BH09	5/26/2004	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8260	Cyclohexane	3.9		0.417	1.7	ug/Kg	280000	N1
BH09	5/26/2004	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8260	Styrene	1		0.339	0.87	ug/Kg	440000	N1
BH10	5/26/2004	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8260	1,1-Dichloroethene	0.57	J	0.431	0.86	ug/Kg	12000	N1
BH10	5/26/2004	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8260	Acetone	9.4		3.04	4.3	ug/Kg	1400000	N1
BH11	5/24/2004	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW8260	1,1-Dichloroethene	0.48	J	0.41	0.82	ug/Kg	12000	N1
BH11	5/24/2004	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8260	Acetone	6.9	BJ	3.33	4.9	ug/Kg	1400000	N1
BH12	5/24/2004	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8260	1,1-Dichloroethene	1.3		0.333	0.77	ug/Kg	12000	N1
BH12	5/24/2004	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8260	Acetone	8.8	J	2.34	3.8	ug/Kg	1400000	N1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8260	1,1,1-Trichloroethane	7.9	J	0.437	0.82	ug/Kg	200000	N1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8260	1,1-Dichloroethane	0.64	J	0.388	0.82	ug/Kg	51000	N1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8260	1,1-Dichloroethene	0.59	J	0.413	0.82	ug/Kg	12000	N1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8260	Tetrachloroethene (PCE)	2.2	J	0.314	0.82	ug/Kg	480	N1
BH13	5/24/2004	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8260	1,1-Dichloroethene	2.1		0.445	0.89	ug/Kg	12000	N1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8260	1,1,1-Trichloroethane	8.6	J	0.57	1.1	ug/Kg	200000	FD1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8260	1,1-Dichloroethane	0.7	J	0.506	1.1	ug/Kg	51000	FD1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8260	1,1-Dichloroethene	0.94	J	0.538	1.1	ug/Kg	12000	FD1
BH13	5/24/2004	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8260	Tetrachloroethene (PCE)	2.6	J	0.409	1.1	ug/Kg	480	FD1
BH14	5/24/2004	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW8260	1,1,1-Trichloroethane	1.1	J	0.481	0.91	ug/Kg	200000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8260	1,1,1-Trichloroethane	12.3		0.498	0.94	ug/Kg	200000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8260	1,1-Dichloroethane	0.67	J	0.442	0.94	ug/Kg	51000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8260	1,1-Dichloroethene	0.62	J	0.47	0.94	ug/Kg	12000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8260	Tetrachloroethene (PCE)	2.9		0.357	0.94	ug/Kg	480	N1
BH15	5/25/2004	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8260	1,1,1-Trichloroethane	15.3		0.496	0.94	ug/Kg	200000	N1
BH15	5/25/2004	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8260	1,1-Dichloroethane	1.7		0.44	0.94	ug/Kg	51000	N1
BH15	5/25/2004	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8260	1,1-Dichloroethene	0.69	J	0.468	0.94	ug/Kg	12000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW8260	1,1,1-Trichloroethane	11.5		0.478	0.9	ug/Kg	200000	FD1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW8260	1,1-Dichloroethane	0.65	J	0.423	0.9	ug/Kg	51000	FD1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW8260	Tetrachloroethene (PCE)	3		0.342	0.9	ug/Kg	480	FD1
BH16	5/25/2004	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW8260	1,1,1-Trichloroethane	0.8	J	0.479	0.9	ug/Kg	200000	N1
BH16	5/25/2004	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW8260	Tetrachloroethene (PCE)	1.2		0.343	0.9	ug/Kg	480	N1
BH16	5/25/2004	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8260	1,1,1-Trichloroethane	0.77	J	0.504	0.95	ug/Kg	200000	N1
BH16	5/25/2004	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8260	1,1-Dichloroethane	0.84	J	0.447	0.95	ug/Kg	51000	N1
BH16	5/25/2004	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8260	1,1-Dichloroethene	0.5	J	0.476	0.95	ug/Kg	12000	N1
BH17	5/26/2004	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8260	1,1-Dichloroethene	1.1		0.438	0.88	ug/Kg	12000	N1
BH17	5/26/2004	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8260	2-Butanone (Methyl ethyl ketone)	3.6	J	3.27	4.4	ug/Kg	2200000	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-15

Summary of Volatile Organic Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH17	5/26/2004	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8260	Acetone	22.4		3.08	4.4	ug/Kg	1400000	N1
BH17	5/26/2004	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8260	Cyclohexane	0.83	J	0.42	1.8	ug/Kg	280000	N1
BH17	5/26/2004	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8260	1,1-Dichloroethene	0.59	J	0.452	0.9	ug/Kg	12000	N1
BH18	5/26/2004	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8260	1,1-Dichloroethene	1.9		0.437	0.87	ug/Kg	12000	N1
BH18	5/26/2004	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8260	Cyclohexane	2.8	J	0.451	1.9	ug/Kg	280000	N1
BH19	5/26/2004	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8260	1,1-Dichloroethene	2.2		0.453	0.9	ug/Kg	12000	N1
BH19	5/26/2004	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8260	2-Butanone (Methyl ethyl ketone)	4.2	J	3.39	4.5	ug/Kg	2200000	N1
BH19	5/26/2004	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8260	Acetone	22.1		3.19	4.5	ug/Kg	1400000	N1
BH19	5/26/2004	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8260	Methylene Chloride	1.9	J	1.22	4.5	ug/Kg	9100	N1
BH19	5/26/2004	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8260	1,1-Dichloroethene	0.58	J	0.475	0.95	ug/Kg	12000	N1
BH19	5/26/2004	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8260	Acetone	8.8		3.34	4.7	ug/Kg	1400000	N1
BH19	5/26/2004	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8260	Cyclohexane	0.63	J	0.456	1.9	ug/Kg	280000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8260	1,1,1-Trichloroethane	0.67	J	0.483	0.91	ug/Kg	200000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8260	1,1-Dichloroethene	0.62	J	0.455	0.91	ug/Kg	12000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8260	Cyclohexane	2.9		0.437	1.8	ug/Kg	280000	N1
BH20	5/25/2004	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8260	1,1-Dichloroethane	1.6		0.439	0.93	ug/Kg	51000	N1
BH20	5/25/2004	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8260	1,1-Dichloroethene	2		0.467	0.93	ug/Kg	12000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW8260	1,1,1-Trichloroethane	1.5		0.46	0.87	ug/Kg	200000	FD1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW8260	Tetrachloroethene (PCE)	0.87		0.33	0.87	ug/Kg	480	FD1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-16

Summary of Nitroaromatic Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8330	2,4,6-Trinitrotoluene	950	J	125	375	ug/Kg	16000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8330	2,4-Dinitrotoluene	700	J	125	375	ug/Kg	12000	N1
BH15	5/25/2004	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8330	2,4,6-Trinitrotoluene	311	J	125	375	ug/Kg	16000	N1
BH15	5/25/2004	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8330	2,4-Dinitrotoluene	506		125	375	ug/Kg	12000	N1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW8330	2,4,6-Trinitrotoluene	683		125	375	ug/Kg	16000	FD1
BH15	5/25/2004	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW8330	2,4-Dinitrotoluene	809		125	375	ug/Kg	12000	FD1
BH16	5/25/2004	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW8330	2,4,6-Trinitrotoluene	763		125	375	ug/Kg	16000	N1
BH16	5/25/2004	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW8330	2,4-Dinitrotoluene	417	J	125	375	ug/Kg	12000	N1
BH16	5/25/2004	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8330	2,4,6-Trinitrotoluene	229	J	125	375	ug/Kg	16000	N1
BH16	5/25/2004	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8330	2,4-Dinitrotoluene	639		125	375	ug/Kg	12000	N1
BH18	5/26/2004	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8330	2,4,6-Trinitrotoluene	17900	J	125	375	ug/Kg	**16000**	N1
BH18	5/26/2004	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8330	2,4-Dinitrotoluene	19200	J	125	375	ug/Kg	**12000**	N1
BH18	5/26/2004	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8330	2,6-Dinitrotoluene	15400	J	125	375	ug/Kg	**6100**	N1
BH18	5/26/2004	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8330	2-Amino-4,6-Dinitrotoluene	4980	J	125	375	ug/Kg		N1
BH19	5/26/2004	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8330	2,4,6-Trinitrotoluene	423		125	375	ug/Kg	16000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8330	2,4,6-Trinitrotoluene	249	J	125	375	ug/Kg	16000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8330	2,4-Dinitrotoluene	370	J	125	375	ug/Kg	12000	N1
BH20	5/25/2004	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW8330	2,4,6-Trinitrotoluene	539		125	375	ug/Kg	16000	FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-17
Summary of PAH Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH09	5/26/2004	10:05	ECEN	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8310	Benzo(a)pyrene	10.6	J	10.3	22.8	ug/Kg	62	N1
BH09	5/26/2004	10:05	ECEN	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	191	NJ	3.86	22.8	ug/Kg	6200	N1
BH10	5/26/2004	9:34	ECEN	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	173	NJ	4.08	24.1	ug/Kg	6200	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Acenaphthylene	68.8	J	41.8	115	ug/Kg		N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Anthracene	10.6	J	4.77	11.5	ug/Kg	2200000	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Benzo(a)pyrene	15.6	J	10.4	23	ug/Kg	62	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	21.1	J	4.11	23	ug/Kg	620	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	84	NJ	3.9	23	ug/Kg	6200	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Chrysene	16.7	J	6.11	57.7	ug/Kg	62000	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Fluoranthene	82.1	J	24.2	115	ug/Kg	230000	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	15	J	3.7	23	ug/Kg	620	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Naphthalene	94.3	J	28	115	ug/Kg	5600	N1
BH10	5/26/2004	9:51	ECEN	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW8310	Phenanthrene	54.8	J	20.1	115	ug/Kg		N1
BH11	5/24/2004	9:46	ECEN	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	70	NJ	3.99	23.6	ug/Kg	6200	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Acenaphthylene	115	NJ	37.7	104	ug/Kg		N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Anthracene	16.1	NJ	4.3	10.4	ug/Kg	2200000	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Benzo(a)pyrene	28.6	NJ	9.38	20.8	ug/Kg	62	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	91.5	NJ	3.52	20.8	ug/Kg	6200	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Chrysene	30.5	J	5.52	52	ug/Kg	62000	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Fluoranthene	227	NJ	21.8	104	ug/Kg	230000	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	12.7	J	3.33	20.8	ug/Kg	620	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Naphthalene	51.2	J	25.3	104	ug/Kg	5600	N1
BH11	5/24/2004	10:04	ECEN	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW8310	Phenanthrene	101	J	18.1	104	ug/Kg		N1
BH12	5/24/2004	8:49	ECEN	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW8310	Benzo(a)pyrene	13.8	J	10.6	23.6	ug/Kg	62	N1
BH12	5/24/2004	8:49	ECEN	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	30.9	NJ	4	23.6	ug/Kg	6200	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Acenaphthylene	169	NJ	41.6	114	ug/Kg		N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Anthracene	22.8	NJ	4.74	11.4	ug/Kg	2200000	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Benzo(a)pyrene	25.6	NJ	10.3	22.9	ug/Kg	62	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	18.8	J	4.09	22.9	ug/Kg	620	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	142	NJ	3.88	22.9	ug/Kg	6200	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Chrysene	28.3	J	6.08	57.4	ug/Kg	62000	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Fluoranthene	298	NJ	24.1	114	ug/Kg	230000	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	19.5	J	3.68	22.9	ug/Kg	620	N1
BH12	5/24/2004	9:10	ECEN	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW8310	Phenanthrene	175	NJ	20	114	ug/Kg		N1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8310	Benzo(a)pyrene	12.5	J	10.8	23.8	ug/Kg	62	N1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	120	NJ	4.04	23.8	ug/Kg	6200	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Acenaphthylene	408	NJ	44.6	123	ug/Kg		N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-17
Summary of PAH Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Anthracene	14.6	NJ	5.08	12.3	ug/Kg	2200000	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	18.7	J	4.38	24.6	ug/Kg	620	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	159	NJ	4.16	24.6	ug/Kg	6200	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Chrysene	23.3	J	6.52	61.5	ug/Kg	62000	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Fluoranthene	216	NJ	25.8	123	ug/Kg	230000	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Fluorene	50.1	J	27.6	246	ug/Kg	270000	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	23.1	J	3.94	24.6	ug/Kg	620	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Naphthalene	256	NJ	29.9	123	ug/Kg	5600	N1
BH13	5/24/2004	11:28	ECEN	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW8310	Phenanthrene	130	NJ	21.4	123	ug/Kg		N1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8310	Benzo(a)pyrene	14.1	J	10.8	23.8	ug/Kg	62	FD1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8310	Benzo(b)fluoranthene	13	J	4.25	23.8	ug/Kg	620	FD1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8310	Benzo(k)fluoranthene	74.5	NJ	4.04	23.8	ug/Kg	6200	FD1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8310	Fluoranthene	25.7	J	25.1	119	ug/Kg	230000	FD1
BH13	5/24/2004	10:56	ECEN	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW8310	Indeno(1,2,3-cd)pyrene	16.7	J	3.82	23.8	ug/Kg	620	FD1
BH14	5/24/2004	14:58	ECEN	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW8310	Benzo(a)pyrene	13.4	J	11	24.4	ug/Kg	62	N1
BH14	5/24/2004	14:58	ECEN	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW8310	Benzo(b)fluoranthene	7.88	J	4.35	24.4	ug/Kg	620	N1
BH14	5/24/2004	14:58	ECEN	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	45.6	NJ	4.13	24.4	ug/Kg	6200	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Acenaphthene	169	NJ	80.2	120	ug/Kg	370000	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Acenaphthylene	60.8	J	43.7	120	ug/Kg		N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Anthracene	11.3	J	4.99	12	ug/Kg	2200000	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Benzo(a)pyrene	16.6	J	10.9	24.1	ug/Kg	62	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	27.3	NJ	4.3	24.1	ug/Kg	620	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	129	NJ	4.08	24.1	ug/Kg	6200	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Chrysene	19	J	6.4	60.3	ug/Kg	62000	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Fluoranthene	83.6	J	25.3	120	ug/Kg	230000	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	16.5	J	3.87	24.1	ug/Kg	620	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Naphthalene	71.2	J	29.3	120	ug/Kg	5600	N1
BH14	5/24/2004	15:16	ECEN	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW8310	Phenanthrene	83.9	J	21	120	ug/Kg		N1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8310	Acenaphthylene	66.5	J	44.6	123	ug/Kg		N1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8310	Benzo(a)pyrene	13.1	J	11.1	24.6	ug/Kg	62	N1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8310	Benzo(b)fluoranthene	5.4	J	4.39	24.6	ug/Kg	620	N1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	42.7	NJ	4.17	24.6	ug/Kg	6200	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Anthracene	5.15	J	5.11	12.3	ug/Kg	2200000	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	17.9	J	4.41	24.7	ug/Kg	620	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Benzo(g,h,i)perylene	51.9	J	16	61.8	ug/Kg		N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	61.6	NJ	4.18	24.7	ug/Kg	6200	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Chrysene	14.2	J	6.55	61.8	ug/Kg	62000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

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Summary of PAH Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Fluoranthene	30.6	J	26	123	ug/Kg	230000	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	10.8	J	3.96	24.7	ug/Kg	620	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Naphthalene	57.3	J	30	123	ug/Kg	5600	N1
BH15	5/25/2004	10:13	ECEN	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW8310	Phenanthrene	37.9	J	21.5	123	ug/Kg		N1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15D(3-5)	3	5	SW8310	Acenaphthylene	52	J	45.1	124	ug/Kg		FD1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15D(3-5)	3	5	SW8310	Benzo(a)pyrene	14.7	J	11.2	24.9	ug/Kg	62	FD1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15D(3-5)	3	5	SW8310	Benzo(b)fluoranthene	4.85	J	4.44	24.9	ug/Kg	620	FD1
BH15	5/25/2004	9:50	ECEN	PBOW-04-SO-2BG-BH15D(3-5)	3	5	SW8310	Benzo(k)fluoranthene	46.9	NJ	4.22	24.9	ug/Kg	6200	FD1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Anthracene	4.93	J	4.66	11.2	ug/Kg	2200000	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Benzo(a)pyrene	12.4	J	10.2	22.5	ug/Kg	62	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	14.3	J	4.02	22.5	ug/Kg	620	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Chrysene	12.8	J	5.98	56.4	ug/Kg	62000	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Fluoranthene	28.4	J	23.7	112	ug/Kg	230000	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	9.89	J	3.61	22.5	ug/Kg	620	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Naphthalene	57.6	J	27.4	112	ug/Kg	5600	N1
BH16	5/25/2004	8:48	ECEN	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW8310	Phenanthrene	22.6	J	19.7	112	ug/Kg		N1
BH17	5/26/2004	11:44	ECEN	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8310	Benzo(b)fluoranthene	4	J	3.92	22	ug/Kg	620	N1
BH17	5/26/2004	11:44	ECEN	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	104	NJ	3.72	22	ug/Kg	6200	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Acenaphthylene	146	NJ	37.5	103	ug/Kg		N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Anthracene	10.9	NJ	4.28	10.3	ug/Kg	2200000	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Benzo(a)pyrene	23.4	NJ	9.33	20.7	ug/Kg	62	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	17.7	J	3.69	20.7	ug/Kg	620	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Benzo(g,h,i)perylene	49.4	J	13.4	51.7	ug/Kg		N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	94.2	NJ	3.5	20.7	ug/Kg	6200	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Chrysene	26.3	J	5.48	51.7	ug/Kg	62000	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Fluoranthene	59.5	J	21.7	103	ug/Kg	230000	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	12.9	J	3.32	20.7	ug/Kg	620	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Naphthalene	74.8	J	25.1	103	ug/Kg	5600	N1
BH17	5/26/2004	11:48	ECEN	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW8310	Phenanthrene	33.6	J	18	103	ug/Kg		N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Acenaphthylene	67.5	J	42.6	117	ug/Kg		N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Benzo(a)pyrene	18.9	J	10.6	23.5	ug/Kg	62	N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Benzo(b)fluoranthene	6.98	J	4.19	23.5	ug/Kg	620	N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	146	NJ	3.98	23.5	ug/Kg	6200	N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Dibenz(a,h)anthracene	39.6	NJ	9.19	23.5	ug/Kg	62	N1
BH18	5/26/2004	11:05	ECEN	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW8310	Naphthalene	234	NJ	28.5	117	ug/Kg	5600	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Anthracene	5.72	J	4.68	11.3	ug/Kg	2200000	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	17.2	J	4.03	22.6	ug/Kg	620	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

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Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Benzo(g,h,i)perylene	50.8	J	14.7	56.6	ug/Kg		N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	77.2	NJ	3.83	22.6	ug/Kg	6200	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Chrysene	18.9	J	6	56.6	ug/Kg	62000	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Fluoranthene	37	J	23.7	113	ug/Kg	230000	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	11.5	J	3.83	22.6	ug/Kg	620	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Naphthalene	37.9	J	27.5	113	ug/Kg	5600	N1
BH18	5/26/2004	11:18	ECEN	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW8310	Phenanthrene	24.2	J	19.7	113	ug/Kg		N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Acenaphthene	241	NJ	71.2	107	ug/Kg	370000	N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Acenaphthylene	42.2	J	38.8	107	ug/Kg		N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Anthracene	4.69	J	4.43	10.7	ug/Kg	2200000	N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Benzo(a)anthracene	9.7	J	7.82	10.7	ug/Kg	620	N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	103	NJ	3.62	21.4	ug/Kg	6200	N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Fluorene	25.6	J	24.1	214	ug/Kg	270000	N1
BH19	5/26/2004	12:15	ECEN	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW8310	Phenanthrene	247	NJ	18.7	107	ug/Kg		N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Acenaphthylene	73.1	J	40.7	112	ug/Kg		N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Anthracene	9.15	J	4.64	11.2	ug/Kg	2200000	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Benzo(a)anthracene	24.3	NJ	8.2	11.2	ug/Kg	620	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Benzo(a)pyrene	27.9	NJ	10.1	22.4	ug/Kg	62	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	29.9	NJ	4	22.4	ug/Kg	620	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Benzo(g,h,i)perylene	70.9	NJ	14.5	56.1	ug/Kg		N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	41.7	NJ	3.8	22.4	ug/Kg	6200	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Chrysene	63.4	NJ	5.95	56.1	ug/Kg	62000	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Fluoranthene	110	J	23.6	112	ug/Kg	230000	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Fluorene	162	J	25.2	224	ug/Kg	270000	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	18.2	J	3.59	22.4	ug/Kg	620	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Naphthalene	52.2	J	27.2	112	ug/Kg	5600	N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Phenanthrene	98.7	J	19.6	112	ug/Kg		N1
BH19	5/26/2004	12:31	ECEN	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW8310	Pyrene	96.2	J	27.9	112	ug/Kg	230000	N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Acenaphthene	90.9	J	78.8	118	ug/Kg	370000	N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Acenaphthylene	78.6	J	42.9	118	ug/Kg		N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Benzo(a)anthracene	11.2	J	8.66	11.8	ug/Kg	620	N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Benzo(k)fluoranthene	59.2	NJ	4.01	23.7	ug/Kg	6200	N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Dibenz(a,h)anthracene	16.1	J	9.26	23.7	ug/Kg	62	N1
BH20	5/25/2004	11:31	ECEN	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW8310	Indeno(1,2,3-cd)pyrene	151	NJ	3.8	23.7	ug/Kg	620	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Benzo(a)pyrene	12.4	J	10.8	23.8	ug/Kg	62	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Benzo(b)fluoranthene	15.9	J	4.25	23.8	ug/Kg	620	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Benzo(g,h,i)perylene	35.7	J	15.5	59.7	ug/Kg		N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-17
Summary of PAH Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Benzo(k)fluoranthene	74.6	NJ	4.04	23.8	ug/Kg	6200	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Chrysene	13.9	J	6.32	59.7	ug/Kg	62000	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Indeno(1,2,3-cd)pyrene	9.59	J	3.82	23.8	ug/Kg	620	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Naphthalene	68.1	J	29	119	ug/Kg	5600	N1
BH20	5/25/2004	11:39	ECEN	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW8310	Phenanthrene	42	J	20.8	119	ug/Kg		N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Aluminum (total)	15750		0.937	11.8	mg/Kg	**7600**	15500	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Arsenic (total)	21.7	J	0.244	0.591	mg/Kg	0.39	36.5	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Barium (total)	263	J	0.0788	0.591	mg/Kg	540	826	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Beryllium (total)	0.946		0.0591	0.591	mg/Kg		1	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Cadmium (total)	1.74	J	0.0565	0.591	mg/Kg	3.7		N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Calcium (total)	3330	J	1.54	11.8	mg/Kg		52300	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Chromium (total)	23.5		0.19	0.591	mg/Kg		29	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Cobalt (total)	30.1	J	0.0943	0.591	mg/Kg	90	116	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Copper (total)	73	J	0.24	0.591	mg/Kg	310	56.2	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Iron (total)	32720	J	1.85	11.8	mg/Kg	2300	234000	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Lead (total)	18.7	J	0.335	0.591	mg/Kg	40	48.6	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Magnesium (total)	4270		0.691	11.8	mg/Kg		10400	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Manganese (total)	3870	J	0.155	1.18	mg/Kg	**180**	3506	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW7471A	Mercury (total)	0.0309		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Nickel (total)	96.5	J	0.101	0.591	mg/Kg	160	55.1	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Potassium (total)	2310	J	4.23	11.8	mg/Kg		3390	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Selenium (total)	1.77		0.192	0.591	mg/Kg	39	2	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Silver (total)	0.973		0.107	0.591	mg/Kg	39	11.1	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Sodium (total)	82.3		4.29	11.8	mg/Kg			N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Vanadium (total)	41.4		0.107	0.591	mg/Kg		40.9	N1
BH09	5/26/04	10:05	GEL	PBOW-04-SO-2BG-BH09A(3-5)	3	5	SW6010B	Zinc (total)	80.3	J	0.199	0.591	mg/Kg	2300	322	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Aluminum (total)	12060		0.985	12.2	mg/Kg	7600	15500	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Antimony (total)	0.519	BJ	0.418	1.22	mg/Kg	3.1	9.3	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Arsenic (total)	8.92	J	0.251	0.608	mg/Kg	0.39	36.5	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Barium (total)	71.1	J	0.0812	0.608	mg/Kg	540	826	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Beryllium (total)	0.577	J	0.0608	0.608	mg/Kg		1	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Cadmium (total)	0.335	J	0.0582	0.608	mg/Kg	3.7		N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Calcium (total)	53990	J	1.59	12.2	mg/Kg		52300	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Chromium (total)	18.7		0.196	0.608	mg/Kg		29	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Cobalt (total)	10.7	J	0.0971	0.608	mg/Kg	90	116	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Copper (total)	48.4	J	0.247	0.608	mg/Kg	310	56.2	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Iron (total)	23710	J	1.91	12.2	mg/Kg	2300	234000	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Lead (total)	11.6	J	0.345	0.608	mg/Kg	40	48.6	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Magnesium (total)	16840		0.712	12.2	mg/Kg		10400	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Manganese (total)	501	J	0.159	1.22	mg/Kg	180	3506	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW7471A	Mercury (total)	0.0151		0.00121	0.0123	mg/Kg	2.3	0.1	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Nickel (total)	26.4	J	0.104	0.608	mg/Kg	160	55.1	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Potassium (total)	2740	J	4.35	12.2	mg/Kg		3390	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Selenium (total)	2.14		0.197	0.608	mg/Kg	39	2	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Silver (total)	0.208	J	0.11	0.608	mg/Kg	39	11.1	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Sodium (total)	156		4.42	12.2	mg/Kg			N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Vanadium (total)	28.7		0.11	0.608	mg/Kg		40.9	N1
BH09	5/26/04	10:15	GEL	PBOW-04-SO-2BG-BH09A(8-10)	8	10	SW6010B	Zinc (total)	63.2	J	0.205	0.608	mg/Kg	2300	322	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Aluminum (total)	16450		1	12.6	mg/Kg	**7600**	15500	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Arsenic (total)	6.1	J	0.26	0.63	mg/Kg	0.39	36.5	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Barium (total)	89.7	J	0.0841	0.63	mg/Kg	540	826	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Beryllium (total)	0.816		0.063	0.63	mg/Kg		1	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Cadmium (total)	0.145	BJ	0.0602	0.63	mg/Kg	3.7		N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Calcium (total)	4530		1.64	12.6	mg/Kg		52300	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Chromium (total)	22.3		0.203	0.63	mg/Kg		29	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Cobalt (total)	6.3	J	0.101	0.63	mg/Kg	90	116	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Copper (total)	26.3	J	0.256	0.63	mg/Kg	310	56.2	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Iron (total)	21910	J	1.97	12.6	mg/Kg	2300	234000	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Lead (total)	11.8	J	0.358	0.63	mg/Kg	40	48.6	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Magnesium (total)	4300		0.737	12.6	mg/Kg		10400	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Manganese (total)	283	J	0.165	1.26	mg/Kg	180	3506	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW7471A	Mercury (total)	0.0346		0.00123	0.0125	mg/Kg	2.3	0.1	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Nickel (total)	24.3	J	0.108	0.63	mg/Kg	160	55.1	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Potassium (total)	2170	J	4.51	12.6	mg/Kg		3390	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Selenium (total)	0.527	BJ	0.204	0.63	mg/Kg	39	2	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Silver (total)	0.37	J	0.114	0.63	mg/Kg	39	11.1	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Sodium (total)	78		4.58	12.6	mg/Kg			N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Thallium (total)	1.44	J	1.26	2.52	mg/Kg	**0.52**	1.3	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Vanadium (total)	34		0.114	0.63	mg/Kg		40.9	N1
BH10	5/26/04	9:34	GEL	PBOW-04-SO-2BG-BH10A(3-5)	3	5	SW6010B	Zinc (total)	64.3		0.212	0.63	mg/Kg	2300	322	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Aluminum (total)	233600		19.3	243	mg/Kg	**7600**	15500	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Arsenic (total)	131	J	5.02	12.2	mg/Kg	**0.39**	36.5	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Barium (total)	798	J	1.62	12.2	mg/Kg	540	826	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Beryllium (total)	11.4	J	1.22	12.2	mg/Kg		1	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Cadmium (total)	8.64	J	1.16	12.2	mg/Kg	3.7		N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Calcium (total)	1173000	J	31.7	243	mg/Kg		52300	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Chromium (total)	367		3.92	12.2	mg/Kg		29	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Cobalt (total)	166	J	1.94	12.2	mg/Kg	**90**	116	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Copper (total)	504	J	4.94	12.2	mg/Kg	**310**	56.2	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Iron (total)	412600	J	38.1	243	mg/Kg	**2300**	234000	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Lead (total)	227	J	6.9	12.2	mg/Kg	**40**	48.6	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Magnesium (total)	383100		14.2	243	mg/Kg		10400	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Manganese (total)	8230	J	3.18	24.3	mg/Kg	**180**	3506	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW7471A	Mercury (total)	0.0142		0.00118	0.012	mg/Kg	2.3	0.1	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Nickel (total)	475	J	2.08	12.2	mg/Kg	**160**	55.1	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Potassium (total)	58210	J	86.9	243	mg/Kg		3390	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Selenium (total)	51.8		3.94	12.2	mg/Kg	**39**	2	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Silver (total)	3.21	J	2.19	12.2	mg/Kg	39	11.1	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Sodium (total)	3690		88.3	243	mg/Kg			N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Vanadium (total)	536		2.21	12.2	mg/Kg		40.9	N1
BH10	5/26/04	9:51	GEL	PBOW-04-SO-2BG-BH10A(8-10)	8	10	SW6010B	Zinc (total)	1140	J	4.09	12.2	mg/Kg	2300	322	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Aluminum (total)	13370		0.926	11.7	mg/Kg	7600	15500	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Arsenic (total)	9.59		0.241	0.584	mg/Kg	0.39	36.5	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Barium (total)	87.7		0.0779	0.584	mg/Kg	540	826	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Beryllium (total)	0.712		0.0584	0.584	mg/Kg		1	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Cadmium (total)	0.125	J	0.0558	0.584	mg/Kg	3.7		N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Calcium (total)	3750		1.52	11.7	mg/Kg		52300	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Chromium (total)	20.7		0.188	0.584	mg/Kg		29	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Cobalt (total)	7.86		0.0932	0.584	mg/Kg	90	116	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Copper (total)	17.6		0.237	0.584	mg/Kg	310	56.2	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Iron (total)	22790		1.83	11.7	mg/Kg	2300	234000	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Lead (total)	11.3		0.331	0.584	mg/Kg	40	48.6	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Magnesium (total)	3340		0.683	11.7	mg/Kg		10400	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Manganese (total)	366		0.153	1.17	mg/Kg	180	3506	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW7471A	Mercury (total)	0.0286		0.00111	0.0113	mg/Kg	2.3	0.1	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Nickel (total)	23.4		0.0997	0.584	mg/Kg	160	55.1	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Potassium (total)	1770		4.18	11.7	mg/Kg		3390	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Selenium (total)	1.2		0.189	0.584	mg/Kg	39	2	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Sodium (total)	68		4.24	11.7	mg/Kg			N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Vanadium (total)	33.6		0.106	0.584	mg/Kg		40.9	N1
BH11	5/24/04	9:46	GEL	PBOW-04-SO-2BG-BH11A(3-5)	3	5	SW6010B	Zinc (total)	53.1		0.197	0.584	mg/Kg	2300	322	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Aluminum (total)	14950		0.981	12.4	mg/Kg	7600	15500	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Arsenic (total)	7.14		0.255	0.619	mg/Kg	0.39	36.5	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Barium (total)	75.8		0.0825	0.619	mg/Kg	540	826	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Beryllium (total)	0.697		0.0619	0.619	mg/Kg		1	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Cadmium (total)	0.249	J	0.0591	0.619	mg/Kg	3.7		N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Calcium (total)	52810		1.61	12.4	mg/Kg		52300	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Chromium (total)	22.5		0.199	0.619	mg/Kg		29	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Cobalt (total)	11		0.0987	0.619	mg/Kg	90	116	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Copper (total)	24.1		0.251	0.619	mg/Kg	310	56.2	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Iron (total)	23390		1.94	12.4	mg/Kg	2300	234000	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Lead (total)	9.83		0.351	0.619	mg/Kg	40	48.6	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Magnesium (total)	14220		0.723	12.4	mg/Kg		10400	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Manganese (total)	395		0.162	1.24	mg/Kg	180	3506	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW7471A	Mercury (total)	0.0157		0.00118	0.012	mg/Kg	2.3	0.1	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Nickel (total)	27.7		0.106	0.619	mg/Kg	160	55.1	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Potassium (total)	3880		4.42	12.4	mg/Kg		3390	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Selenium (total)	3.06		0.201	0.619	mg/Kg	39	2	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Sodium (total)	186		4.49	12.4	mg/Kg			N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Vanadium (total)	31.6		0.112	0.619	mg/Kg		40.9	N1
BH11	5/24/04	10:04	GEL	PBOW-04-SO-2BG-BH11A(8-10)	8	10	SW6010B	Zinc (total)	54.9		0.208	0.619	mg/Kg	2300	322	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Aluminum (total)	12360		0.947	11.9	mg/Kg	7600	15500	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Arsenic (total)	13.6		0.247	0.597	mg/Kg	0.39	36.5	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Barium (total)	70.2		0.0797	0.597	mg/Kg	540	826	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Beryllium (total)	0.734		0.0597	0.597	mg/Kg		1	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Cadmium (total)	0.0779	J	0.0571	0.597	mg/Kg	3.7		N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Calcium (total)	3030		1.56	11.9	mg/Kg		52300	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Chromium (total)	20		0.192	0.597	mg/Kg		29	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Cobalt (total)	9.57		0.0953	0.597	mg/Kg	90	116	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Copper (total)	23.4		0.243	0.597	mg/Kg	310	56.2	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Iron (total)	26430		1.87	11.9	mg/Kg	2300	234000	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Lead (total)	13		0.339	0.597	mg/Kg	40	48.6	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Magnesium (total)	3440		0.699	11.9	mg/Kg		10400	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Manganese (total)	426		0.156	1.19	mg/Kg	180	3506	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW7471A	Mercury (total)	0.0243		0.00111	0.0113	mg/Kg	2.3	0.1	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Nickel (total)	27.3		0.102	0.597	mg/Kg	160	55.1	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Potassium (total)	1880		4.27	11.9	mg/Kg		3390	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Selenium (total)	0.785	B	0.194	0.597	mg/Kg	39	2	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Sodium (total)	76.7		4.34	11.9	mg/Kg			N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Vanadium (total)	36.9		0.108	0.597	mg/Kg		40.9	N1
BH12	5/24/04	8:49	GEL	PBOW-04-SO-2BG-BH12A(3-5)	3	5	SW6010B	Zinc (total)	52.7		0.201	0.597	mg/Kg	2300	322	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Aluminum (total)	11720		0.91	11.5	mg/Kg	7600	15500	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Antimony (total)	0.413	J	0.394	1.15	mg/Kg	3.1	9.3	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-16

Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Arsenic (total)	12.6		0.237	0.574	mg/Kg	0.39	36.5	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Barium (total)	61.4		0.0765	0.574	mg/Kg	540	826	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Beryllium (total)	0.562	J	0.0574	0.574	mg/Kg		1	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Cadmium (total)	0.272	J	0.0549	0.574	mg/Kg	3.7		N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Calcium (total)	60300		1.5	11.5	mg/Kg		52300	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Chromium (total)	17.6		0.185	0.574	mg/Kg		29	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Cobalt (total)	10		0.0916	0.574	mg/Kg	90	116	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Copper (total)	28.6		0.233	0.574	mg/Kg	310	56.2	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Iron (total)	23250		1.8	11.5	mg/Kg	2300	234000	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Lead (total)	9.75		0.326	0.574	mg/Kg	40	48.6	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Magnesium (total)	14940		0.671	11.5	mg/Kg		10400	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Manganese (total)	446		0.15	1.15	mg/Kg	180	3506	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW7471A	Mercury (total)	0.0148		0.00115	0.0117	mg/Kg	2.3	0.1	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Nickel (total)	29.6		0.098	0.574	mg/Kg	160	55.1	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Potassium (total)	3480		4.1	11.5	mg/Kg		3390	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Selenium (total)	2.68		0.186	0.574	mg/Kg	39	2	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Sodium (total)	165		4.17	11.5	mg/Kg			N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Vanadium (total)	23.5		0.104	0.574	mg/Kg		40.9	N1
BH12	5/24/04	9:10	GEL	PBOW-04-SO-2BG-BH12A(8-10)	8	10	SW6010B	Zinc (total)	57.9		0.193	0.574	mg/Kg	2300	322	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Aluminum (total)	13140		0.941	11.9	mg/Kg	7600	15500	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Arsenic (total)	12.8		0.245	0.593	mg/Kg	0.39	36.5	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Barium (total)	112		0.0791	0.593	mg/Kg	540	826	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Beryllium (total)	0.793		0.0593	0.593	mg/Kg		1	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Cadmium (total)	0.299	J	0.0567	0.593	mg/Kg	3.7		N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Calcium (total)	3420		1.55	11.9	mg/Kg		52300	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Chromium (total)	20.6		0.191	0.593	mg/Kg		29	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Cobalt (total)	16.2	J	0.0946	0.593	mg/Kg	90	116	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Copper (total)	25.7		0.241	0.593	mg/Kg	310	56.2	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Iron (total)	24350		1.86	11.9	mg/Kg	2300	234000	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Lead (total)	14		0.336	0.593	mg/Kg	40	48.6	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Magnesium (total)	3590		0.694	11.9	mg/Kg		10400	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Manganese (total)	1070	J	0.155	1.19	mg/Kg	180	3506	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW7471A	Mercury (total)	0.027		0.00117	0.0119	mg/Kg	2.3	0.1	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Nickel (total)	34.6		0.101	0.593	mg/Kg	160	55.1	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Potassium (total)	2060		4.24	11.9	mg/Kg		3390	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Selenium (total)	0.755	B	0.192	0.593	mg/Kg	39	2	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Sodium (total)	82.1		4.31	11.9	mg/Kg			N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Vanadium (total)	35.9		0.108	0.593	mg/Kg		40.9	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13A(3-5)	3	5	SW6010B	Zinc (total)	54.7		0.2	0.593	mg/Kg	2300	322	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Aluminum (total)	11370		0.969	12.2	mg/Kg	7600	15500	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Arsenic (total)	9.76		0.252	0.611	mg/Kg	0.39	36.5	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Barium (total)	64.1		0.0815	0.611	mg/Kg	540	826	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Beryllium (total)	0.58	J	0.0611	0.611	mg/Kg		1	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Cadmium (total)	0.415	J	0.0584	0.611	mg/Kg	3.7		N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Calcium (total)	47530		1.59	12.2	mg/Kg		52300	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Chromium (total)	18.6		0.197	0.611	mg/Kg		29	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Cobalt (total)	8.67		0.0975	0.611	mg/Kg	90	116	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Copper (total)	25.8		0.248	0.611	mg/Kg	310	56.2	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Iron (total)	21760		1.91	12.2	mg/Kg	2300	234000	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Lead (total)	10.2		0.347	0.611	mg/Kg	40	48.6	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Magnesium (total)	16400		0.714	12.2	mg/Kg		10400	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Manganese (total)	614		0.16	1.22	mg/Kg	180	3506	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW7471A	Mercury (total)	0.0195		0.00112	0.0114	mg/Kg	2.3	0.1	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Nickel (total)	28.3		0.104	0.611	mg/Kg	160	55.1	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Potassium (total)	2900		4.37	12.2	mg/Kg		3390	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Selenium (total)	3.61		0.198	0.611	mg/Kg	39	2	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Sodium (total)	164		4.44	12.2	mg/Kg			N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Vanadium (total)	30.4		0.111	0.611	mg/Kg		40.9	N1
BH13	5/24/04	11:28	GEL	PBOW-04-SO-2BG-BH13A(8-10)	8	10	SW6010B	Zinc (total)	53.7		0.206	0.611	mg/Kg	2300	322	N1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Aluminum (total)	13630		0.954	12	mg/Kg	7600	15500	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Arsenic (total)	8.43		0.248	0.601	mg/Kg	0.39	36.5	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Barium (total)	77.6		0.0802	0.601	mg/Kg	540	826	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Beryllium (total)	0.689		0.0601	0.601	mg/Kg		1	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Cadmium (total)	0.0682	J	0.0575	0.601	mg/Kg	3.7		FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Calcium (total)	3360		1.57	12	mg/Kg		52300	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Chromium (total)	20.8		0.194	0.601	mg/Kg		29	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Cobalt (total)	6.2	J	0.096	0.601	mg/Kg	90	116	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Copper (total)	17.6		0.244	0.601	mg/Kg	310	56.2	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Iron (total)	21460		1.88	12	mg/Kg	2300	234000	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Lead (total)	9.83		0.341	0.601	mg/Kg	40	48.6	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Magnesium (total)	3820		0.703	12	mg/Kg		10400	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Manganese (total)	276	J	0.157	1.2	mg/Kg	180	3506	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW7471A	Mercury (total)	0.0257		0.00115	0.0117	mg/Kg	2.3	0.1	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Nickel (total)	22.6		0.103	0.601	mg/Kg	160	55.1	FD1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected In 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Potassium (total)	2070		4.3	12	mg/Kg		3390	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Selenium (total)	0.629	B	0.195	0.601	mg/Kg	39	2	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Sodium (total)	83.6		4.37	12	mg/Kg			FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Vanadium (total)	31.6		0.109	0.601	mg/Kg		40.9	FD1
BH13	5/24/04	10:56	GEL	PBOW-04-SO-2BG-BH13D(3-5)	3	5	SW6010B	Zinc (total)	55.4		0.202	0.601	mg/Kg	2300	322	FD1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Aluminum (total)	12430		0.94	11.9	mg/Kg	7600	15500	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Arsenic (total)	9.89		0.245	0.593	mg/Kg	0.39	36.5	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Barium (total)	87.3		0.0791	0.593	mg/Kg	540	826	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Beryllium (total)	0.599		0.0593	0.593	mg/Kg		1	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Cadmium (total)	0.467	J	0.0567	0.593	mg/Kg	3.7		N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Calcium (total)	51910		1.55	11.9	mg/Kg		52300	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Chromium (total)	19.2		0.191	0.593	mg/Kg		29	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Cobalt (total)	11.1		0.0946	0.593	mg/Kg	90	116	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Copper (total)	22.7		0.241	0.593	mg/Kg	310	56.2	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Iron (total)	21920		1.86	11.9	mg/Kg	2300	234000	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Lead (total)	9.46		0.336	0.593	mg/Kg	40	48.6	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Magnesium (total)	17530		0.693	11.9	mg/Kg		10400	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Manganese (total)	746		0.155	1.19	mg/Kg	180	3506	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW7471A	Mercury (total)	0.0152		0.00112	0.0114	mg/Kg	2.3	0.1	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Nickel (total)	32		0.101	0.593	mg/Kg	160	55.1	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Potassium (total)	2620		4.24	11.9	mg/Kg		3390	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Selenium (total)	2.13		0.192	0.593	mg/Kg	39	2	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Sodium (total)	149		4.3	11.9	mg/Kg			N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Vanadium (total)	32.3		0.108	0.593	mg/Kg		40.9	N1
BH14	5/24/04	14:58	GEL	PBOW-04-SO-2BG-BH14A(3-5)	3	5	SW6010B	Zinc (total)	54.5		0.2	0.593	mg/Kg	2300	322	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Aluminum (total)	11270		0.98	12.4	mg/Kg	7600	15500	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Arsenic (total)	8.81		0.255	0.618	mg/Kg	0.39	36.5	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Barium (total)	64.9		0.0824	0.618	mg/Kg	540	826	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Beryllium (total)	0.574	J	0.0618	0.618	mg/Kg		1	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Cadmium (total)	0.356	J	0.0591	0.618	mg/Kg	3.7		N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Calcium (total)	47940		1.61	12.4	mg/Kg		52300	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Chromium (total)	18.9		0.199	0.618	mg/Kg		29	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Cobalt (total)	9.05		0.0986	0.618	mg/Kg	90	116	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Copper (total)	23		0.251	0.618	mg/Kg	310	56.2	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Iron (total)	21740		1.94	12.4	mg/Kg	2300	234000	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Lead (total)	10.3		0.351	0.618	mg/Kg	40	48.6	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Magnesium (total)	18820		0.723	12.4	mg/Kg		10400	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Manganese (total)	509		0.162	1.24	mg/Kg	180	3506	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW7471A	Mercury (total)	0.0183		0.00114	0.0115	mg/Kg	2.3	0.1	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Nickel (total)	27.5		0.106	0.618	mg/Kg	160	55.1	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Potassium (total)	3000		4.42	12.4	mg/Kg		3390	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Selenium (total)	3.63		0.2	0.618	mg/Kg	39	2	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Sodium (total)	181		4.49	12.4	mg/Kg			N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Vanadium (total)	31		0.112	0.618	mg/Kg		40.9	N1
BH14	5/24/04	15:16	GEL	PBOW-04-SO-2BG-BH14A(8-10)	8	10	SW6010B	Zinc (total)	53.2		0.208	0.618	mg/Kg	2300	322	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Aluminum (total)	9690	J	0.992	12.5	mg/Kg	7600	15500	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Arsenic (total)	13.6	J	0.258	0.626	mg/Kg	0.39	36.5	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Barium (total)	48.7	J	0.0835	0.626	mg/Kg	540	826	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Beryllium (total)	0.584	J	0.0626	0.626	mg/Kg		1	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Cadmium (total)	0.121	J	0.0598	0.626	mg/Kg	3.7		N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Calcium (total)	9000	J	1.63	12.5	mg/Kg		52300	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Chromium (total)	15.7	J	0.202	0.626	mg/Kg		29	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Cobalt (total)	7.54	J	0.0999	0.626	mg/Kg	90	116	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Copper (total)	23	J	0.254	0.626	mg/Kg	310	56.2	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Iron (total)	22780	J	1.96	12.5	mg/Kg	2300	234000	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Lead (total)	10.8	J	0.355	0.626	mg/Kg	40	48.6	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Magnesium (total)	4450	J	0.732	12.5	mg/Kg		10400	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Manganese (total)	283	J	0.164	1.25	mg/Kg	180	3506	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW7471A	Mercury (total)	0.0252		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Nickel (total)	21.7	J	0.107	0.626	mg/Kg	160	55.1	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Potassium (total)	1420	J	4.48	12.5	mg/Kg		3390	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Selenium (total)	1.89	J	0.203	0.626	mg/Kg	39	2	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Silver (total)	0.154	J	0.113	0.626	mg/Kg	39	11.1	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Sodium (total)	103	J	4.54	12.5	mg/Kg		.	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Vanadium (total)	28.1	J	0.114	0.626	mg/Kg		40.9	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15A(3-5)	3	5	SW6010B	Zinc (total)	49.1		0.211	0.626	mg/Kg	2300	322	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Aluminum (total)	13040	J	0.973	12.3	mg/Kg	7600	15500	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Arsenic (total)	6.82	J	0.253	0.613	mg/Kg	0.39	36.5	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Barium (total)	67.7	J	0.0818	0.613	mg/Kg	540	826	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Beryllium (total)	0.601	J	0.0613	0.613	mg/Kg		1	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Cadmium (total)	0.305	J	0.0586	0.613	mg/Kg	3.7		N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Calcium (total)	54050	J	1.6	12.3	mg/Kg		52300	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Chromium (total)	18.9	J	0.198	0.613	mg/Kg		29	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Cobalt (total)	9.58	J	0.0979	0.613	mg/Kg	90	116	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18

Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Copper (total)	22.2	J	0.249	0.613	mg/Kg	310	56.2	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Iron (total)	21160	J	1.92	12.3	mg/Kg	2300	234000	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Lead (total)	10.5	J	0.348	0.613	mg/Kg	40	48.6	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Magnesium (total)	21450	J	0.717	12.3	mg/Kg		10400	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Manganese (total)	491	J	0.16	1.23	mg/Kg	180	3506	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW7471A	Mercury (total)	0.0161		0.00121	0.0124	mg/Kg	2.3	0.1	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Nickel (total)	25.1	J	0.105	0.613	mg/Kg	160	55.1	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Potassium (total)	3360	J	4.39	12.3	mg/Kg		3390	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Selenium (total)	3.95	J	0.199	0.613	mg/Kg	39	2	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Silver (total)	0.16	J	0.111	0.613	mg/Kg	39	11.1	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Sodium (total)	223	J	4.46	12.3	mg/Kg			N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Vanadium (total)	30.6	J	0.111	0.613	mg/Kg		40.9	N1
BH15	5/25/04	10:13	GEL	PBOW-04-SO-2BG-BH15A(8-10)	8	10	SW6010B	Zinc (total)	51		0.206	0.613	mg/Kg	2300	322	N1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Aluminum (total)	10990	J	0.983	12.4	mg/Kg	7600	15500	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Arsenic (total)	13.6	J	0.256	0.62	mg/Kg	0.39	36.5	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Barium (total)	62.8	J	0.0826	0.62	mg/Kg	540	826	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Beryllium (total)	0.611	J	0.062	0.62	mg/Kg		1	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Cadmium (total)	0.158	J	0.0592	0.62	mg/Kg	3.7		FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Calcium (total)	4210	J	1.62	12.4	mg/Kg		52300	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Chromium (total)	16.9	J	0.2	0.62	mg/Kg		29	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Cobalt (total)	10.1	J	0.0989	0.62	mg/Kg	90	116	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Copper (total)	25.1	J	0.252	0.62	mg/Kg	310	56.2	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Iron (total)	23980	J	1.94	12.4	mg/Kg	2300	234000	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Lead (total)	12.8	J	0.352	0.62	mg/Kg	40	48.6	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Magnesium (total)	3600	J	0.725	12.4	mg/Kg		10400	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Manganese (total)	465	J	0.162	1.24	mg/Kg	180	3506	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW7471A	Mercury (total)	0.0254		0.00116	0.0118	mg/Kg	2.3	0.1	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Nickel (total)	25.3	J	0.106	0.62	mg/Kg	160	55.1	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Potassium (total)	1530	J	4.43	12.4	mg/Kg		3390	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Silver (total)	0.274	J	0.112	0.62	mg/Kg	39	11.1	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Sodium (total)	99	J	4.5	12.4	mg/Kg			FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Vanadium (total)	29.6	J	0.113	0.62	mg/Kg		40.9	FD1
BH15	5/25/04	9:50	GEL	PBOW-04-SO-2BG-BH15D(3-5	3	5	SW6010B	Zinc (total)	51.9		0.209	0.62	mg/Kg	2300	322	FD1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Aluminum (total)	14670	J	0.949	12	mg/Kg	7600	15500	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Arsenic (total)	11.9	J	0.247	0.598	mg/Kg	0.39	36.5	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Barium (total)	76.2	J	0.0798	0.598	mg/Kg	540	826	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Beryllium (total)	0.75		0.0598	0.598	mg/Kg		1	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Calcium (total)	3620	J	1.56	12	mg/Kg		52300	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Chromium (total)	22.9	J	0.193	0.598	mg/Kg		29	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Cobalt (total)	7.27	J	0.0955	0.598	mg/Kg	90	116	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Copper (total)	21.1	J	0.243	0.598	mg/Kg	310	56.2	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Iron (total)	26750	J	1.88	12	mg/Kg	2300	234000	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Lead (total)	7.88	J	0.34	0.598	mg/Kg	40	48.6	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Magnesium (total)	4350	J	0.7	12	mg/Kg		10400	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Manganese (total)	256	J	0.157	1.2	mg/Kg	180	3506	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW7471A	Mercury (total)	0.0346		0.00118	0.012	mg/Kg	2.3	0.1	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Nickel (total)	22.8	J	0.102	0.598	mg/Kg	160	55.1	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Potassium (total)	2000	J	4.28	12	mg/Kg		3390	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Selenium (total)	1.73	J	0.194	0.598	mg/Kg	39	2	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Sodium (total)	91.6	J	4.35	12	mg/Kg			N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Thallium (total)	1.8	J	1.2	2.39	mg/Kg	**0.52**	1.3	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Vanadium (total)	36.2	J	0.109	0.598	mg/Kg		40.9	N1
BH16	5/25/04	8:20	GEL	PBOW-04-SO-2BG-BH16A(3-5)	3	5	SW6010B	Zinc (total)	52.2		0.201	0.598	mg/Kg	2300	322	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Aluminum (total)	7940	J	0.955	12	mg/Kg	7600	15500	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Arsenic (total)	9.68	J	0.248	0.602	mg/Kg	0.39	36.5	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Barium (total)	59.8	J	0.0803	0.602	mg/Kg	540	826	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Beryllium (total)	0.388	J	0.0602	0.602	mg/Kg		1	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Cadmium (total)	0.398	J	0.0575	0.602	mg/Kg	3.7		N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Calcium (total)	54190	J	1.57	12	mg/Kg		52300	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Chromium (total)	12.4	J	0.194	0.602	mg/Kg		29	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Cobalt (total)	7.39	J	0.0961	0.602	mg/Kg	90	116	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Copper (total)	22.5	J	0.244	0.602	mg/Kg	310	56.2	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Iron (total)	19150	J	1.89	12	mg/Kg	2300	234000	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Lead (total)	13.5	J	0.341	0.602	mg/Kg	40	48.6	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Magnesium (total)	18320	J	0.704	12	mg/Kg		10400	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Manganese (total)	492	J	0.157	1.2	mg/Kg	180	3506	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW7471A	Mercury (total)	0.0137		0.0012	0.0123	mg/Kg	2.3	0.1	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Nickel (total)	19.7	J	0.103	0.602	mg/Kg	160	55.1	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Potassium (total)	2010	J	4.3	12	mg/Kg		3390	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Selenium (total)	3.53	J	0.195	0.602	mg/Kg	39	2	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Sodium (total)	163	J	4.37	12	mg/Kg			N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Vanadium (total)	21.3	J	0.109	0.602	mg/Kg		40.9	N1
BH16	5/25/04	8:48	GEL	PBOW-04-SO-2BG-BH16A(8-10)	8	10	SW6010B	Zinc (total)	47.6		0.203	0.602	mg/Kg	2300	322	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Aluminum (total)	15660		0.958	12.1	mg/Kg	**7800**	15500	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18

Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Arsenic (total)	16.1	J	0.249	0.604	mg/Kg	0.39	36.5	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Barium (total)	116	J	0.0806	0.604	mg/Kg	540	826	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Beryllium (total)	0.878		0.0604	0.604	mg/Kg		1	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Cadmium (total)	0.16	BJ	0.0577	0.604	mg/Kg	3.7		N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Calcium (total)	3640		1.58	12.1	mg/Kg		52300	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Chromium (total)	23.6		0.195	0.604	mg/Kg		29	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Cobalt (total)	16.7	J	0.0964	0.604	mg/Kg	90	116	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Copper (total)	27.8	J	0.245	0.604	mg/Kg	310	56.2	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Iron (total)	29990	J	1.89	12.1	mg/Kg	2300	234000	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Lead (total)	14.4	J	0.343	0.604	mg/Kg	40	48.6	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Magnesium (total)	4420		0.706	12.1	mg/Kg		10400	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Manganese (total)	856	J	0.158	1.21	mg/Kg	180	3506	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW7471A	Mercury (total)	0.0241		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Nickel (total)	36.1	J	0.103	0.604	mg/Kg	160	55.1	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Potassium (total)	2570	J	4.32	12.1	mg/Kg		3390	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Selenium (total)	0.267	BJ	0.196	0.604	mg/Kg	39	2	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Silver (total)	0.514	J	0.109	0.604	mg/Kg	39	11.1	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Sodium (total)	160		4.39	12.1	mg/Kg			N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Vanadium (total)	40.2		0.11	0.604	mg/Kg		40.9	N1
BH17	5/26/04	11:44	GEL	PBOW-04-SO-2BG-BH17A(3-5)	3	5	SW6010B	Zinc (total)	61.9	J	0.203	0.604	mg/Kg	2300	322	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Aluminum (total)	13810		0.959	12.1	mg/Kg	7600	15500	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Antimony (total)	0.724	BJ	0.415	1.21	mg/Kg	3.1	9.3	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Arsenic (total)	8.79	J	0.249	0.604	mg/Kg	0.39	36.5	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Barium (total)	97	J	0.0806	0.604	mg/Kg	540	826	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Beryllium (total)	0.674		0.0604	0.604	mg/Kg		1	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Cadmium (total)	0.375	J	0.0578	0.604	mg/Kg	3.7		N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Calcium (total)	54080	J	1.58	12.1	mg/Kg		52300	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Chromium (total)	20.8		0.195	0.604	mg/Kg		29	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Cobalt (total)	11.9	J	0.0965	0.604	mg/Kg	90	116	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Copper (total)	34.3	J	0.245	0.604	mg/Kg	310	56.2	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Iron (total)	24330	J	1.89	12.1	mg/Kg	2300	234000	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Lead (total)	18.1		0.343	0.604	mg/Kg	40	48.6	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Magnesium (total)	16970		0.707	12.1	mg/Kg		10400	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Manganese (total)	723	J	0.158	1.21	mg/Kg	180	3506	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW7471A	Mercury (total)	0.0182		0.00114	0.0116	mg/Kg	2.3	0.1	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Nickel (total)	35.3	J	0.103	0.604	mg/Kg	160	55.1	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Potassium (total)	3440	J	4.32	12.1	mg/Kg		3390	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Selenium (total)	2.9		0.196	0.604	mg/Kg	39	2	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Silver (total)	0.28	J	0.109	0.604	mg/Kg	39	11.1	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Sodium (total)	212		4.39	12.1	mg/Kg			N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Vanadium (total)	32.5		0.11	0.604	mg/Kg		40.9	N1
BH17	5/26/04	11:48	GEL	PBOW-04-SO-2BG-BH17A(8-10)	8	10	SW6010B	Zinc (total)	64.7	J	0.203	0.604	mg/Kg	2300	322	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Aluminum (total)	17390		0.958	12.1	mg/Kg	**7600**	15500	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Arsenic (total)	10.2	J	0.249	0.604	mg/Kg	0.39	36.5	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Barium (total)	99.2	J	0.0806	0.604	mg/Kg	540	826	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Beryllium (total)	0.909		0.0604	0.604	mg/Kg		1	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Cadmium (total)	0.0826	BJ	0.0576	0.604	mg/Kg	3.7		N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Calcium (total)	4100	J	1.58	12.1	mg/Kg		52300	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Chromium (total)	27.1		0.195	0.604	mg/Kg		29	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Cobalt (total)	7.77	J	0.0964	0.604	mg/Kg	90	116	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Copper (total)	25.3	J	0.245	0.604	mg/Kg	310	56.2	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Iron (total)	28250	J	1.89	12.1	mg/Kg	2300	234000	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Lead (total)	103		0.343	0.604	mg/Kg	**40**	48.6	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Magnesium (total)	5760		0.707	12.1	mg/Kg		10400	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Manganese (total)	226	J	0.158	1.21	mg/Kg	180	3506	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW7471A	Mercury (total)	0.0232		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Nickel (total)	30.2	J	0.103	0.604	mg/Kg	160	55.1	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Potassium (total)	2870	J	4.32	12.1	mg/Kg		3390	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Selenium (total)	1.27		0.196	0.604	mg/Kg	39	2	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Silver (total)	0.368	J	0.109	0.604	mg/Kg	39	11.1	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Sodium (total)	138		4.39	12.1	mg/Kg			N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Thallium (total)	2.07	J	1.21	2.42	mg/Kg	**0.52**	1.3	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Vanadium (total)	40.8		0.11	0.604	mg/Kg		40.9	N1
BH18	5/26/04	11:05	GEL	PBOW-04-SO-2BG-BH18A(3-5)	3	5	SW6010B	Zinc (total)	106	J	0.203	0.604	mg/Kg	2300	322	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Aluminum (total)	12560		0.956	12.1	mg/Kg	7600	15500	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Arsenic (total)	9.45	J	0.249	0.603	mg/Kg	0.39	36.5	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Barium (total)	55.7	J	0.0804	0.603	mg/Kg	540	826	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Beryllium (total)	0.629		0.0603	0.603	mg/Kg		1	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Cadmium (total)	0.381	J	0.0576	0.603	mg/Kg	3.7		N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Calcium (total)	49400	J	1.57	12.1	mg/Kg		52300	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Chromium (total)	19.5		0.194	0.603	mg/Kg		29	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Cobalt (total)	8.11	J	0.0962	0.603	mg/Kg	90	116	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Copper (total)	29	J	0.245	0.603	mg/Kg	310	56.2	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Iron (total)	22070	J	1.89	12.1	mg/Kg	2300	234000	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Lead (total)	13.5	J	0.342	0.603	mg/Kg	40	48.6	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Magnesium (total)	17330		0.705	12.1	mg/Kg		10400	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Manganese (total)	388	J	0.158	1.21	mg/Kg	180	3506	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW7471A	Mercury (total)	0.0152		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Nickel (total)	24.7	J	0.103	0.603	mg/Kg	160	55.1	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Potassium (total)	3180	J	4.31	12.1	mg/Kg		3390	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Selenium (total)	2.23		0.195	0.603	mg/Kg	39	2	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Sodium (total)	195		4.38	12.1	mg/Kg			N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Vanadium (total)	33.5		0.109	0.603	mg/Kg		40.9	N1
BH18	5/26/04	11:18	GEL	PBOW-04-SO-2BG-BH18A(8-10)	8	10	SW6010B	Zinc (total)	60.7		0.203	0.603	mg/Kg	2300	322	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Aluminum (total)	11490		0.953	12	mg/Kg	7600	15500	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Arsenic (total)	7.07	J	0.248	0.601	mg/Kg	0.39	36.5	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Barium (total)	57.8	J	0.0801	0.601	mg/Kg	540	826	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Beryllium (total)	0.635		0.0601	0.601	mg/Kg		1	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Cadmium (total)	0.111	BJ	0.0574	0.601	mg/Kg	3.7		N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Calcium (total)	2950	J	1.57	12	mg/Kg		52300	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Chromium (total)	19.2		0.194	0.601	mg/Kg		29	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Cobalt (total)	8.37	J	0.0959	0.601	mg/Kg	90	116	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Copper (total)	16.1	J	0.244	0.601	mg/Kg	310	56.2	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Iron (total)	19620	J	1.88	12	mg/Kg	2300	234000	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Lead (total)	8.94	J	0.341	0.601	mg/Kg	40	48.6	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Magnesium (total)	3190		0.703	12	mg/Kg		10400	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Manganese (total)	229	J	0.157	1.2	mg/Kg	180	3506	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW7471A	Mercury (total)	0.023		0.00117	0.0119	mg/Kg	2.3	0.1	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Nickel (total)	23.4	J	0.103	0.601	mg/Kg	160	55.1	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Potassium (total)	1770	J	4.3	12	mg/Kg		3390	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Selenium (total)	0.756	B	0.195	0.601	mg/Kg	39	2	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Silver (total)	0.19	J	0.108	0.601	mg/Kg	39	11.1	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Sodium (total)	184		4.36	12	mg/Kg			N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Thallium (total)	1.63	J	1.2	2.4	mg/Kg	**0.52**	1.3	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Vanadium (total)	29.6		0.109	0.601	mg/Kg		40.9	N1
BH19	5/26/04	12:15	GEL	PBOW-04-SO-2BG-BH19A(3-5)	3	5	SW6010B	Zinc (total)	50.2	J	0.202	0.601	mg/Kg	2300	322	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Aluminum (total)	12140		0.98	12.1	mg/Kg	7600	15500	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Arsenic (total)	7.72	J	0.25	0.605	mg/Kg	0.39	36.5	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Barium (total)	55.1	J	0.0808	0.605	mg/Kg	540	826	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Beryllium (total)	0.569	J	0.0605	0.605	mg/Kg		1	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Cadmium (total)	0.297	J	0.0579	0.605	mg/Kg	3.7		N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18

Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Calcium (total)	55790	J	1.58	12.1	mg/Kg		52300	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Chromium (total)	19.4		0.195	0.605	mg/Kg		29	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Cobalt (total)	7.26	J	0.0966	0.605	mg/Kg	90	116	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Copper (total)	23.1	J	0.246	0.605	mg/Kg	310	56.2	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Iron (total)	20980	J	1.9	12.1	mg/Kg	2300	234000	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Lead (total)	10.5	J	0.343	0.605	mg/Kg	40	48.6	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Magnesium (total)	18310		0.708	12.1	mg/Kg		10400	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Manganese (total)	368	J	0.158	1.21	mg/Kg	180	3506	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW7471A	Mercury (total)	0.0143		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Nickel (total)	23.7	J	0.103	0.605	mg/Kg	160	55.1	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Potassium (total)	3080	J	4.33	12.1	mg/Kg		3390	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Selenium (total)	3.13		0.196	0.605	mg/Kg	39	2	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Sodium (total)	199		4.4	12.1	mg/Kg			N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Vanadium (total)	29		0.11	0.605	mg/Kg		40.9	N1
BH19	5/26/04	12:31	GEL	PBOW-04-SO-2BG-BH19A(8-10)	8	10	SW6010B	Zinc (total)	57.4	J	0.204	0.605	mg/Kg	2300	322	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Aluminum (total)	11000	J	0.933	11.8	mg/Kg	7600	15500	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Arsenic (total)	9.89	J	0.243	0.588	mg/Kg	0.39	36.5	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Barium (total)	63.3	J	0.0785	0.588	mg/Kg	540	826	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Beryllium (total)	0.604		0.0588	0.588	mg/Kg		1	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Cadmium (total)	0.0941	J	0.0562	0.588	mg/Kg	3.7		N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Calcium (total)	3080	J	1.53	11.8	mg/Kg		52300	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Chromium (total)	17	J	0.19	0.588	mg/Kg		29	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Cobalt (total)	7.42	J	0.0939	0.588	mg/Kg	90	116	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Copper (total)	9.98	J	0.239	0.588	mg/Kg	310	56.2	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Iron (total)	23370	J	1.84	11.8	mg/Kg	2300	234000	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Lead (total)	9.39	J	0.334	0.588	mg/Kg	40	48.6	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Magnesium (total)	3000	J	0.688	11.8	mg/Kg		10400	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Manganese (total)	344	J	0.154	1.18	mg/Kg	180	3506	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW7471A	Mercury (total)	0.0205		0.00116	0.0118	mg/Kg	2.3	0.1	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Nickel (total)	19.3	J	0.1	0.588	mg/Kg	160	55.1	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Potassium (total)	1490	J	4.21	11.8	mg/Kg		3390	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Selenium (total)	1.62	J	0.191	0.588	mg/Kg	39	2	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Silver (total)	0.165	J	0.106	0.588	mg/Kg	39	11.1	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Sodium (total)	74.7	J	4.27	11.8	mg/Kg			N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Vanadium (total)	31.6	J	0.107	0.588	mg/Kg		40.9	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20A(3-5)	3	5	SW6010B	Zinc (total)	51.4		0.198	0.588	mg/Kg	2300	322	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Aluminum (total)	12600	J	0.952	12	mg/Kg	7600	15500	N1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Arsenic (total)	9.78	J	0.248	0.6	mg/Kg	0.39	36.5	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Barium (total)	103	J	0.0801	0.6	mg/Kg	540	826	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Beryllium (total)	0.603		0.06	0.6	mg/Kg		1	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Cadmium (total)	0.319	J	0.0574	0.6	mg/Kg	3.7		N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Calcium (total)	53910	J	1.57	12	mg/Kg		52300	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Chromium (total)	18.8	J	0.193	0.6	mg/Kg		29	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Cobalt (total)	9.45	J	0.0958	0.6	mg/Kg	90	116	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Copper (total)	23.5	J	0.244	0.6	mg/Kg	310	56.2	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Iron (total)	25710	J	1.88	12	mg/Kg	2300	234000	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Lead (total)	10.5	J	0.341	0.6	mg/Kg	40	48.6	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Magnesium (total)	18240	J	0.702	12	mg/Kg		10400	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Manganese (total)	542	J	0.157	1.2	mg/Kg	180	3506	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW7471A	Mercury (total)	0.0157		0.0012	0.0122	mg/Kg	2.3	0.1	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Nickel (total)	26.7	J	0.103	0.6	mg/Kg	160	55.1	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Potassium (total)	3250	J	4.29	12	mg/Kg		3390	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Selenium (total)	4.57	J	0.195	0.6	mg/Kg	39	2	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Sodium (total)	213	J	4.36	12	mg/Kg			N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Vanadium (total)	30.6	J	0.109	0.6	mg/Kg		40.9	N1
BH20	5/25/04	11:39	GEL	PBOW-04-SO-2BG-BH20A(8-10)	8	10	SW6010B	Zinc (total)	57.3		0.202	0.6	mg/Kg	2300	322	N1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Aluminum (total)	10180	J	0.911	11.5	mg/Kg	7600	15500	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Arsenic (total)	11.6	J	0.237	0.575	mg/Kg	0.39	36.5	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Barium (total)	64.9	J	0.0786	0.575	mg/Kg	540	826	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Beryllium (total)	0.59		0.0575	0.575	mg/Kg		1	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Calcium (total)	2810	J	1.5	11.5	mg/Kg		52300	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Chromium (total)	16.5	J	0.185	0.575	mg/Kg		29	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Cobalt (total)	10.1	J	0.0917	0.575	mg/Kg	90	116	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Copper (total)	9.65	J	0.233	0.575	mg/Kg	310	56.2	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Iron (total)	24630	J	1.8	11.5	mg/Kg	2300	234000	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Lead (total)	9.47	J	0.326	0.575	mg/Kg	40	48.6	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Magnesium (total)	2810	J	0.672	11.5	mg/Kg		10400	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Manganese (total)	346	J	0.15	1.15	mg/Kg	180	3506	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW7471A	Mercury (total)	0.0231		0.00115	0.0117	mg/Kg	2.3	0.1	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Nickel (total)	18.6	J	0.0981	0.575	mg/Kg	160	55.1	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Potassium (total)	1420	J	4.11	11.5	mg/Kg		3390	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Selenium (total)	0.957	J	0.186	0.575	mg/Kg	39	2	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Silver (total)	0.241	J	0.104	0.575	mg/Kg	39	11.1	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Sodium (total)	75.2	J	4.17	11.5	mg/Kg			FD1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-18
Summary of Metals Compounds Detected in 2004 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Vanadium (total)	33	J	0.104	0.575	mg/Kg		40.9	FD1
BH20	5/25/04	11:31	GEL	PBOW-04-SO-2BG-BH20D(3-5)	3	5	SW6010B	Zinc (total)	45.7		0.193	0.575	mg/Kg	2300	322	FD1

J = estimated, B = detected in blank sample

N1 = regular sample, FD1 = field duplicate

Table 4-19
Summary of Organic Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8330	2,4,6-Trinitrotoluene	3.6		0.25	0.25	mg/Kg	16	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8330	2,4-Dinitrotoluene	4.5		0.25	0.25	mg/Kg	12	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8270	2,4-Dinitrotoluene	19000		2300	2300	ug/Kg	**12000**	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8270	2,6-Dinitrotoluene	3400		2300	2300	ug/Kg	6100	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8260	2-Butanone (Methyl ethyl ketone)	54	J	24	24	ug/Kg	2200000	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW8260	Acetone	300	J	24	24	ug/Kg	1400000	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW8330	2,4,6-Trinitrotoluene	9.6		1.2	1.2	mg/Kg	16	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW8330	2,4-Dinitrotoluene	6.9		1.2	1.2	mg/Kg	12	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW8270	2,4-Dinitrotoluene	2900		410	410	ug/Kg	12000	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW8270	2,6-Dinitrotoluene	500		410	410	ug/Kg	6100	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW8260	Acetone	200	J	120	120	ug/Kg	1400000	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW8330	2,4,6-Trinitrotoluene	0.8		0.25	0.25	mg/Kg	16	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW8081	PCB-1260 (Aroclor 1260)	60		41	41	ug/Kg	220	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW8270	bis(2-Ethylhexyl)phthalate	60	J	60	410	ug/Kg	35000	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8330	2,4,6-Trinitrotoluene	94		12	12	mg/Kg	**16**	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8330	2,4-Dinitrotoluene	160		12	12	mg/Kg	**12**	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8081	PCB-1260 (Aroclor 1260)	1800		400	400	ug/Kg	**220**	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8270	2,4-Dinitrotoluene	6400		1200	1200	ug/Kg	12000	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8270	2,6-Dinitrotoluene	680		400	400	ug/Kg	6100	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8260	Acetone	90		24	24	ug/Kg	1400000	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW8260	Toluene	3.2	J	3.2	6	ug/Kg	66000	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW8330	2,4,6-Trinitrotoluene	10		2.5	2.5	mg/Kg	16	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW8330	2,4-Dinitrotoluene	11		2.5	2.5	mg/Kg	12	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW8081	PCB-1260 (Aroclor 1260)	53		42	42	ug/Kg	220	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW8270	2,4-Dinitrotoluene	120	J	120	420	ug/Kg	12000	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW8260	Acetone	18	J	18	23	ug/Kg	1400000	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW8330	2,4,6-Trinitrotoluene	0.34		0.25	0.25	mg/Kg	16	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW8330	4-Amino-2,6-Dinitrotoluene	1.5		0.25	0.25	mg/Kg		N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW8260	Acetone	290		130	130	ug/Kg	1400000	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW8260	Toluene	20	J	20	32	ug/Kg	66000	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW8260	Xylenes, Total	11	J	11	32	ug/Kg	27000	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW8260	Acetone	43	J	25	25	ug/Kg	1400000	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW8260	Toluene	1.5	J	1.5	6	ug/Kg	66000	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW8260	Acetone	160		120	120	ug/Kg	1400000	FD1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW8260	Acetone	17	J	17	24	ug/Kg	1400000	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW8260	Toluene	1.9	J	1.9	6.1	ug/Kg	66000	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW8260	Toluene	1.6	J	1.6	6.1	ug/Kg	66000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Aluminum (total)	11200		23.7	23.7	mg/Kg	7600	15500	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Arsenic (total)	4.7		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Barium (total)	75		23.7	23.7	mg/Kg	540	826	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Calcium (total)	3070		592	592	mg/Kg		52300	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Chromium (total)	14.7		1.2	1.2	mg/Kg		29	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Cobalt (total)	8.1		5.9	5.9	mg/Kg	90	116	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Copper (total)	11.7		3	3	mg/Kg	310	56.2	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Iron (total)	18400		11.8	11.8	mg/Kg	2300	234000	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Lead (total)	13.8		0.36	0.36	mg/Kg	40	48.6	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Magnesium (total)	2790		592	592	mg/Kg		10400	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Manganese (total)	157	J	1.8	1.8	mg/Kg	180	3506	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Nickel (total)	17.1		4.7	4.7	mg/Kg	160	55.1	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Potassium (total)	928		592	592	mg/Kg		3390	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Thallium (total)	1.9		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Vanadium (total)	23.5		5.9	5.9	mg/Kg		40.9	N1
2BGSO01	10/1/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO01-1020-(2-3)	2	3	SW6010	Zinc (total)	61.3		2.4	2.4	mg/Kg	2300	322	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Aluminum (total)	11800		24.8	24.8	mg/Kg	7600	15500	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Arsenic (total)	11.7		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Barium (total)	86.9		24.8	24.8	mg/Kg	540	826	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Beryllium (total)	0.65		0.62	0.62	mg/Kg		1	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Calcium (total)	3900		620	620	mg/Kg		52300	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Chromium (total)	19.8		1.2	1.2	mg/Kg		29	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Cobalt (total)	13.9		6.2	6.2	mg/Kg	90	116	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Copper (total)	22		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Iron (total)	27500		12.4	12.4	mg/Kg	2300	234000	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Lead (total)	21.4		0.37	0.37	mg/Kg	40	48.6	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Magnesium (total)	3420		620	620	mg/Kg		10400	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Manganese (total)	417	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Nickel (total)	29.1		5	5	mg/Kg	160	55.1	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Potassium (total)	1740		620	620	mg/Kg		3390	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Silver (total)	1.3		1.2	1.2	mg/Kg	39	11.1	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Thallium (total)	2.8		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Vanadium (total)	29.1		6.2	6.2	mg/Kg		40.9	N1
2BGSO01	10/1/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO01-1030-(6-7)	6	7	SW6010	Zinc (total)	63.1		2.5	2.5	mg/Kg	2300	322	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Aluminum (total)	14900		24.4	24.4	mg/Kg	7600	15500	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Arsenic (total)	9.7		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Barium (total)	111		24.4	24.4	mg/Kg	540	826	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Beryllium (total)	0.69		0.61	0.61	mg/Kg		1	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Calcium (total)	4100		611	611	mg/Kg		52300	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Chromium (total)	18.5		1.2	1.2	mg/Kg		29	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Cobalt (total)	13.5		6.1	6.1	mg/Kg	90	116	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Copper (total)	18.2		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Iron (total)	26400		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Lead (total)	16.2		0.37	0.37	mg/Kg	40	48.6	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Magnesium (total)	3620		611	611	mg/Kg		10400	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Manganese (total)	1000	J	1.8	1.8	mg/Kg	180	3506	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Nickel (total)	23.7		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Potassium (total)	1570		611	611	mg/Kg		3390	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Selenium (total)	0.62		0.61	0.61	mg/Kg	39	2	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Thallium (total)	1.8		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Vanadium (total)	29.2		6.1	6.1	mg/Kg		40.9	N1
2BGSO02	10/1/96	17:00	KNX	PBOW-96-SO-2BG-2BGSO02-1050-(2-3)	2	3	SW6010	Zinc (total)	83.1		2.4	2.4	mg/Kg	2300	322	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Aluminum (total)	16100		24.7	24.7	mg/Kg	**7600**	15500	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Arsenic (total)	13.3		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Barium (total)	84.4		24.7	24.7	mg/Kg	540	826	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Beryllium (total)	0.78		0.62	0.62	mg/Kg		1	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Calcium (total)	3860		618	618	mg/Kg		52300	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Chromium (total)	22.6		1.2	1.2	mg/Kg		29	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Cobalt (total)	14.2		6.2	6.2	mg/Kg	90	116	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Copper (total)	31.1		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Iron (total)	35900		12.4	12.4	mg/Kg	2300	234000	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Lead (total)	13.3		0.37	0.37	mg/Kg	40	48.6	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Magnesium (total)	5690		618	618	mg/Kg		10400	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Manganese (total)	580	J	1.9	1.9	mg/Kg	180	3506	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Nickel (total)	43		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Potassium (total)	2130		618	618	mg/Kg		3390	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Selenium (total)	0.63		0.62	0.62	mg/Kg	39	2	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Thallium (total)	2.7		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Vanadium (total)	28.1		6.2	6.2	mg/Kg		40.9	N1
2BGSO02	10/1/96	17:15	KNX	PBOW-96-SO-2BG-2BGSO02-1060-(6-7)	6	7	SW6010	Zinc (total)	84.1		2.5	2.5	mg/Kg	2300	322	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Aluminum (total)	10100		24	24	mg/Kg	7600	15500	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Arsenic (total)	18.3		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Barium (total)	118		24	24	mg/Kg	540	826	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Beryllium (total)	0.81		0.6	0.6	mg/Kg		1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Cadmium (total)	0.84		0.6	0.6	mg/Kg	3.7		N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Calcium (total)	12200		601	601	mg/Kg		52300	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Chromium (total)	19.2	J	1.2	1.2	mg/Kg		29	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Cobalt (total)	15.5		6	6	mg/Kg	90	116	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Copper (total)	172		3	3	mg/Kg	310	56.2	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Iron (total)	34100		12	12	mg/Kg	2300	234000	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Lead (total)	232		0.36	0.36	mg/Kg	**40**	48.6	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Magnesium (total)	4160		601	601	mg/Kg		10400	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Manganese (total)	213		1.8	1.8	mg/Kg	180	3506	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Nickel (total)	49.5		4.8	4.8	mg/Kg	160	55.1	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Potassium (total)	2050	J	601	601	mg/Kg		3390	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Selenium (total)	1.2		0.6	0.6	mg/Kg	39	2	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Thallium (total)	3.3		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Vanadium (total)	20.5	J	6	6	mg/Kg		40.9	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW6010	Zinc (total)	270		2.4	2.4	mg/Kg	2300	322	N1
2BGSO03	10/2/96	9:05	KNX	PBOW-96-SO-2BG-2BGSO03-1080-(2-3)	2	3	SW7471	Mercury (total)	0.12		0.04	0.04	mg/Kg	2.3	0.1	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Aluminum (total)	17000		25.3	25.3	mg/Kg	**7600**	15500	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Arsenic (total)	17.6		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Barium (total)	140		25.3	25.3	mg/Kg	540	826	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Beryllium (total)	0.83		0.63	0.63	mg/Kg		1	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Calcium (total)	5610		632	632	mg/Kg		52300	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Chromium (total)	24.8	J	1.3	1.3	mg/Kg		29	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Cobalt (total)	21.2		6.3	6.3	mg/Kg	90	116	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Copper (total)	37.7		3.2	3.2	mg/Kg	310	56.2	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Iron (total)	37300		12.6	12.6	mg/Kg	2300	234000	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Lead (total)	31.4		0.38	0.38	mg/Kg	40	48.6	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Magnesium (total)	5040		632	632	mg/Kg		10400	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Manganese (total)	1360		1.9	1.9	mg/Kg	180	3506	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Nickel (total)	45.7		5.1	5.1	mg/Kg	160	55.1	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Potassium (total)	3010	J	632	632	mg/Kg		3390	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Thallium (total)	2.3		1.3	1.3	mg/Kg	**0.52**	1.3	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Vanadium (total)	34.3	J	6.3	6.3	mg/Kg		40.9	N1
2BGSO03	10/2/96	9:20	KNX	PBOW-96-SO-2BG-2BGSO03-1090-(6-7)	6	7	SW6010	Zinc (total)	93.5		2.5	2.5	mg/Kg	2300	322	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Aluminum (total)	14900		23.4	23.4	mg/Kg	7600	15500	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Arsenic (total)	9.8		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Barium (total)	116		23.4	23.4	mg/Kg	540	826	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Beryllium (total)	0.88		0.58	0.58	mg/Kg		1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Calcium (total)	4330		585	585	mg/Kg		52300	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Chromium (total)	20	J	1.2	1.2	mg/Kg		29	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Cobalt (total)	16.2		5.8	5.8	mg/Kg	90	116	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Copper (total)	34.8		2.9	2.9	mg/Kg	310	56.2	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Iron (total)	28100		11.7	11.7	mg/Kg	2300	234000	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Lead (total)	21.4		0.35	0.35	mg/Kg	40	48.6	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Magnesium (total)	4110		585	585	mg/Kg		10400	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Manganese (total)	716		1.8	1.8	mg/Kg	180	3506	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Nickel (total)	34.5		4.7	4.7	mg/Kg	160	55.1	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Potassium (total)	1590	J	585	585	mg/Kg		3390	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Thallium (total)	1.6		1.2	1.2	mg/Kg	**0.52**	1.3	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Vanadium (total)	32.9	J	5.8	5.8	mg/Kg		40.9	N1
2BGSO04	10/2/96	10:30	KNX	PBOW-96-SO-2BG-2BGSO04-1110-(2-3)	2	3	SW6010	Zinc (total)	78		2.3	2.3	mg/Kg	2300	322	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Aluminum (total)	13400		25.5	25.5	mg/Kg	7600	15500	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Arsenic (total)	4.1		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Barium (total)	91		25.5	25.5	mg/Kg	540	826	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Beryllium (total)	0.69		0.64	0.64	mg/Kg		1	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Calcium (total)	5480		637	637	mg/Kg		52300	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Chromium (total)	21	J	1.3	1.3	mg/Kg		29	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Cobalt (total)	10.8		6.4	6.4	mg/Kg	90	116	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Copper (total)	24.5		3.2	3.2	mg/Kg	310	56.2	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Iron (total)	21800		12.7	12.7	mg/Kg	2300	234000	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Lead (total)	14.2		0.38	0.38	mg/Kg	40	48.6	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Magnesium (total)	5830		637	637	mg/Kg		10400	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Manganese (total)	256		1.9	1.9	mg/Kg	180	3506	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Nickel (total)	32.3		5.1	5.1	mg/Kg	160	55.1	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Potassium (total)	1860	J	637	637	mg/Kg		3390	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Vanadium (total)	23.7	J	6.4	6.4	mg/Kg		40.9	N1
2BGSO04	10/2/96	10:45	KNX	PBOW-96-SO-2BG-2BGSO04-1120-(6-7)	6	7	SW6010	Zinc (total)	79.3		2.5	2.5	mg/Kg	2300	322	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Aluminum (total)	11400		25	25	mg/Kg	7600	15500	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Arsenic (total)	5.6		1.3	1.3	mg/Kg	0.39	36.5	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Barium (total)	55.5		25	25	mg/Kg	540	826	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Calcium (total)	59200		626	626	mg/Kg		52300	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Chromium (total)	17.6	J	1.3	1.3	mg/Kg		29	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Cobalt (total)	6.5		6.3	6.3	mg/Kg	90	116	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Copper (total)	25.7		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Iron (total)	21800		12.5	12.5	mg/Kg	2300	234000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected In 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Lead (total)	14.6		0.38	0.38	mg/Kg	40	48.6	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Magnesium (total)	17700		626	626	mg/Kg		10400	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Manganese (total)	327		1.9	1.9	mg/Kg	180	3506	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Nickel (total)	24.2		5	5	mg/Kg	160	55.1	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Potassium (total)	2350	J	626	626	mg/Kg		3390	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Vanadium (total)	27.3	J	6.3	6.3	mg/Kg		40.9	N1
2BGSO05	10/2/96	12:00	KNX	PBOW-96-SO-2BG-2BGSO05-1150-(6-7)	6	7	SW6010	Zinc (total)	66.3		2.5	2.5	mg/Kg	2300	322	N1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Aluminum (total)	16000		24.6	24.6	mg/Kg	**7600**	15500	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Arsenic (total)	13		1.2	1.2	mg/Kg	0.39	36.5	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Barium (total)	90.1		24.6	24.6	mg/Kg	540	826	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Beryllium (total)	0.79		0.62	0.62	mg/Kg		1	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Calcium (total)	4030		615	615	mg/Kg		52300	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Chromium (total)	21.7	J	1.2	1.2	mg/Kg		29	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Cobalt (total)	14		6.2	6.2	mg/Kg	90	116	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Copper (total)	32.3		3.1	3.1	mg/Kg	310	56.2	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Iron (total)	33300		12.3	12.3	mg/Kg	2300	234000	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Lead (total)	14.2		0.37	0.37	mg/Kg	40	48.6	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Magnesium (total)	5230		615	615	mg/Kg		10400	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Manganese (total)	487		1.8	1.8	mg/Kg	180	3506	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Nickel (total)	33.2		4.9	4.9	mg/Kg	160	55.1	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Potassium (total)	2040	J	615	615	mg/Kg		3390	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Thallium (total)	2.1		1.2	1.2	mg/Kg	**0.52**	1.3	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Vanadium (total)	33.2	J	6.2	6.2	mg/Kg		40.9	FD1
2BGSO05	10/2/96	12:30	KNX	PBOW-96-FD-2BG-2BGSO05-1141-(2-3)	2	3	SW6010	Zinc (total)	83.3		2.5	2.5	mg/Kg	2300	322	FD1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Aluminum (total)	12100		23.8	23.8	mg/Kg	7600	15500	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Arsenic (total)	8.4		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Barium (total)	70.9		23.8	23.8	mg/Kg	540	826	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Calcium (total)	61200		596	596	mg/Kg		52300	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Chromium (total)	17.6	J	1.2	1.2	mg/Kg		29	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Cobalt (total)	9.9		6	6	mg/Kg	90	116	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Copper (total)	23.4		3	3	mg/Kg	310	56.2	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Iron (total)	22100		11.9	11.9	mg/Kg	2300	234000	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Lead (total)	10.8		0.36	0.36	mg/Kg	40	48.6	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Magnesium (total)	20100		596	596	mg/Kg		10400	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Manganese (total)	499		1.8	1.8	mg/Kg	180	3506	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Nickel (total)	25.8		4.8	4.8	mg/Kg	160	55.1	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Potassium (total)	1770	J	596	596	mg/Kg		3390	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected In 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Vanadium (total)	31	J	6	6	mg/Kg		40.9	N1
2BGSO06	10/2/96	14:25	KNX	PBOW-96-SO-2BG-2BGSO06-1170-(2-3)	2	3	SW6010	Zinc (total)	59.5		2.4	2.4	mg/Kg	2300	322	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Aluminum (total)	9540		24.3	24.3	mg/Kg	7600	15500	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Arsenic (total)	8.2		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Barium (total)	63.9		24.3	24.3	mg/Kg	540	826	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Calcium (total)	56200		608	608	mg/Kg		52300	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Chromium (total)	14.8	J	1.2	1.2	mg/Kg		29	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Cobalt (total)	10.2		6.1	6.1	mg/Kg	90	116	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Copper (total)	24.8		3	3	mg/Kg	310	56.2	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Iron (total)	22400		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Lead (total)	12		0.36	0.36	mg/Kg	40	48.8	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Magnesium (total)	17500		608	608	mg/Kg		10400	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Manganese (total)	492		1.8	1.8	mg/Kg	180	3506	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Nickel (total)	25.7		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Potassium (total)	1970	J	608	608	mg/Kg		3390	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Vanadium (total)	23.4	J	6.1	6.1	mg/Kg		40.9	N1
2BGSO06	10/2/96	14:35	KNX	PBOW-96-SO-2BG-2BGSO06-1180-(6-7)	6	7	SW6010	Zinc (total)	61		2.4	2.4	mg/Kg	2300	322	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Aluminum (total)	12100		22.8	22.8	mg/Kg	7600	15500	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Arsenic (total)	11.9		1.1	1.1	mg/Kg	0.39	36.5	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Barium (total)	108		22.8	22.8	mg/Kg	540	826	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Beryllium (total)	0.67		0.57	0.57	mg/Kg		1	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Calcium (total)	3540		569	569	mg/Kg		52300	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Chromium (total)	17	J	1.1	1.1	mg/Kg		29	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Cobalt (total)	19.4		5.7	5.7	mg/Kg	90	116	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Copper (total)	30.6		2.8	2.8	mg/Kg	310	56.2	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Iron (total)	27400		11.4	11.4	mg/Kg	2300	234000	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Lead (total)	19.5		0.34	0.34	mg/Kg	40	48.6	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Magnesium (total)	3900		569	569	mg/Kg		10400	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Manganese (total)	1140		1.7	1.7	mg/Kg	180	3506	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Nickel (total)	40.9		4.6	4.6	mg/Kg	160	55.1	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Potassium (total)	1400	J	569	569	mg/Kg		3390	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Thallium (total)	1.4		1.1	1.1	mg/Kg	**0.52**	1.3	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Vanadium (total)	28	J	5.7	5.7	mg/Kg		40.9	N1
2BGSO07	10/2/96	15:30	KNX	PBOW-96-SO-2BG-2BGSO07-1200-(2-3)	2	3	SW6010	Zinc (total)	70.2		2.3	2.3	mg/Kg	2300	322	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Aluminum (total)	6100		23.5	23.5	mg/Kg	7600	15500	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Arsenic (total)	9		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Barium (total)	39.3		23.5	23.5	mg/Kg	540	826	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Calcium (total)	54000		587	587	mg/Kg		52300	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Chromium (total)	10.5	J	1.2	1.2	mg/Kg		29	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Cobalt (total)	7		5.9	5.9	mg/Kg	90	116	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Copper (total)	19.4		2.9	2.9	mg/Kg	310	56.2	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Iron (total)	17600		11.7	11.7	mg/Kg	2300	234000	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Lead (total)	11.8		0.35	0.35	mg/Kg	40	48.6	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Magnesium (total)	19000		587	587	mg/Kg		10400	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Manganese (total)	421		1.8	1.8	mg/Kg	180	3506	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Nickel (total)	17.1		4.7	4.7	mg/Kg	160	55.1	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Potassium (total)	1240	J	587	587	mg/Kg		3390	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Vanadium (total)	20	J	5.9	5.9	mg/Kg		40.9	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-SO-2BG-2BGSO07-1210-(6-7)	6	7	SW6010	Zinc (total)	52.9		2.3	2.3	mg/Kg	2300	322	N1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Aluminum (total)	6350		23.8	23.8	mg/Kg	7600	15500	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Arsenic (total)	8.2		1.2	1.2	mg/Kg	0.39	36.5	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Barium (total)	42		23.8	23.8	mg/Kg	540	826	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Calcium (total)	55700		594	594	mg/Kg		52300	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Chromium (total)	11.1	J	1.2	1.2	mg/Kg		29	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Cobalt (total)	6.8		5.9	5.9	mg/Kg	90	116	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Copper (total)	19.4		3	3	mg/Kg	310	56.2	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Iron (total)	17700		11.9	11.9	mg/Kg	2300	234000	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Lead (total)	10.1		0.36	0.36	mg/Kg	40	48.6	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Magnesium (total)	19700		594	594	mg/Kg		10400	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Manganese (total)	428		1.8	1.8	mg/Kg	180	3506	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Nickel (total)	18.1		4.8	4.8	mg/Kg	160	55.1	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Potassium (total)	1260	J	594	594	mg/Kg		3390	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Vanadium (total)	20.3	J	5.9	5.9	mg/Kg		40.9	FD1
2BGSO07	10/2/96	16:00	KNX	PBOW-96-FD-2BG-2BGSO07-1211-(6-7)	6	7	SW6010	Zinc (total)	48.6		2.4	2.4	mg/Kg	2300	322	FD1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Aluminum (total)	12900		24.4	24.4	mg/Kg	7600	15500	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Arsenic (total)	9.9		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Barium (total)	68.7		24.4	24.4	mg/Kg	540	826	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Calcium (total)	3650		609	609	mg/Kg		52300	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Chromium (total)	19.2	J	1.2	1.2	mg/Kg		29	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Cobalt (total)	9.1		6.1	6.1	mg/Kg	90	116	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Copper (total)	26.3		3	3	mg/Kg	310	56.2	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Iron (total)	27500		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Lead (total)	13.3		0.37	0.37	mg/Kg	40	48.6	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Magnesium (total)	4240		609	609	mg/Kg		10400	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-20
Summary of Metals Compounds Detected in 1996 Subsurface Soil Investigation

Location	Date	Time Samp.	Lab	Sample ID	Depth to Top of Smp. (ft)	Depth to Bot. of Smp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Manganese (total)	205		1.8	1.8	mg/Kg	180	3506	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Nickel (total)	24.3		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Potassium (total)	1740	J	609	609	mg/Kg		3390	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Thallium (total)	1.3		1.2	1.2	mg/Kg	0.52	1.3	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Vanadium (total)	28.7	J	6.1	6.1	mg/Kg		40.9	N1
2BGSO08	10/2/96	16:20	KNX	PBOW-96-SO-2BG-2BGSO08-1230-(2-3)	2	3	SW6010	Zinc (total)	67.7		2.4	2.4	mg/Kg	2300	322	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Aluminum (total)	12000		24.4	24.4	mg/Kg	7600	15500	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Arsenic (total)	5.3		1.2	1.2	mg/Kg	0.39	36.5	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Barium (total)	66.7		24.4	24.4	mg/Kg	540	826	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Calcium (total)	54600		611	611	mg/Kg		52300	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Chromium (total)	17.8	J	1.2	1.2	mg/Kg		29	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Cobalt (total)	8.1		6.1	6.1	mg/Kg	90	116	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Copper (total)	25.6		3.1	3.1	mg/Kg	310	56.2	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Iron (total)	21300		12.2	12.2	mg/Kg	2300	234000	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Lead (total)	21.2		0.37	0.37	mg/Kg	40	48.6	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Magnesium (total)	16400		611	611	mg/Kg		10400	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Manganese (total)	309		1.8	1.8	mg/Kg	180	3506	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Nickel (total)	20		4.9	4.9	mg/Kg	160	55.1	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Potassium (total)	2470	J	611	611	mg/Kg		3390	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Vanadium (total)	26.8	J	6.1	6.1	mg/Kg		40.9	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW6010	Zinc (total)	66.1		2.4	2.4	mg/Kg	2300	322	N1
2BGSO08	10/2/96	16:40	KNX	PBOW-96-SO-2BG-2BGSO08-1240-(6-7)	6	7	SW7471	Mercury (total)	0.058		0.04	0.04	mg/Kg	2.3	0.1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 4-21

Summary of Volatile Organic Compounds Detected In Round 1 Groundwater

Location	Date	Time Samp.	Lab ID	Sample ID	Test	Analyte	Result	Qual	DL	RL	Units	Bkg.	Adjusted Region 9 Tap Water Std	Type
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Acetone	27.4		11.5	25	ug/L		550	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Carbon Disulfide	146		9.55	25	ug/L		**100**	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Chloromethane	54		2.5	5	ug/L		**16**	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Cyclohexane	295		1.65	5	ug/L		1000	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Ethylbenzene	9.6		1.05	5	ug/L	0.87	130	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Isopropylbenzene (Cumene)	5.1		1.45	5	ug/L		66	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Methylcyclohexane	132		1.7	5	ug/L		520	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Toluene	17.6		1.95	5	ug/L	1.7	72	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	Xylenes, Total	145		1.25	5	ug/L	5.5	**21**	N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	m,p-Xylene (sum of isomers)	115		3	10	ug/L			N1
2BG-BED-MW01	1/28/05	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW8260	o-Xylene (1,2-Dimethylbenzene)	29.9		1.25	5	ug/L			N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Acetone	473		115	250	ug/L		550	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Benzene	2460		16.5	50	ug/L	2.4	**0.35**	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Carbon Disulfide	234	J	95.5	250	ug/L		**100**	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Cyclohexane	683		16.5	50	ug/L		1000	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Ethylbenzene	137		10.5	50	ug/L	0.87	**130**	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Isopropylbenzene (Cumene)	37.1	J	14.5	50	ug/L		66	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Methylcyclohexane	337		17	50	ug/L		520	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Toluene	403		19.5	50	ug/L	1.7	**72**	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	Xylenes, Total	1610		12.5	50	ug/L	5.5	**21**	N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	m,p-Xylene (sum of isomers)	1160		30	100	ug/L			N1
2BG-BED-MW02	1/31/05	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW8260	o-Xylene (1,2-Dimethylbenzene)	454		12.5	50	ug/L			N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Acetone	518		115	250	ug/L		550	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Benzene	1510		16.5	50	ug/L	2.4	**0.35**	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Carbon Disulfide	171	J	95.5	250	ug/L		**100**	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Cyclohexane	627		16.5	50	ug/L		1000	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Ethylbenzene	110		10.5	50	ug/L	0.87	130	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Isopropylbenzene (Cumene)	34	J	14.5	50	ug/L		66	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Methylcyclohexane	259		17	50	ug/L		520	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Toluene	323		19.5	50	ug/L	1.7	**72**	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	Xylenes, Total	1390		12.5	50	ug/L	5.5	**21**	N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	m,p-Xylene (sum of isomers)	968		30	100	ug/L			N1
2BG-BED-MW03	1/31/05	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW8260	o-Xylene (1,2-Dimethylbenzene)	426		12.5	50	ug/L			N1

J = estimated

N1 = regular sample

Table 4-22
Summary of PAH Compounds Detected in Round 1 Groundwater

Location	Date	Time Samp.	Lab ID	Sample ID	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Region 9 Tap Water Std	Type
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Acenaphthene	535	NJ	2.87	19.4	ug/L	**37**	N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Acenaphthylene	26.2	NJ	5.3	19.4	ug/L		N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Anthracene	3.24	NJ	0.104	1.94	ug/L	180	N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Benzo(a)anthracene	0.293	NJ	0.0724	1.94	ug/L	**0.092**	N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Fluoranthene	1.65	NJ	0.759	19.4	ug/L	150	N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Naphthalene	8.87	NJ	2.23	19.4	ug/L	**0.62**	N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Phenanthrene	1.86	NJ	0.882	19.4	ug/L		N1
2BG-BED-MW0	1/31/2005	14:30	ECEN	PBOW-05-GW-2BG-BEDMW003-01A	SW8310	Pyrene	2.34	NJ	0.734	19.4	ug/L	18	N1

NJ = tentatively identified, value estimated

N1 = regular sample

Table 4-23
Summary of Metals Compounds Detected in Round 1 Groundwater

Location	Date	Time Samp.	Lab ID	Sample ID	Test	Analyte	Result	Qual	DL	RL	Units	Bkg.	Adjusted Region 9 Tap Water Std	Type
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Aluminum (total)	11600		45.4	75	ug/L	309	**3600**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Antimony (total)	2.6		0.28	2	ug/L		**1.5**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Arsenic (total)	221		5	15	ug/L	7.4	**0.045**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Barium (total)	286		0.95	10	ug/L	11800	260	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Beryllium (total)	0.76		0.08	0.2	ug/L		7.3	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Cadmium (total)	1.4	J	0.04	1	ug/L		1.8	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Calcium (total)	743000		200	500	ug/L	316000		N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Chromium (total)	31.7		0.38	3	ug/L			N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Cobalt (total)	9.9		0.06	1	ug/L	12.1	73	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Copper (total)	17.7		0.69	1	ug/L	19.8	150	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Iron (total)	27300		15.8	25	ug/L	1550	**1100**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Lead (total)	17.9		0.25	10	ug/L			N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Magnesium (total)	18000		31.7	50	ug/L	217000		N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Manganese (total)	1020		8.05	25	ug/L	636	**88**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Nickel (total)	36.5		0.07	2	ug/L	8.6	73	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Potassium (total)	40500		75.3	1500	ug/L	116000		N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Silver (total)	0.13	J	0.04	1	ug/L		18	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Sodium (total)	380000		48.4	1250	ug/L	1390000		N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Thallium (total)	2.3	J	0.1	2.5	ug/L		**0.24**	N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Vanadium (total)	22.4		5.44	10	ug/L			N1
2BG-BED-MW01	1/28/2005	14:50	GEL	PBOW-05-GW-2BG-BEDMW001-01A	SW6020	Zinc (total)	47.2	J	5.45	50	ug/L	507	1100	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Aluminum (total)	6620		45.4	75	ug/L	309	**3600**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Antimony (total)	3		0.28	2	ug/L		**1.5**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Arsenic (total)	45.3		5	15	ug/L	7.4	**0.045**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Barium (total)	340		0.95	10	ug/L	11800	260	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Beryllium (total)	0.44		0.08	0.2	ug/L		7.3	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Cadmium (total)	0.24	J	0.04	1	ug/L		1.8	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Calcium (total)	699000		200	500	ug/L	316000		N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Chromium (total)	20		0.38	3	ug/L			N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Cobalt (total)	6.7		0.06	1	ug/L	12.1	73	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Copper (total)	13.7		0.69	1	ug/L	19.8	150	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Iron (total)	14900		15.8	25	ug/L	1550	**1100**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Lead (total)	12.5		0.25	10	ug/L			N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Magnesium (total)	263000		31.7	50	ug/L	217000		N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Manganese (total)	678		8.05	25	ug/L	636	**88**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Nickel (total)	27.9		0.07	2	ug/L	8.6	73	N1

J = estimated

N1 = regualr samples, FD1 = field duplicate

Table 4-23
Summary of Metals Compounds Detected in Round 1 Groundwater

Location	Date	Time Samp.	Lab ID	Sample ID	Test	Analyte	Result	Qual	DL	RL	Units	Bkg.	Adjusted Region 9 Tap Water Std	Type
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Potassium (total)	56400		75.3	1500	ug/L	116000		N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Silver (total)	0.082	J	0.04	1	ug/L		18	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Sodium (total)	785000		48.4	1250	ug/L	1390000		N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Thallium (total)	0.36	J	0.1	2.5	ug/L		**0.24**	N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Vanadium (total)	8.9	J	5.44	10	ug/L			N1
2BG-BED-MW02	1/31/2005	13:30	GEL	PBOW-05-GW-2BG-BEDMW002-01A	SW6020	Zinc (total)	30.4	J	5.45	50	ug/L	507	1100	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Aluminum (total)	1290		45.4	75	ug/L	309	3600	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Antimony (total)	2	J	0.28	2	ug/L		**1.5**	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Arsenic (total)	72.6		5	15	ug/L	7.4	**0.045**	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Barium (total)	842		0.95	10	ug/L	11800	260	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Beryllium (total)	0.085	J	0.08	0.2	ug/L		7.3	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Calcium (total)	237000		200	500	ug/L	316000		N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Cobalt (total)	2.6		0.06	1	ug/L	12.1	73	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Copper (total)	4		0.69	1	ug/L	19.8	150	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Iron (total)	3590		15.8	25	ug/L	1550	**1100**	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Lead (total)	2.9	J	0.25	10	ug/L			N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Magnesium (total)	163000		31.7	50	ug/L	217000		N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Manganese (total)	409		8.05	25	ug/L	636	88	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Nickel (total)	11.1		0.07	2	ug/L	8.6	73	N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Potassium (total)	50100		75.3	1500	ug/L	116000		N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Sodium (total)	706000		48.4	1250	ug/L	1390000		N1
2BG-BED-MW03	1/31/2005	14:30	GEL	PBOW-05-GW-2BG-BEDMW003-01A	SW6020	Zinc (total)	11.3	J	5.45	50	ug/L	507	1100	N1

J = estimated

N1 = regualr samples, FD1 = field duplicate

Table 6-1

Summary of Volatile Organic Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW8260	1,1-Dichloroethene	1	J	0.685	1.4	ug/Kg	12000	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW8260	Acetone	13.8		4.83	6.8	ug/Kg	1400000	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW8260	Cyclohexane	2.3	J	0.658	2.7	ug/Kg	280000	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW8260	Toluene	0.52	J	0.466	1.4	ug/Kg	66000	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW8260	1,1-Dichloroethene	1.8	J	1.27	2.5	ug/Kg	12000	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW8260	2-Butanone (Methyl ethyl ketone)	39.7		9.51	12.7	ug/Kg	2200000	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW8260	Acetone	197		8.95	12.7	ug/Kg	1400000	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW8260	1,1-Dichloroethene	1.3	J	1.01	2	ug/Kg	12000	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW8260	2-Butanone (Methyl ethyl ketone)	33.3		7.54	10.1	ug/Kg	2200000	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW8260	Acetone	175		7.1	10.1	ug/Kg	1400000	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW8260	Cyclohexane	11	J	0.968	4	ug/Kg	280000	FD1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW8260	1,1-Dichloroethane	4.5		0.746	1.6	ug/Kg	51000	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW8260	2-Butanone (Methyl ethyl ketone)	51.2		5.94	7.9	ug/Kg	2200000	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW8260	Acetone	234		5.59	7.9	ug/Kg	1400000	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW8260	Toluene	0.86	J	0.54	1.6	ug/Kg	66000	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-2
Summary of PAH Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Anthracene	6.41	NJ	2.13	5.14	ug/Kg	2200000	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Benzo(a)anthracene	22.5	NJ	3.77	5.14	ug/Kg	620	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Benzo(a)pyrene	126	NJ	4.65	10.3	ug/Kg	**62**	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Benzo(b)fluoranthene	31.9	NJ	1.84	10.3	ug/Kg	620	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Benzo(g,h,i)perylene	22.3	J	6.69	25.8	ug/Kg		N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Benzo(k)fluoranthene	49.8	NJ	1.75	10.3	ug/Kg	6200	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Chrysene	33.4	NJ	2.73	25.8	ug/Kg	62000	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Dibenz(a,h)anthracene	23.9	NJ	4.03	10.3	ug/Kg	62	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Fluoranthene	75.5	NJ	10.8	51.4	ug/Kg	230000	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Indeno(1,2,3-cd)pyrene	13.6	NJ	1.65	10.3	ug/Kg	620	N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Phenanthrene	66.8	NJ	8.99	51.4	ug/Kg		N1
SD01	5/23/2004	11:38	ECEN	PBOW-04-SD-2BG-SD01-A	0	0	SW8310	Pyrene	30.9	J	12.8	51.4	ug/Kg	230000	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Acenaphthylene	53	J	25.6	70.4	ug/Kg		N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Anthracene	9.78	NJ	2.92	7.04	ug/Kg	2200000	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(a)anthracene	26.9	NJ	5.16	7.04	ug/Kg	620	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(a)pyrene	178	NJ	6.36	14.1	ug/Kg	**62**	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(b)fluoranthene	49.5	NJ	2.52	14.1	ug/Kg	620	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(g,h,i)perylene	56.5	NJ	9.15	35.3	ug/Kg		N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(k)fluoranthene	40.3	NJ	2.39	14.1	ug/Kg	6200	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Chrysene	45.5	NJ	3.74	35.3	ug/Kg	62000	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Dibenz(a,h)anthracene	16.5	NJ	5.52	14.1	ug/Kg	62	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Fluoranthene	138	NJ	14.8	70.4	ug/Kg	230000	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Indeno(1,2,3-cd)pyrene	36	NJ	2.26	14.1	ug/Kg	620	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Naphthalene	195	NJ	17.1	70.4	ug/Kg	5600	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Phenanthrene	382	NJ	12.3	70.4	ug/Kg		N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Pyrene	64.5	J	17.6	70.4	ug/Kg	230000	N1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(a)pyrene	234	NJ	30.7	67.9	ug/Kg	**62**	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(b)fluoranthene	52.3	J	12.1	67.9	ug/Kg	620	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Benzo(k)fluoranthene	42.7	J	11.5	67.9	ug/Kg	6200	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Chrysene	38.5	J	18	170	ug/Kg	62000	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Fluoranthene	116	J	71.4	339	ug/Kg	230000	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Indeno(1,2,3-cd)pyrene	31.4	J	10.9	67.9	ug/Kg	620	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Naphthalene	237	J	82.6	339	ug/Kg	5600	FD1
SD02	5/23/2004	13:00	ECEN	PBOW-04-SD-2BG-SD02-A	0	0	SW8310	Phenanthrene	63.3	J	59.3	339	ug/Kg		FD1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Acenaphthene	5750	NJ	218	327	ug/Kg	370000	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Acenaphthylene	853	NJ	119	327	ug/Kg		N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Anthracene	288	NJ	13.6	32.7	ug/Kg	2200000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-2
Summary of PAH Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Benzo(a)anthracene	1130	NJ	24	32.7	ug/Kg	**620**	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Benzo(a)pyrene	1590	NJ	29.6	65.5	ug/Kg	**62**	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Benzo(b)fluoranthene	1230	NJ	11.7	65.5	ug/Kg	**620**	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Benzo(g,h,i)perylene	728	NJ	42.5	164	ug/Kg		N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Benzo(k)fluoranthene	881	NJ	11.1	65.5	ug/Kg	6200	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Chrysene	1330	NJ	17.4	164	ug/Kg	62000	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Dibenz(a,h)anthracene	31.6	J	25.6	65.5	ug/Kg	62	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Fluoranthene	3680	NJ	68.8	327	ug/Kg	230000	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Indeno(1,2,3-cd)pyrene	751	NJ	10.5	65.5	ug/Kg	**620**	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Naphthalene	2660	NJ	79.6	327	ug/Kg	5600	N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Phenanthrene	1460	NJ	57.1	327	ug/Kg		N1
SD03	5/23/2004	14:15	ECEN	PBOW-04-SD-2BG-SD03-A	0	0	SW8310	Pyrene	2440	NJ	81.6	327	ug/Kg	230000	N1

NJ = tentatively identified, value estimated, J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-3
Summary of Dioxin/Furan Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDD	3.43	J	0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDF	0.985	J	0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	1,2,3,7,8,9-HxCDD	0.38	J	0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	2,3,7,8-TCDF	0.353	J	0.15	0.15	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	OCDD	22.7		0.684	0.684	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	OCDF	1.35		0.684	0.684	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total HpCDD	6.86		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total HpCDF	1.91		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total HxCDD	2.17		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total HxCDF	1.55		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total PeCDD	2.46		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total PeCDF	1.99		0.342	0.342	ng/Kg		N1
SD01	5/23/2004	11:38	PDMW	PBOW-04-SD-2BG-SD01-A	0	0	SW8290	Total TCDF	1.44		0.15	0.15	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDD	28.7	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDF	8.09	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,7,8,9-HpCDF	0.722	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,7,8-HxCDF	1.39	J	0.428	0.428	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,6,7,8-HxCDD	1.66	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,6,7,8-HxCDF	1.02	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,7,8,9-HxCDD	1.85	J	0.428	0.428	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,7,8-PeCDD	0.974	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,7,8-PeCDF	0.823	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,4,6,7,8-HxCDF	1.43	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,4,7,8-PeCDF	1.77	J	0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,7,8-TCDD	2.32	J	0.182	0.182	ng/Kg	3.9	N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,7,8-TCDF	2.38	J	0.168	0.168	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	OCDD	213	J	0.84	0.84	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	OCDF	16.3	J	0.84	0.84	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HpCDD	50.1		0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HpCDF	21.5		0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HxCDD	16.8		0.421	0.421	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HxCDF	19.4		0.424	0.424	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total PeCDD	11.7		0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total PeCDF	18.8		0.42	0.42	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total TCDD	5.44		0.571	0.571	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total TCDF	15.9		0.227	0.227	ng/Kg		N1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDD	13.3	J	0.57	0.57	ng/Kg		FD1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-3
Summary of Dioxin/Furan Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDF	3.91	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,4,7,8-HxCDF	0.652	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,6,7,8-HxCDD	1.03	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	1,2,3,7,8,9-HxCDD	0.985	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,4,6,7,8-HxCDF	0.597	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,4,7,8-PeCDF	0.853	J	0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	2,3,7,8-TCDF	1.2	J	0.268	0.268	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	OCDD	84.8	J	1.14	1.14	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	OCDF	6.69	J	1.14	1.14	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HpCDD	23.3		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HpCDF	9.71		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HxCDD	8.38		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total HxCDF	7.79		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total PeCDD	3.39		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total PeCDF	7.52		0.57	0.57	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total TCDD	0.843		0.802	0.802	ng/Kg		FD1
SD02	5/23/2004	13:00	PDMW	PBOW-04-SD-2BG-SD02-A	0	0	SW8290	Total TCDF	6.71		0.268	0.268	ng/Kg		FD1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDD	68.8	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,4,6,7,8-HpCDF	18.2	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,4,7,8,9-HpCDF	1.52	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,4,7,8-HxCDD	1.72	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,4,7,8-HxCDF	2.22	J	0.731	0.731	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,6,7,8-HxCDD	3.55	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,6,7,8-HxCDF	1.82	J	0.645	0.645	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,7,8,9-HxCDD	4.51	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,7,8-PeCDD	1.46	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	1,2,3,7,8-PeCDF	0.615	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	2,3,4,6,7,8-HxCDF	2.94	J	0.699	0.699	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	2,3,4,7,8-PeCDF	2.41	J	0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	2,3,7,8-TCDD	1.52	J	0.346	0.346	ng/Kg	3.9	N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	2,3,7,8-TCDF	0.831	J	0.512	0.512	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	OCDD	508	J	0.887	0.887	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	OCDF	31.7	J	0.75	0.75	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total HpCDD	131		0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total HpCDF	46.2		0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total HxCDD	34.4		0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total HxCDF	42.7		0.724	0.724	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-3

Summary of Dioxin/Furan Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Type
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total PeCDD	9.41		0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total PeCDF	21.7		0.375	0.375	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total TCDD	3.16		0.42	0.42	ng/Kg		N1
SD03	5/23/2004	14:15	PDMW	PBOW-04-SD-2BG-SD03-A	0	0	SW8290	Total TCDF	14.5		0.512	0.512	ng/Kg		N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-4

Summary of Metals Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Aluminum (total)	9460		1.25	15.8	mg/Kg	7600	15500	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Arsenic (total)	6.09		0.326	0.789	mg/Kg	0.39	36.5	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Barium (total)	51.2		0.105	0.789	mg/Kg	540	826	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Beryllium (total)	0.45	J	0.0789	0.789	mg/Kg		1	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Cadmium (total)	0.711	J	0.0754	0.789	mg/Kg	3.7		N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Calcium (total)	82280		2.06	15.8	mg/Kg		52300	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Chromium (total)	14.3		0.254	0.789	mg/Kg		29	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Cobalt (total)	5.82		0.126	0.789	mg/Kg	90	116	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Copper (total)	19.7		0.32	0.789	mg/Kg	310	56.2	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Iron (total)	15540		2.47	15.8	mg/Kg	2300	234000	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Lead (total)	14		0.448	0.789	mg/Kg	40	48.6	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Magnesium (total)	11900		0.923	15.8	mg/Kg		10400	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Manganese (total)	181		0.206	1.58	mg/Kg	180	3506	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW7471A	Mercury (total)	0.0402		0.00154	0.0157	mg/Kg	2.3	0.1	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Nickel (total)	19		0.135	0.789	mg/Kg	160	55.1	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Potassium (total)	2050		5.64	15.8	mg/Kg		3390	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Selenium (total)	3.61		0.256	0.789	mg/Kg	39	2	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Sodium (total)	107		5.73	15.8	mg/Kg			N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Vanadium (total)	23.5		0.143	0.789	mg/Kg		40.9	N1
SD01	5/23/2004	11:38	GEL	PBOW-04-SD-2BG-SD01-A	0	0	SW6010B	Zinc (total)	60.2		0.266	0.789	mg/Kg	2300	322	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Aluminum (total)	11310		1.57	19.8	mg/Kg	7600	15500	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Arsenic (total)	5.55		0.41	0.992	mg/Kg	0.39	36.5	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Barium (total)	77.3		0.132	0.992	mg/Kg	540	826	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Beryllium (total)	0.648	J	0.0992	0.992	mg/Kg		1	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Cadmium (total)	0.93	J	0.0948	0.992	mg/Kg	3.7		N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Calcium (total)	9150		2.59	19.8	mg/Kg		52300	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Chromium (total)	17.2		0.32	0.992	mg/Kg		29	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Cobalt (total)	6.86		0.158	0.992	mg/Kg	90	116	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Copper (total)	26.6		0.403	0.992	mg/Kg	310	56.2	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Iron (total)	18510		3.11	19.8	mg/Kg	2300	234000	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Lead (total)	28.1		0.563	0.992	mg/Kg	40	48.6	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Magnesium (total)	3770		1.16	19.8	mg/Kg		10400	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Manganese (total)	114		0.26	1.98	mg/Kg	180	3506	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW7471A	Mercury (total)	0.0711		0.0019	0.0193	mg/Kg	2.3	0.1	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Nickel (total)	21.2		0.169	0.992	mg/Kg	160	55.1	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Potassium (total)	2280		7.1	19.8	mg/Kg		3390	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Selenium (total)	2.82		0.322	0.992	mg/Kg	39	2	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-4
Summary of Metals Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Sodium (total)	89.9		7.21	19.8	mg/Kg			N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Vanadium (total)	27.5		0.18	0.992	mg/Kg		40.9	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-A	0	0	SW6010B	Zinc (total)	98.6		0.334	0.992	mg/Kg	2300	322	N1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Aluminum (total)	8650		1.61	20.3	mg/Kg	7600	15500	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Arsenic (total)	4.3		0.419	1.02	mg/Kg	0.39	36.5	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Barium (total)	63.2		0.136	1.02	mg/Kg	540	826	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Beryllium (total)	0.483	J	0.102	1.02	mg/Kg		1	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Cadmium (total)	2.88		0.0971	1.02	mg/Kg	3.7		FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Calcium (total)	9190		2.65	20.3	mg/Kg		52300	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Chromium (total)	13.5		0.327	1.02	mg/Kg		29	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Cobalt (total)	5.48		0.162	1.02	mg/Kg	90	116	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Copper (total)	23.6		0.413	1.02	mg/Kg	310	56.2	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Iron (total)	14350		3.18	20.3	mg/Kg	2300	234000	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Lead (total)	21.7		0.577	1.02	mg/Kg	40	48.6	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Magnesium (total)	3000		1.19	20.3	mg/Kg		10400	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Manganese (total)	99.6		0.266	2.03	mg/Kg	180	3506	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW7471A	Mercury (total)	0.0739		0.00204	0.0208	mg/Kg	2.3	0.1	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Nickel (total)	16.7		0.174	1.02	mg/Kg	160	55.1	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Potassium (total)	2310		7.27	20.3	mg/Kg		3390	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Selenium (total)	2.6		0.329	1.02	mg/Kg	39	2	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Sodium (total)	90.6		7.38	20.3	mg/Kg			FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Vanadium (total)	22.5		0.185	1.02	mg/Kg		40.9	FD1
SD02	5/23/2004	13:00	GEL	PBOW-04-SD-2BG-SD02-D	0	0	SW6010B	Zinc (total)	85.4		0.342	1.02	mg/Kg	2300	322	FD1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Aluminum (total)	7790		1.42	17.9	mg/Kg	7600	15500	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Arsenic (total)	4.3		0.37	0.896	mg/Kg	0.39	36.5	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Barium (total)	51.9		0.12	0.896	mg/Kg	540	826	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Beryllium (total)	0.427	J	0.0896	0.896	mg/Kg		1	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Cadmium (total)	0.586	J	0.0857	0.896	mg/Kg	3.7		N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Calcium (total)	29640		2.34	17.9	mg/Kg		52300	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Chromium (total)	12		0.289	0.896	mg/Kg		29	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Cobalt (total)	4.56		0.143	0.896	mg/Kg	90	116	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Copper (total)	26.7		0.364	0.896	mg/Kg	310	56.2	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Iron (total)	12100		2.81	17.9	mg/Kg	2300	234000	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Lead (total)	19.3		0.508	0.896	mg/Kg	40	48.6	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Magnesium (total)	7760		1.05	17.9	mg/Kg		10400	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Manganese (total)	147		0.234	1.79	mg/Kg	180	3506	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW7471A	Mercury (total)	0.0467		0.00177	0.018	mg/Kg	2.3	0.1	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Table 6-4
Summary of Metals Compounds Detected in 2004 Sediment Investigation

Location	Date	Time Samp.	Lab ID	Sample ID	Depth to Top of Samp. (ft)	Depth to Bot. of Samp. (ft)	Test	Analyte	Result	Qual	DL	RL	Units	Adjusted Soil PRG	Soil Bkg.	Type
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Nickel (total)	16.1		0.153	0.896	mg/Kg	160	55.1	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Potassium (total)	1510		6.41	17.9	mg/Kg		3390	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Selenium (total)	3.69		0.291	0.896	mg/Kg	39	2	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Sodium (total)	98.6		6.51	17.9	mg/Kg			N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Vanadium (total)	21.5		0.163	0.896	mg/Kg		40.9	N1
SD03	5/23/2004	14:15	GEL	PBOW-04-SD-2BG-SD03-A	0	0	SW6010B	Zinc (total)	64.9		0.302	0.896	mg/Kg	2300	322	N1

J = estimated

N1 = regular sample, FD1 = field duplicate

Appendix A
NASA Drilling and Excavation Permit.

Digging and Excavation Permit

Part I - To be completed by the Requestor

Requestor (Please print clearly): Neil Casper		Request Date: 5-17-04
Requestor's Organization: PBOSG	Requestor's Mail Stop: 7141-209	Requestor's Phone Number: 4-3291
Work Order or Contract Number:	Site Location: Old Picnic Area north of Fox Rd. and west of the driveway to 7194-Recreation Bldg.	

Description of Work (Include start and stop dates, reference drawings, etc. Attach a plot plan of the work area.

Approximate start date-5-17-04 and finish by 7-31-04-04.

Excavate approximately 3 to 4 feet and do soil testing. Excavation will be backfilled with the material that was removed in the reverse order. This will ensure it is returned to its original composition. Soil will be compacted to the existing grade.

Copy of drawing number PF-65329 is attached.

Description of All Safety and Environmental Control Measures:

All NASA safety and environmental regulations will be followed.

The excavations will be a maximum of 3 feet wide or one bucket width. This could mean an excavation 4 feet deep and 3 feet across.

There will be no personnel entering the excavations.

Six wells will be bored. They will be 6" in diameter. Three will be 20-25 feet deep, and three will be 60-75 feet deep.

There will be twelve direct push borings approximately 2 ¾ to 3 inch in diameter and 2 to 4 feet deep.

A competent person will be there at all times with a two-way radio.

There are no underground utilities in the designated area. Overhead wires are approximately 40-50 feet to the east of this area.

A backhoe will be used to excavate.

Excavation equipment will be decontaminated between excavations.

Any water encountered will be tested for contamination and handled accordingly.

~~A copy of Form C-133 is attached.~~

Digging and Excavation Permit

Additional Comments:

Part II - To be completed by the Requestor's Supervisor or Sub-Contract Monitor

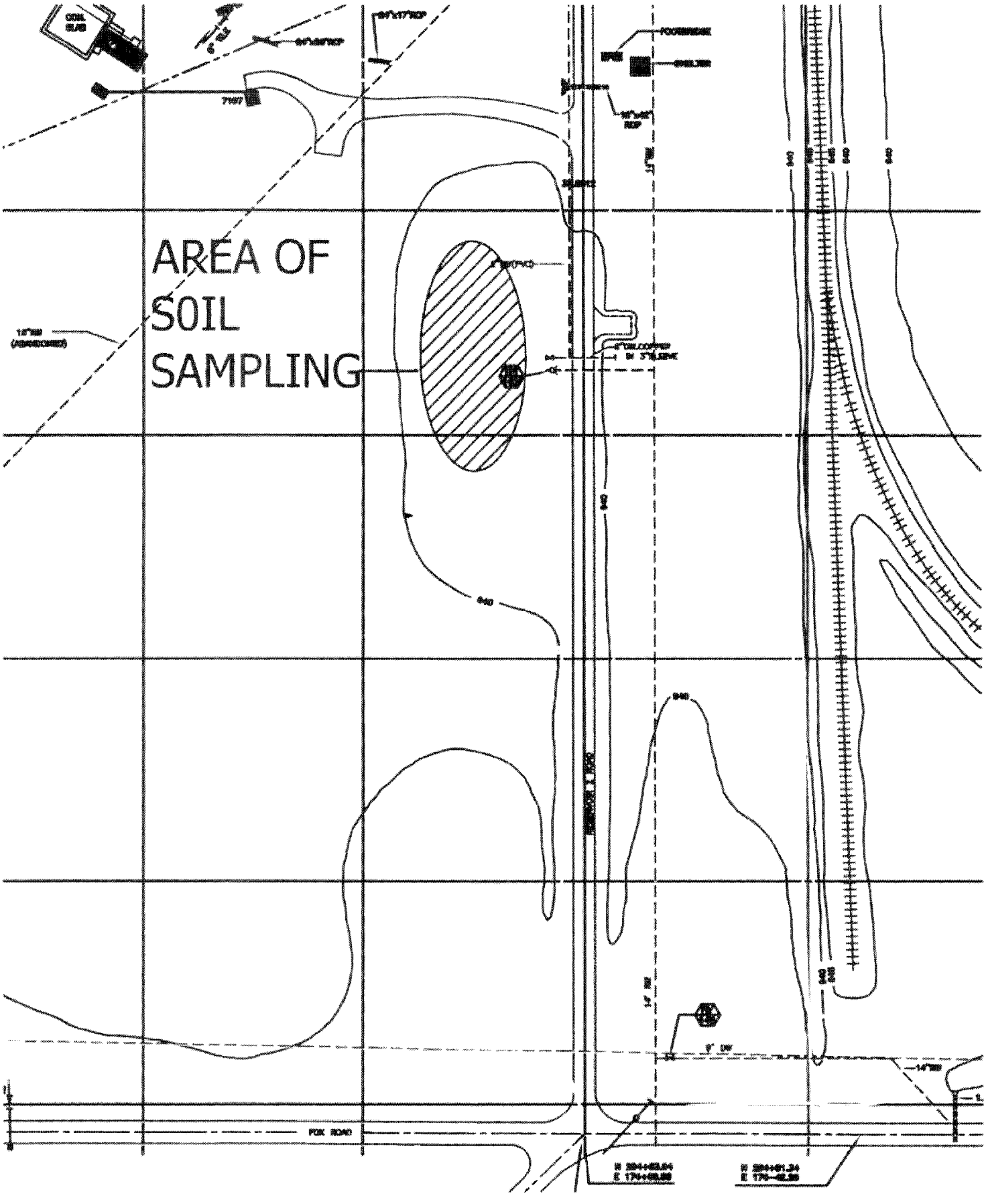
Yes	No	
X		Have known underground utilities and structures been identified and physically located and marked?
X		Have all conflicts between the proposed digging and excavation activity and the underground utilities and structures been resolved?
X		Have protective systems been identified and implemented to protect personnel from cave-ins or collapsing soil?
	X	Has a C-133, Soil Determination Checklist been completed in accordance with Chapter 34 of the GRC Environmental Programs Manual? Remedial Action

Competent Person Jim Knoll	Organization: PBOSG	Phone Number: 4-3228
Requestor's Supervisor or Sub-Contract Monitor: Lee Early	Phone Number: 4-3223	Date:

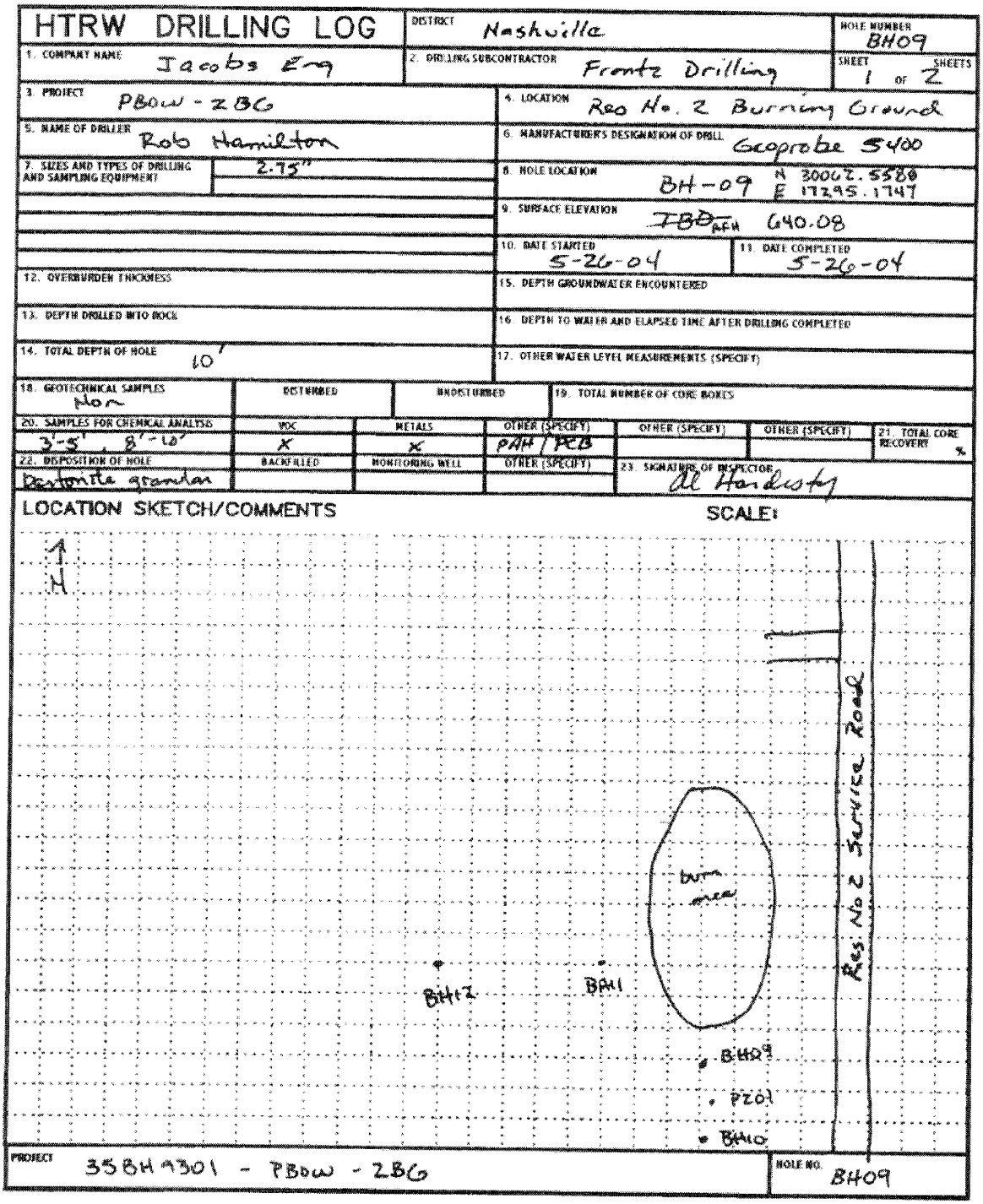
Part III - To be completed by GSO and EMO

Yes	No	
✓		Have all known and potential safety hazards been identified?
✓		Have known underground utilities and structures been identified and physically located and marked?
✓		Have all conflicts between the proposed digging and excavation activity and the underground utilities and structures been resolved?
✓		Have adequate safety control measure been identified and implemented?
X		Have all known and potential environmental concerns been identified and adequately controlled (Eg, stormwater control)?
	X	Has a C-133, Soil Determination Checklist been completed in accordance with Chapter 34 of the GRC Environmental Programs Manual? Remedial Action

Glenn Safety Office: Tommy L. Bowen	Approval Date: 5/18/04
Environmental Management Office: Robert J. Tallerine	Approval Date: 5/18/04
Plum Brook Reactor Facility Manager (if required): N/A.	Approval Date:


AREA OF
SOIL
SAMPLING

Appendix B
Soil Boring Logs.



HTRW DRILLING LOG

DISTRICT: Nashville
HOLE NUMBER: BH09
SHEET: 1 OF 2 SHEETS

1. COMPANY NAME: Jacobs Eng
2. DRILLING SUBCONTRACTOR: Frontz Drilling
3. PROJECT: PBOW - ZBG
4. LOCATION: Reo No. 2 Burning Ground
5. NAME OF DRILLER: Rob Hamilton
6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75"
8. HOLE LOCATION: BH-09 N 30062.5580 E 17295.1747
9. SURFACE ELEVATION: IBD$_{AFH}$ 640.08
10. DATE STARTED: 5-26-04
11. DATE COMPLETED: 5-26-04
12. OVERBURDEN THICKNESS:
13. DEPTH DRILLED INTO ROCK:
14. TOTAL DEPTH OF HOLE: 10'
15. DEPTH GROUNDWATER ENCOUNTERED:
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
18. GEOTECHNICAL SAMPLES: Non — DISTURBED: — UNDISTURBED: —
19. TOTAL NUMBER OF CORE BOXES:
20. SAMPLES FOR CHEMICAL ANALYSIS: 3'-5', 8'-10' — VOC: X — METALS: X — OTHER (SPECIFY): PAH / PCB — OTHER (SPECIFY): — OTHER (SPECIFY): —
21. TOTAL CORE RECOVERY %:
22. DISPOSITION OF HOLE: Bentonite granular — BACKFILLED: — MONITORING WELL: — OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR: Al Hardisty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 - PBOW - ZBG
HOLE NO.: BH09

Figure 5-1

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH09

PROJECT PBOW - 2B6

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SAMPLE NO.	LABORATORY SAMPLE NO.	WATER CONTENT (%)	REMARKS
	1	0' - 2.5', OL/OH, Clay, organic, dark brown (10YR, 3/1), firm, low plasticity, moist. Burn layer material cinders, gravel (black) at 15" - 19".					
	2						
	3	2.5' - 7.25', CL, clay, silty, light brown (10YR, 4/4), firm, low plasticity, moist. Soft at 5.5' - 5.75' and at 6.75' - 7'. Higher silt content at 6.25' - 6.5'.					
	4						
	5						
	6						
	7						
	8	7.25' - 9.25', ML/CL silt and clay, light brown (10YR, 4/6) soft to firm, low plasticity, moist					
	9						
	10	9.25' - 10', CH, clay medium brown to medium gray (10YR, 4/2) firm, low to medium plasticity, moist					

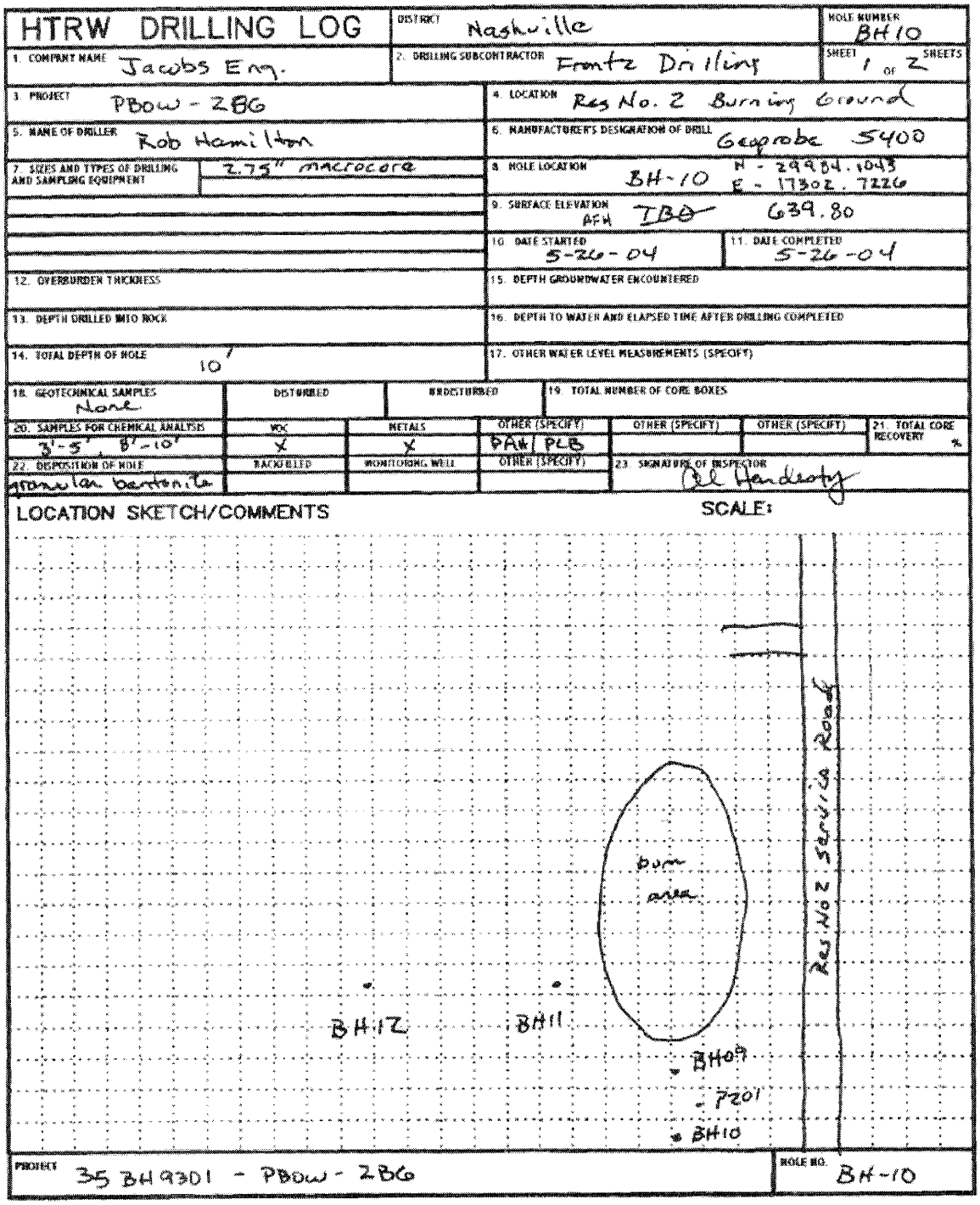
PROJECT 35BH9301 - PBOW - 2B6

HOLE NO. BH09

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: BH10

1. COMPANY NAME: Jacobs Eng.

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET 1 OF 2 SHEETS

3. PROJECT: PBOW - 286

4. LOCATION: Reg No. 2 Burning Ground

5. NAME OF DRILLER: Rob Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore

8. HOLE LOCATION: BH-10 N - 29934.1043 E - 17302.7226

9. SURFACE ELEVATION AFH: TBD 639.80

10. DATE STARTED: 5-26-04

11. DATE COMPLETED: 5-26-04

12. OVERBURDEN THICKNESS:

13. DEPTH DRILLED INTO ROCK:

14. TOTAL DEPTH OF HOLE: 10'

15. DEPTH GROUNDWATER ENCOUNTERED:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED:

19. TOTAL NUMBER OF CORE BOXES:

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5', 8'-10'	X	X	PAH/PCB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
granular bentonite				Al Henderson

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: 35 BH9301 - PBOW - 286

HOLE NO.: BH-10

Figure 5-1

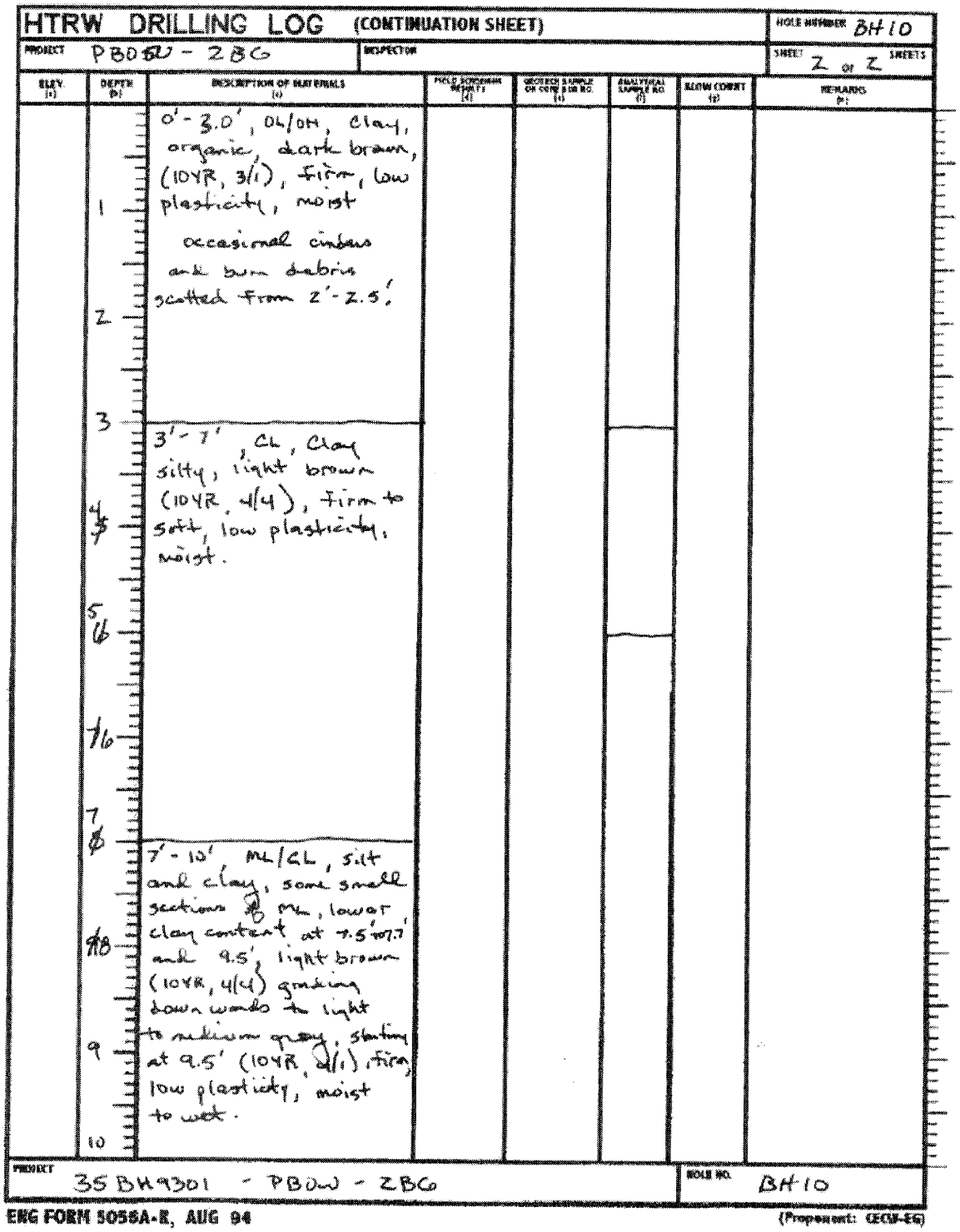
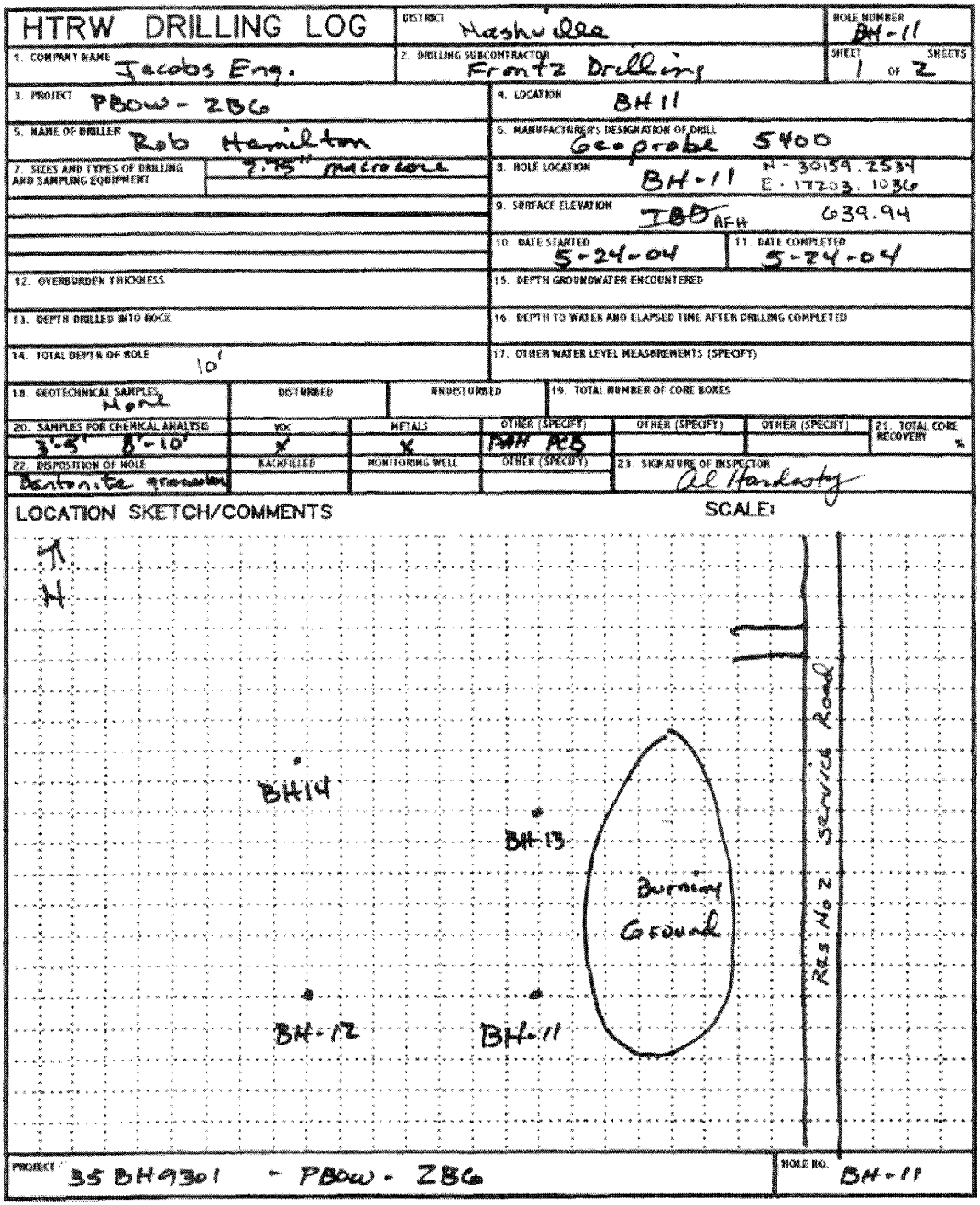


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville | HOLE NUMBER: BH-11

1. COMPANY NAME: Jacobs Eng. | 2. DRILLING SUBCONTRACTOR: Frontz Drilling | SHEET 1 OF 2 SHEETS

3. PROJECT: PBOW - ZBG | 4. LOCATION: BH 11

5. NAME OF DRILLER: Rob Hamilton | 6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore | 8. HOLE LOCATION: BH-11 N - 30159.2534 E - 17203.1036

9. SURFACE ELEVATION: TBD AFH 639.94

10. DATE STARTED: 5-24-04 | 11. DATE COMPLETED: 5-24-04

12. OVERBURDEN THICKNESS | 15. DEPTH GROUNDWATER ENCOUNTERED

13. DEPTH DRILLED INTO ROCK | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

14. TOTAL DEPTH OF HOLE: 10' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES: None | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES

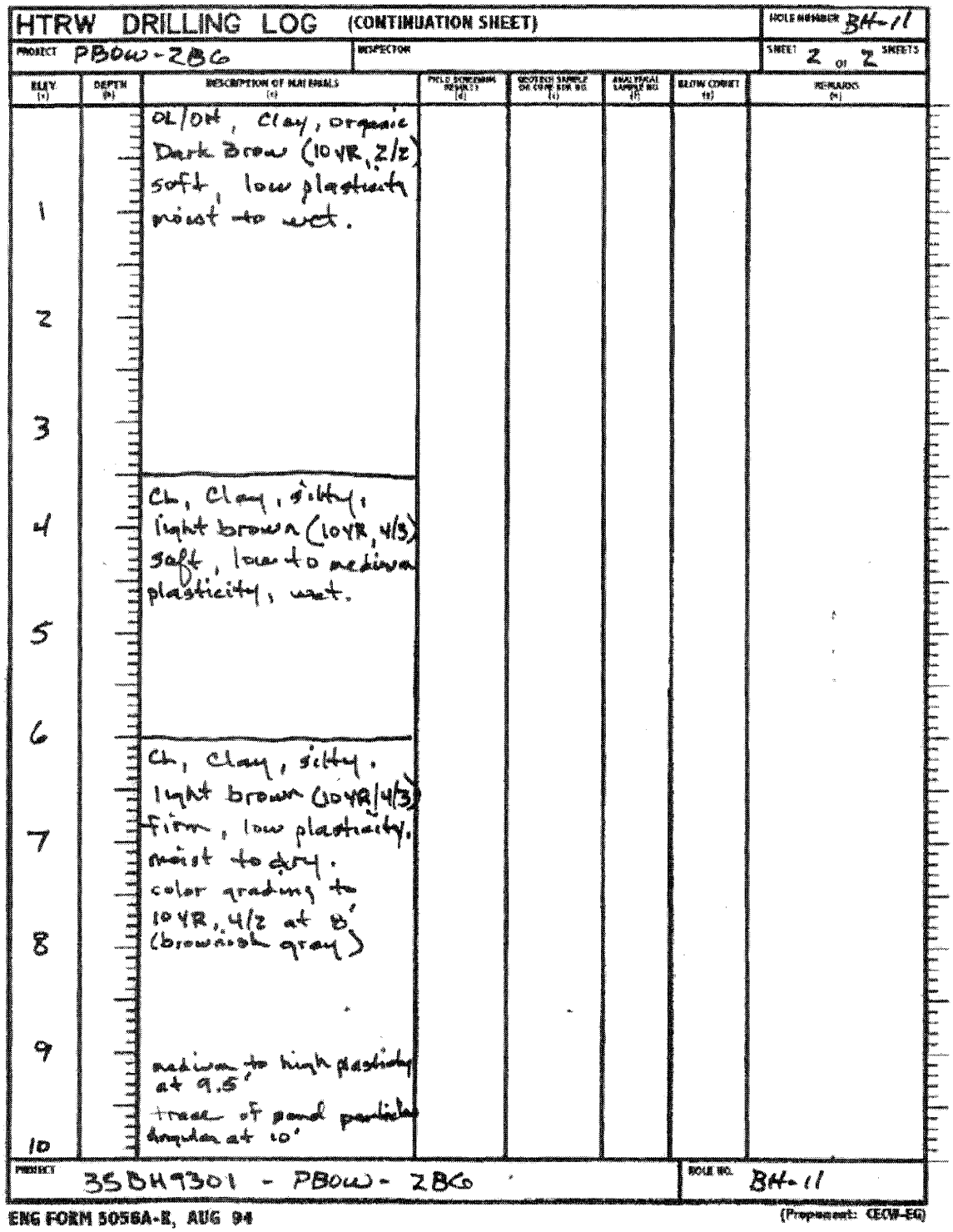
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5' 8'-10'	X	X	PAH PCB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Bentonite granules				Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35 BH9301 - PBOW - ZBG | HOLE NO. BH-11

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH-11

PROJECT PBOW-2BG

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	1	OL/OH, Clay, organic Dark Brown (10YR, 2/2) soft, low plasticity moist to wet.					
	2						
	3						
	4	CL, Clay, silty, light brown (10YR, 4/3) soft, low to medium plasticity, wet.					
	5						
	6						
	7	CL, Clay, silty, light brown (10YR/4/3) firm, low plasticity, moist to dry. color grading to 10YR, 4/2 at 8' (brownish gray)					
	8						
	9	medium to high plasticity at 9.5'					
	10	trace of sand particles angular at 10'					

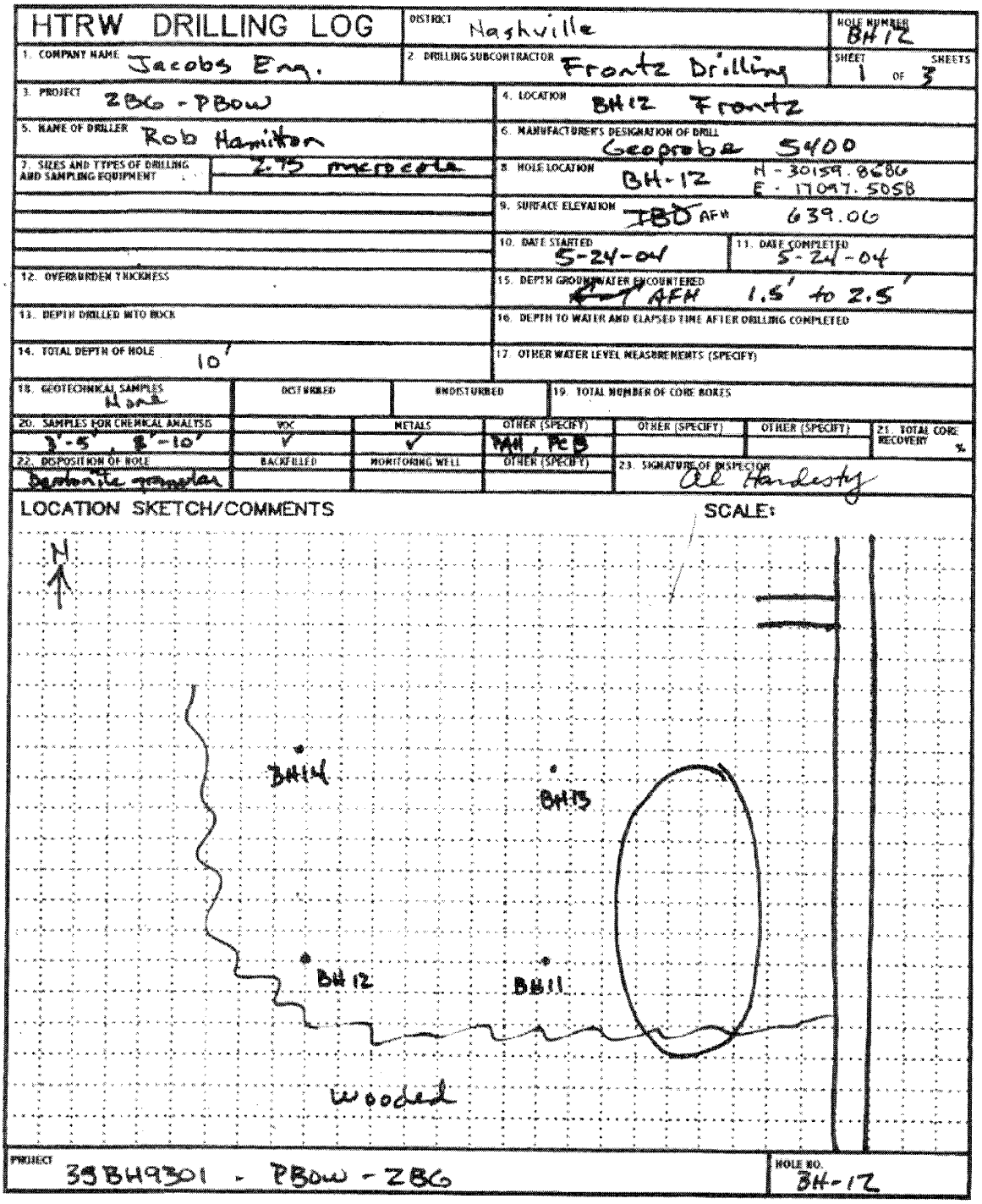
PROJECT 35DH9301 - PBOW - 2BG

HOLE NO. BH-11

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: BH12

1. COMPANY NAME: Jacobs Eng.

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET: 1 OF 3 SHEETS

3. PROJECT: ZBG - PBOW

4. LOCATION: BH12 Frontz

5. NAME OF DRILLER: Rob Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75 macrocore

8. HOLE LOCATION: BH-12 N - 30159.8686 E - 17097.5058

9. SURFACE ELEVATION: ~~639.0~~ 638 AFH 639.06

10. DATE STARTED: 5-24-04

11. DATE COMPLETED: 5-24-04

12. OVERBURDEN THICKNESS:

13. DEPTH DRILLED INTO ROCK:

14. TOTAL DEPTH OF HOLE: 10'

15. DEPTH GROUNDWATER ENCOUNTERED: ~~5'~~ AFH 1.5' to 2.5'

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED: — 19. TOTAL NUMBER OF CORE BOXES:

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5', 8'-10'	✓	✓	PAH, PCB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Bentonite granular				Al Hardesty

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: 39BH9301 - PBOW - ZBG

HOLE NO.: BH-12

Figure 5-1

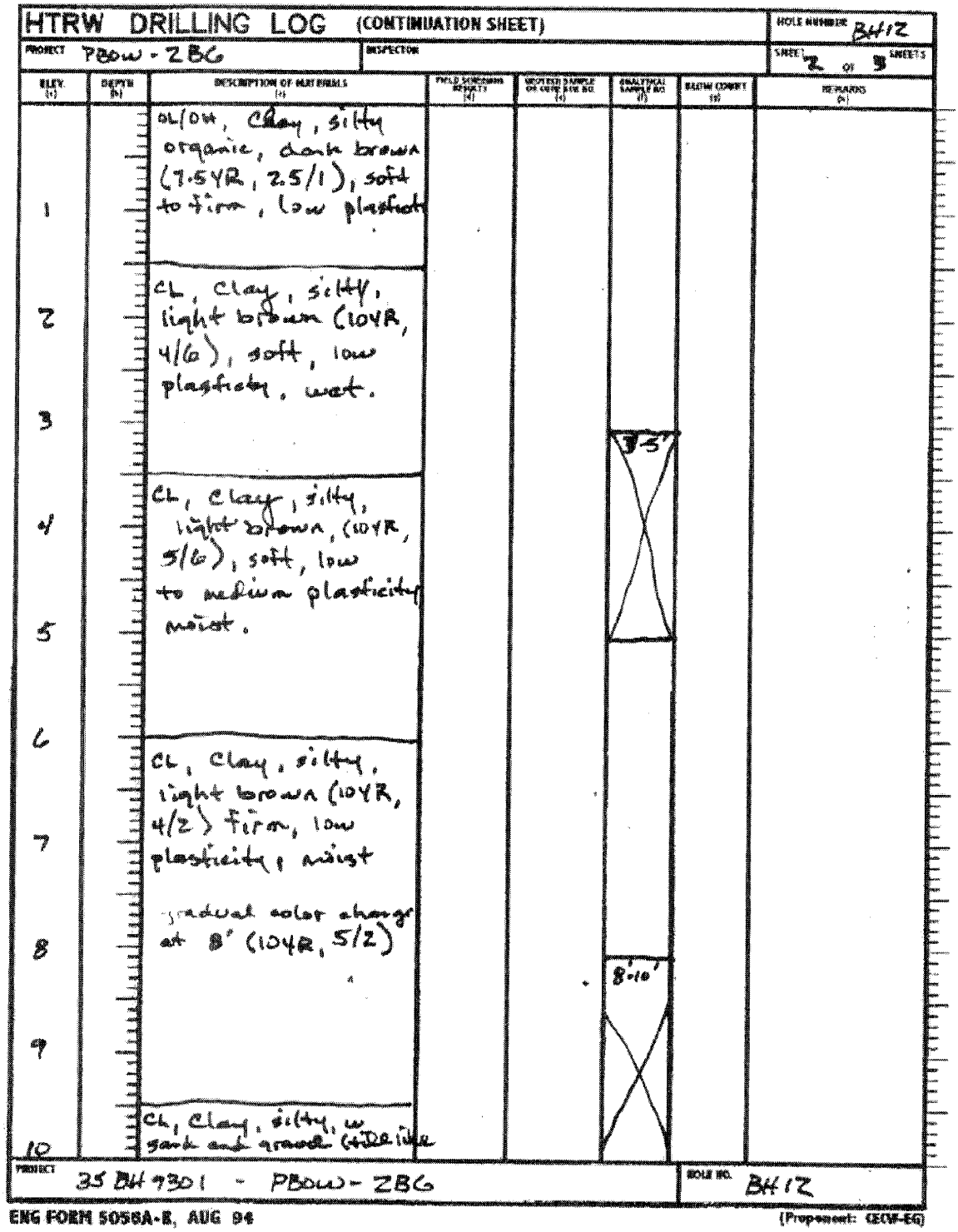
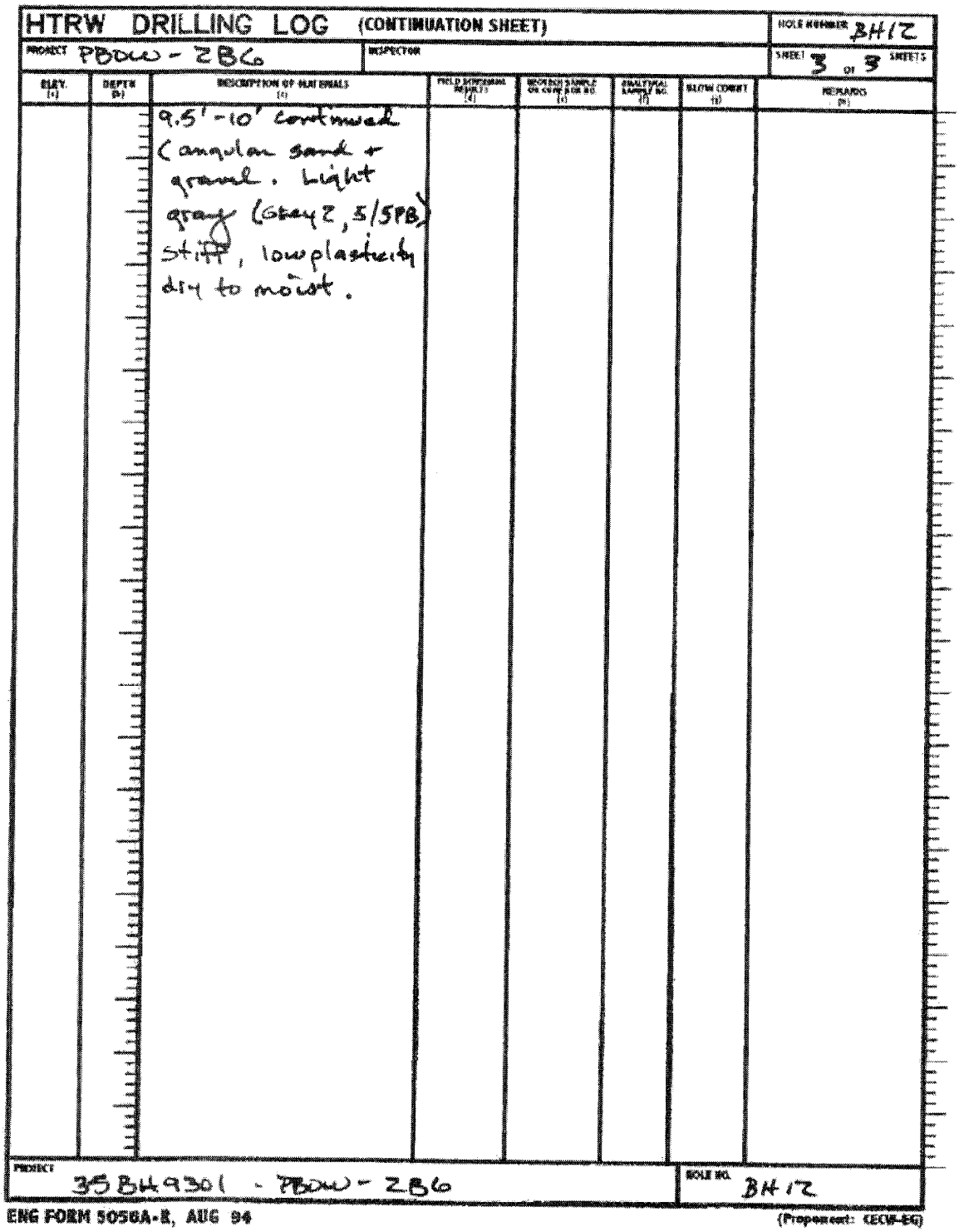


Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH12

PROJECT PBOW - 2B6

INSPECTOR

SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SECONDARY SAMPLE ID	ANALYTICAL SAMPLE ID	BLOW COUNT	REMARKS
		9.5'-10' continued Angular sand + gravel. Light gray (Gley2, 5/5PB) stiff, low plasticity dry to moist.					

PROJECT 35BH9301 - PBOW - 2B6

HOLE NO. BH12

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

HTRW DRILLING LOG

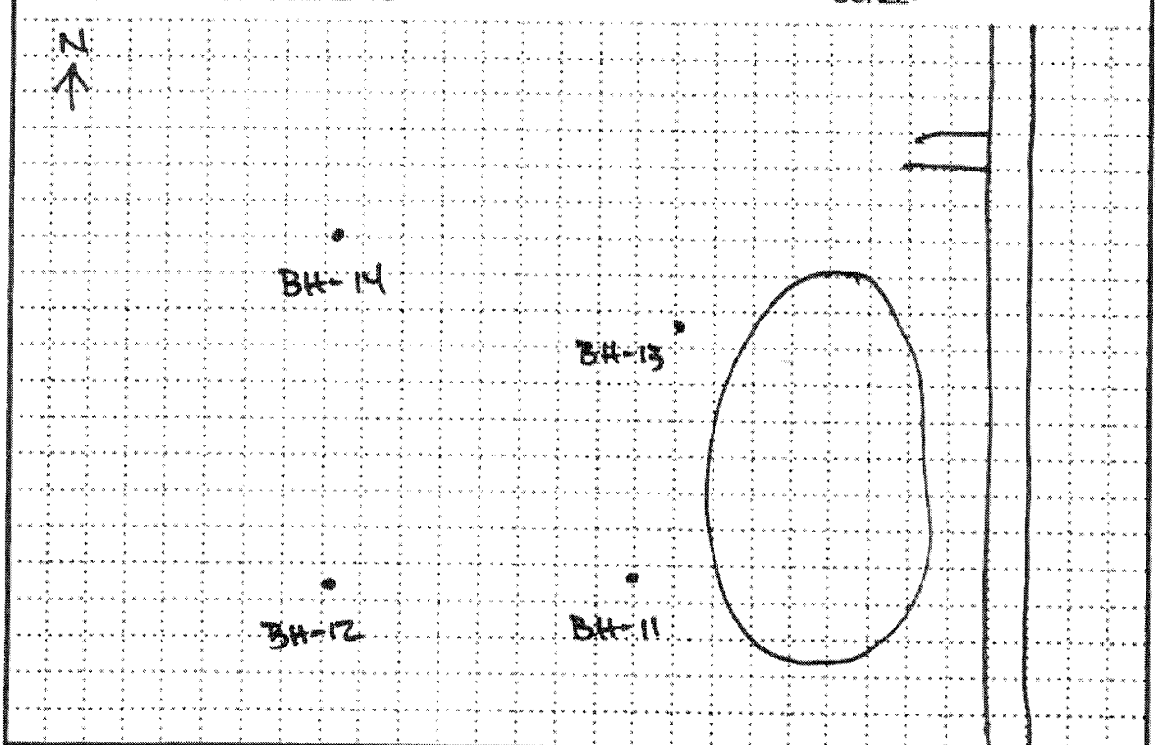
DISTRICT: Nashville		HOLE NUMBER: BH-13
1. COMPANY NAME: Jacobs Eng	2. DRILLING SUBCONTRACTOR: Frontz Drilling	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW-2BG	4. LOCATION: BH-13	
5. NAME OF DRILLER: Rob Hamilton	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore	8. HOLE LOCATION: N-30222.8758 E-17218.6157 BH-13 outside burn layer	
	9. SURFACE ELEVATION: ~~IBD~~ AFH 640.19	
	10. DATE STARTED: 5-24-04	11. DATE COMPLETED: 5-24-04
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3'-5' - 8'-10'	X	X	PAH - PCB			x

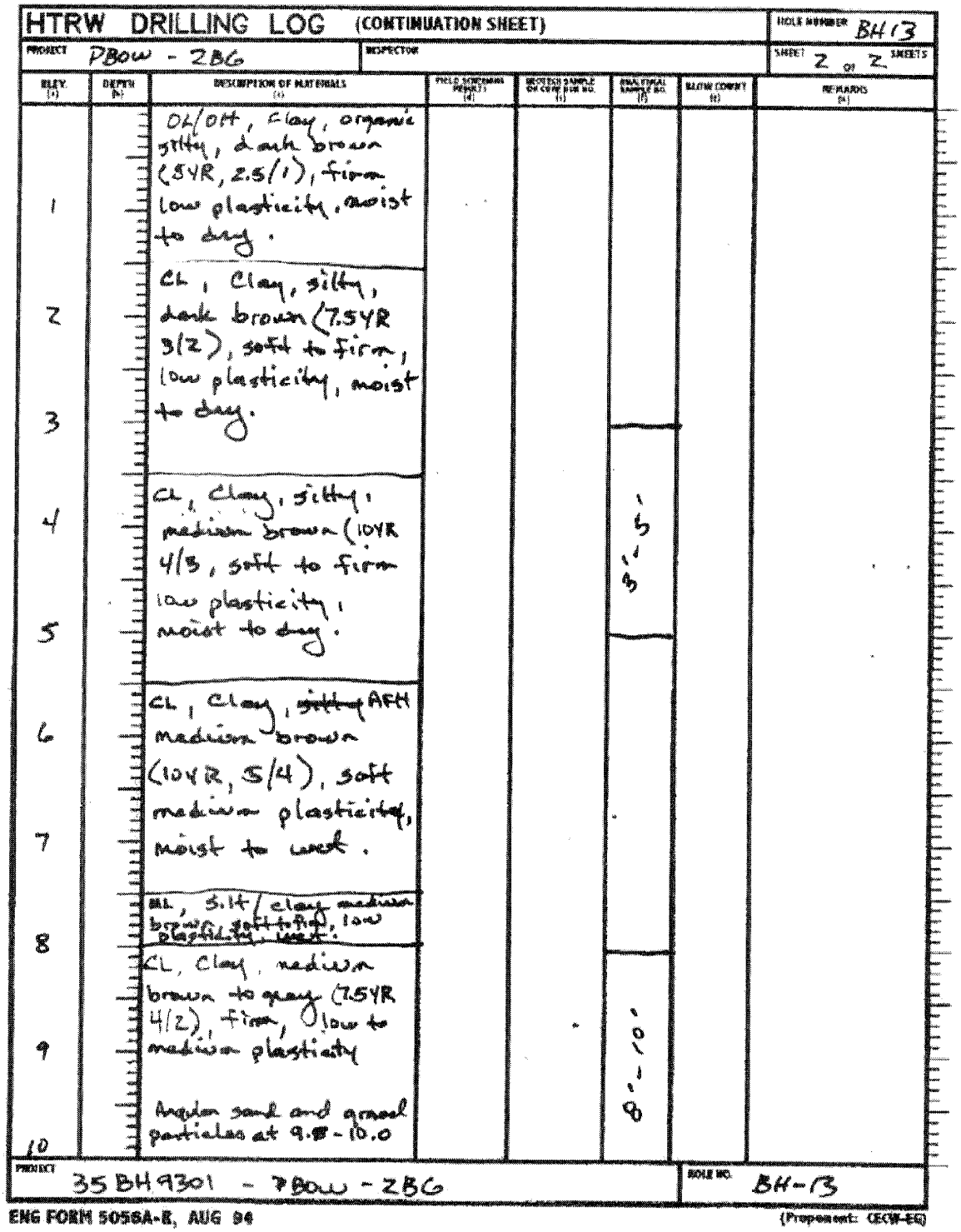
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Bentonite granular				Al Hardisty

LOCATION SKETCH/COMMENTS SCALE:



PROJECT: 35BH9301 - PBOW-2BG	HOLE NO. BH-13

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH13

PROJECT PBOW - ZBG

INSPECTOR

SHEET 2 OF 2 SHEETS

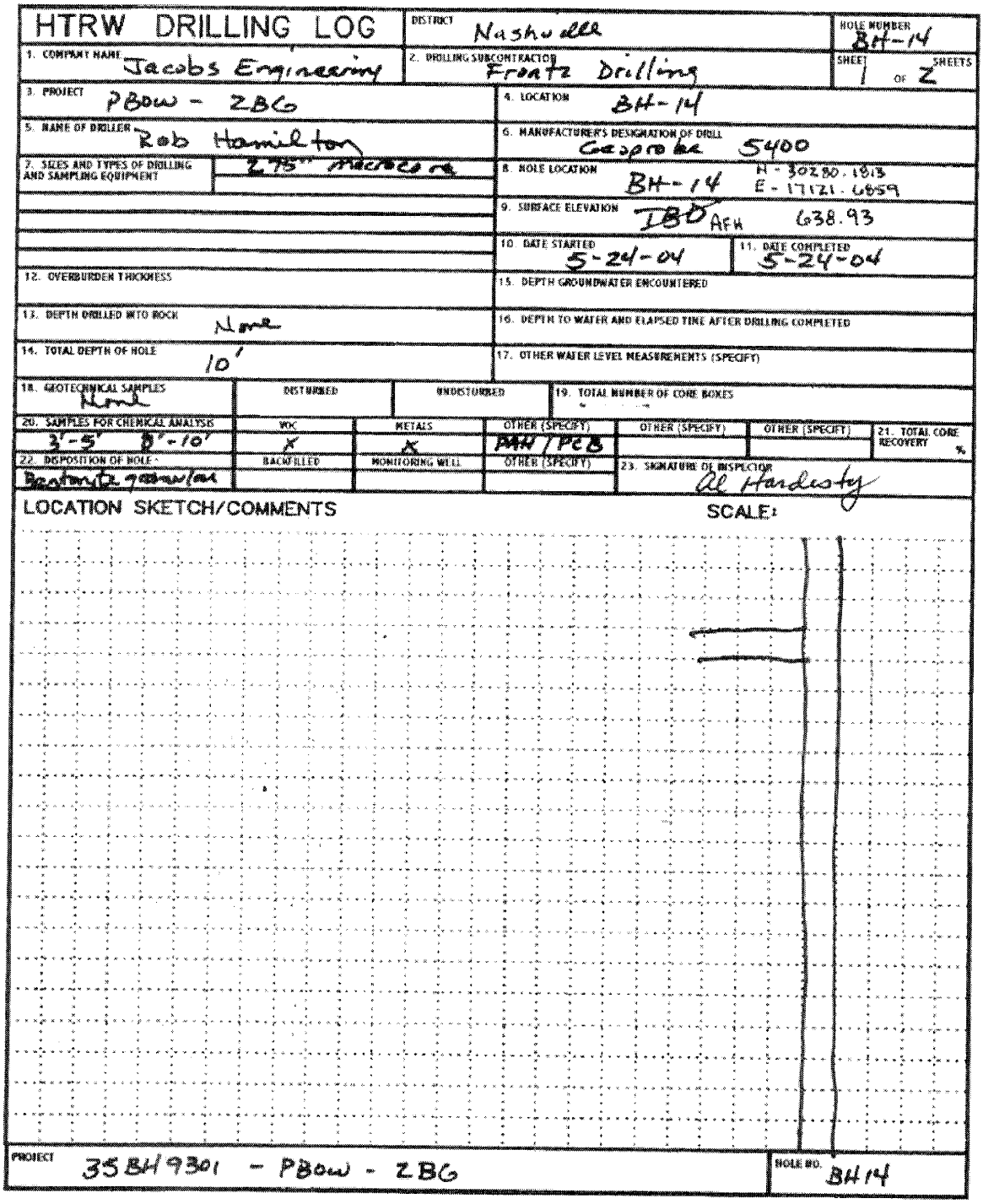
ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SELECTED SAMPLE OR CORE RUN NO. (e)	ANALYTICAL SAMPLE NO. (f)	BELOW CASING (g)	REMARKS (h)
1		OL/OH, clay, organic silty, dark brown (5YR, 2.5/1), firm low plasticity, moist to dry.					
2		CL, Clay, silty, dark brown (7.5YR 3/2), soft to firm, low plasticity, moist to dry.					
3							
4		CL, Clay, silty, medium brown (10YR 4/3, soft to firm low plasticity, moist to dry.			3'-5'		
5							
6		CL, Clay, ~~silty~~ AFH medium brown (10YR, 5/4), soft medium plasticity, moist to wet.					
7							
8		ML, Silt/clay medium brown, soft to firm, low plasticity, wet.					
9		CL, Clay, medium brown to gray (7.5YR 4/2), firm, low to medium plasticity Angular sand and gravel particles at 9.8 - 10.0			8'-10'		
10							

PROJECT 35BH9301 - PBOW - ZBG

HOLE NO. BH-13

ENG FORM 5056A-E, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville | HOLE NUMBER: BH-14 | SHEET 1 OF 2 SHEETS

1. COMPANY NAME: Jacobs Engineering
2. DRILLING SUBCONTRACTOR: Fronatz Drilling
3. PROJECT: PBOW - ZBG
4. LOCATION: BH-14
5. NAME OF DRILLER: Rob Hamilton
6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" Macro Core
8. HOLE LOCATION: BH-14 — N - 30280.1813, E - 17121.6859
9. SURFACE ELEVATION: IBD AFH 638.93
10. DATE STARTED: 5-24-04
11. DATE COMPLETED: 5-24-04
12. OVERBURDEN THICKNESS:
13. DEPTH DRILLED INTO ROCK: None
14. TOTAL DEPTH OF HOLE: 10'
15. DEPTH GROUNDWATER ENCOUNTERED:
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED: —
19. TOTAL NUMBER OF CORE BOXES:
20. SAMPLES FOR CHEMICAL ANALYSIS: 3'-5' 8'-10' — VOC: X — METALS: X — OTHER (SPECIFY): PAH / PCB — OTHER (SPECIFY): — OTHER (SPECIFY): — 21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE: Backfilled — BACKFILLED: — MONITORING WELL: — OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR: Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 - PBOW - ZBG | HOLE NO.: BH14

Figure 5-1

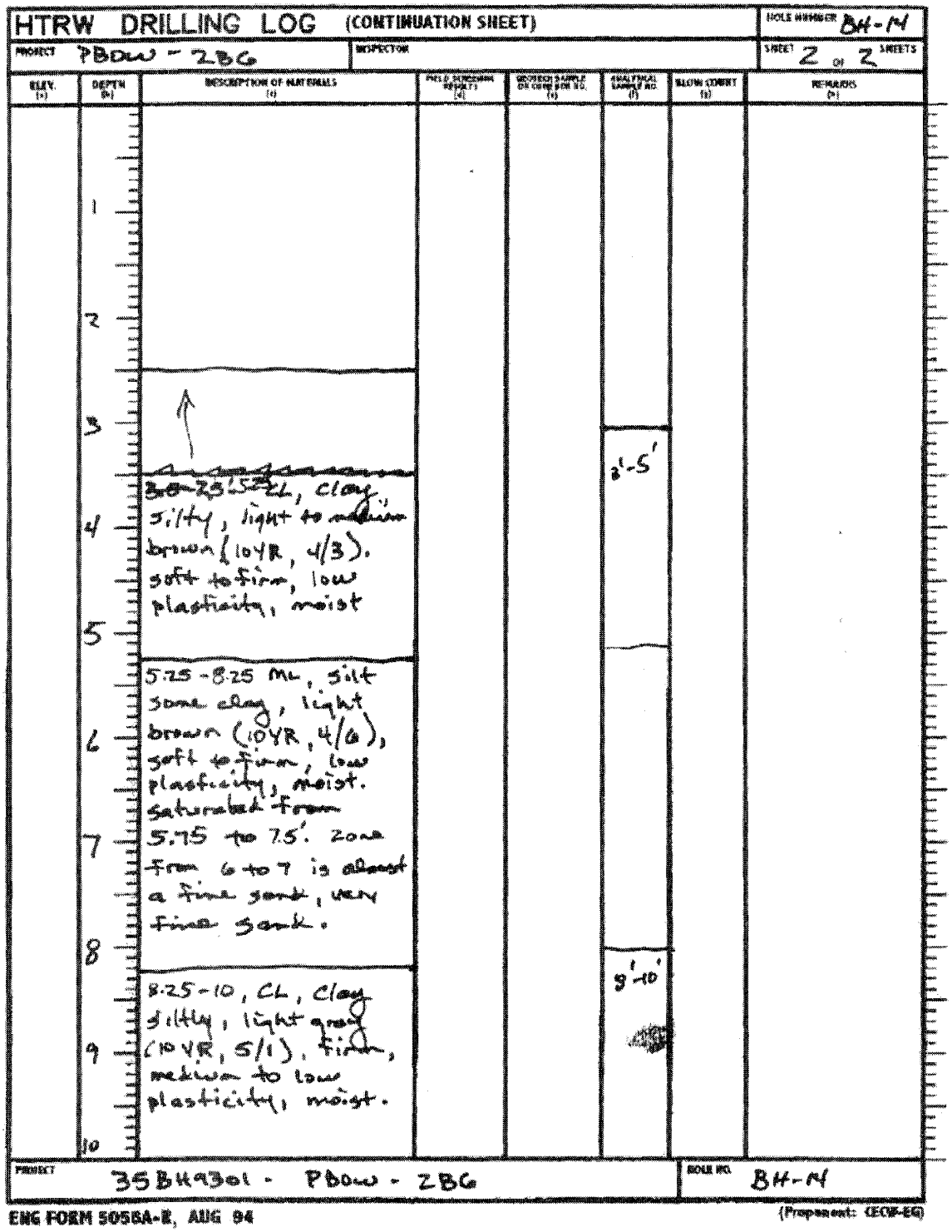
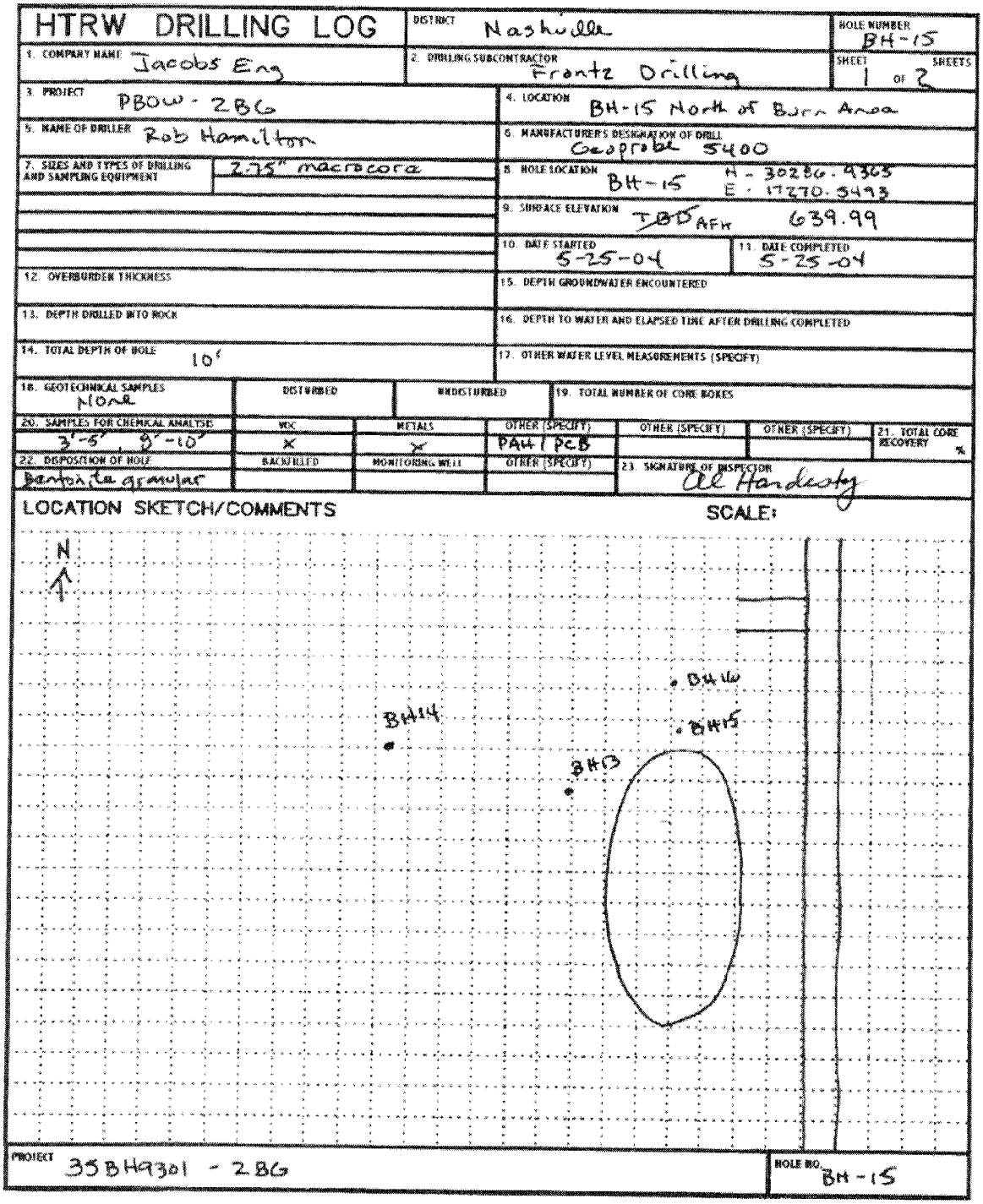


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville
HOLE NUMBER: BH-15
SHEET: 1 OF 2 SHEETS

1. COMPANY NAME: Jacobs Eng
2. DRILLING SUBCONTRACTOR: Frontz Drilling
3. PROJECT: PBOW - 2BG
4. LOCATION: BH-15 North of Burn Area
5. NAME OF DRILLER: Rob Hamilton
6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore
8. HOLE LOCATION: BH-15 N - 30286.9303 E - 17270.3493
9. SURFACE ELEVATION: TBD AFH 639.99
10. DATE STARTED: 5-25-04
11. DATE COMPLETED: 5-25-04
12. OVERBURDEN THICKNESS:
13. DEPTH DRILLED INTO ROCK:
14. TOTAL DEPTH OF HOLE: 10'
15. DEPTH GROUNDWATER ENCOUNTERED:
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES:

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5', 8'-10'	X	X	PAH / PCB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
bentonite granular				Al Handerby

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 - 2BG
HOLE NO.: BH-15

Figure 5-1

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH-15

PROJECT PBOW - ZBG

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SECTION SAMPLE OR CORE RUN NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	0"-6", OL/OH, clay, organic, dark brown (10YR, 2/2), firm, low plasticity, moist.					
	2	6"-8", ML, silt, light brown, (5YR, 4/4), soft, loose, low to none plasticity, moist.					
	3	8"-2.5', OL/OH, clay, organic, dark brown (10YR, 3/1), firm, low plasticity, moist					
	4	2.5'-3.0', CL/ML, clay and silt, grading into silt w/ clay downwards light brown (10YR, 4/6) soft to firm, low plasticity, moist.			3'-5'		
	5	3.0'-3.25' ML, silt w clay, light brown (10YR, 4/6), soft, low plasticity, wet.					
	6	3.25'-9.75' CL, clay silty, light brown (10YR, 4/4), soft, low to medium plasticity, moist to wet.					
	7	silt layer at 6.0'-6.25'					
	8						
	9	9.75'-10'-CL, Clay, little silt, light gray (10YR, 5/1), soft to firm, medium plasticity moist.					
	10						

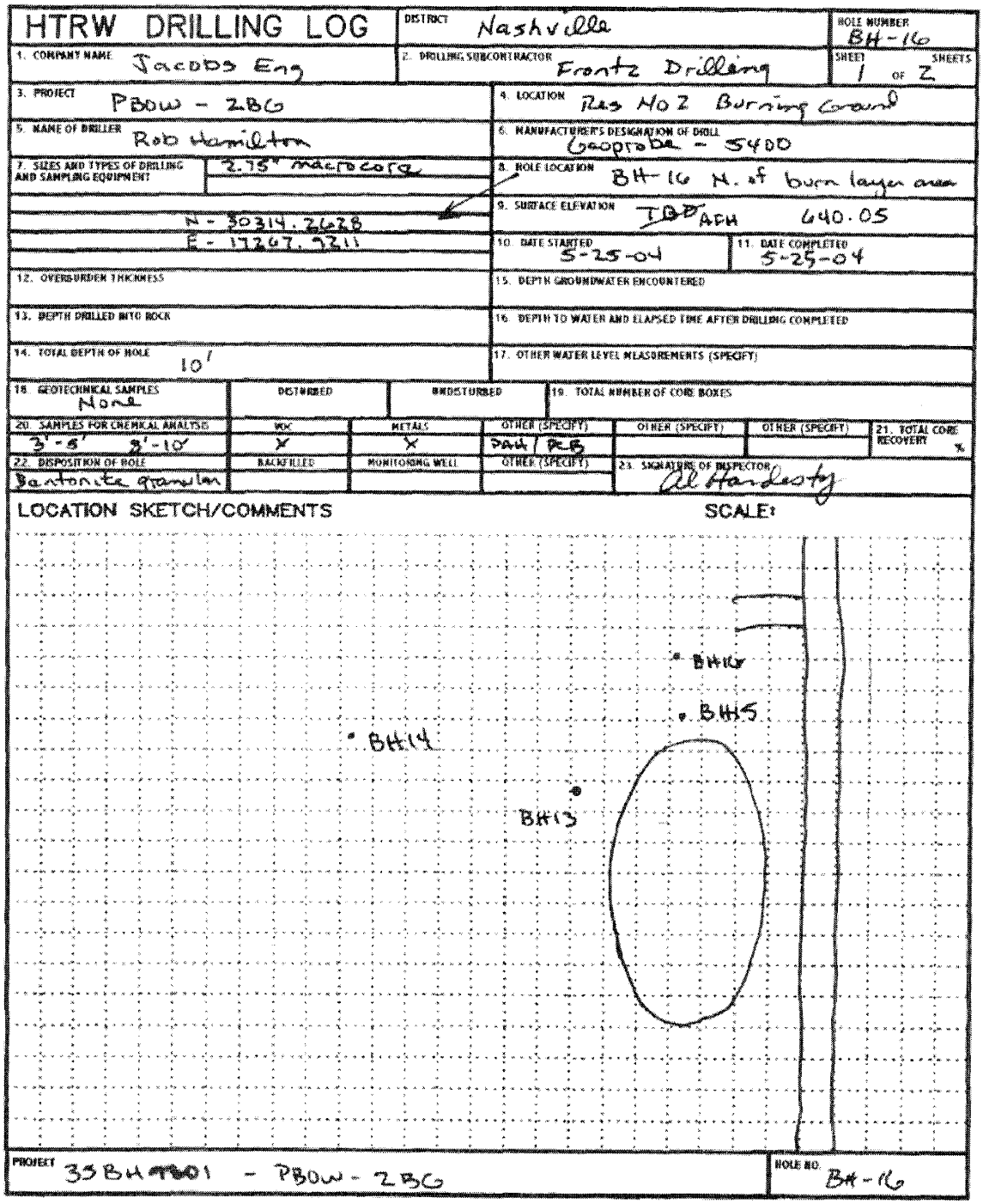
PROJECT 35BH9301 - PBOW - ZBG

HOLE NO. BH-15

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

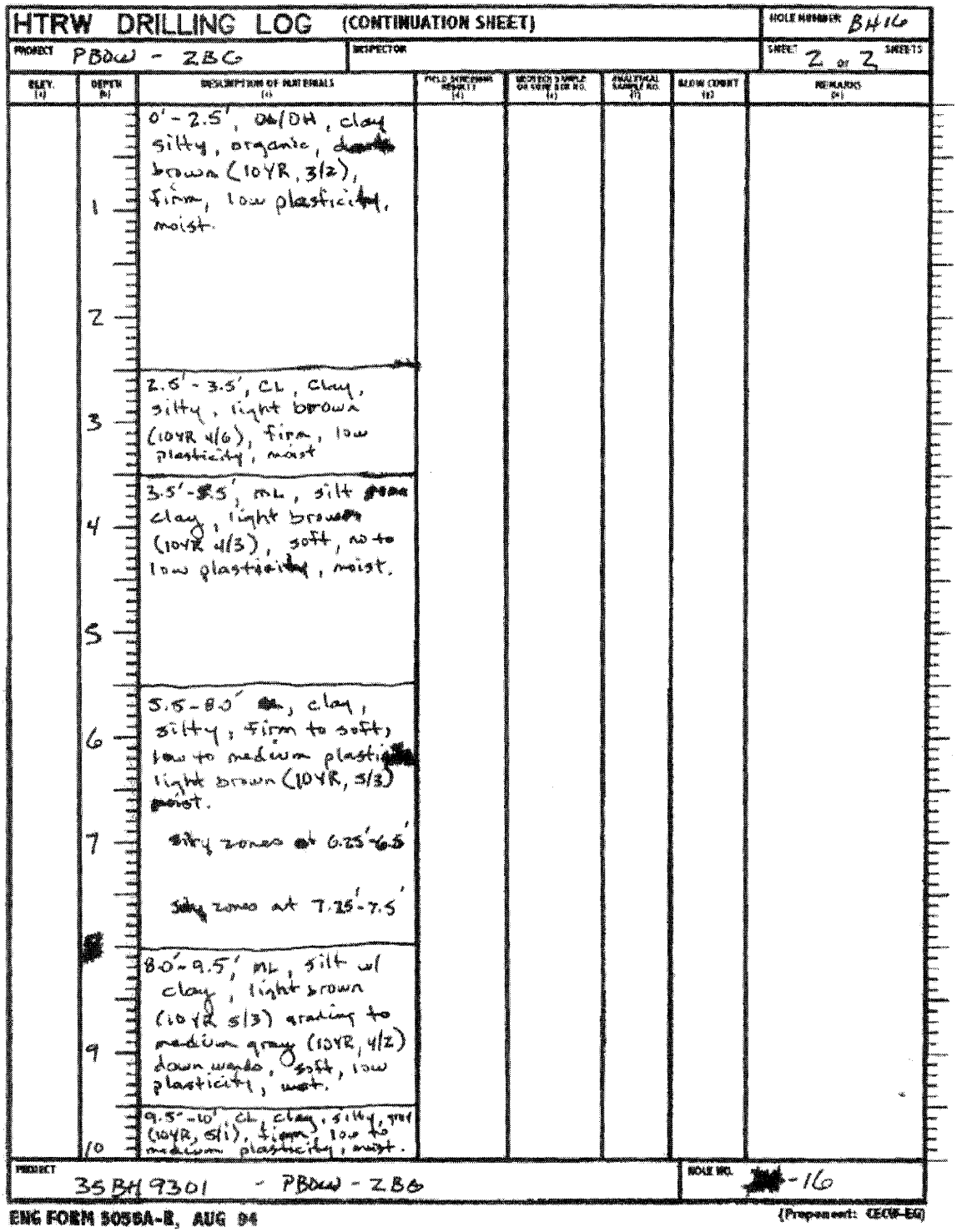
DISTRICT: Nashville
HOLE NUMBER: BH-16
SHEET 1 OF 2 SHEETS

1. COMPANY NAME: Jacobs Eng
2. DRILLING SUBCONTRACTOR: Frontz Drilling
3. PROJECT: PBOW - 2BG
4. LOCATION: Rag No 2 Burning Ground
5. NAME OF DRILLER: Rob Hamilton
6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe - 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore
8. HOLE LOCATION: BH-16 N. of burn layer area
N - 30314.2628
E - 17267.7211
9. SURFACE ELEVATION: IDD APH 640.05
10. DATE STARTED: 5-25-04
11. DATE COMPLETED: 5-25-04
12. OVERBURDEN THICKNESS:
13. DEPTH DRILLED INTO ROCK:
14. TOTAL DEPTH OF HOLE: 10'
15. DEPTH GROUNDWATER ENCOUNTERED:
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
18. GEOTECHNICAL SAMPLES: None — DISTURBED — UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES:
20. SAMPLES FOR CHEMICAL ANALYSIS: 3'-5' 8'-10' — VOC: X — METALS: X — OTHER (SPECIFY): Pest / PCB — OTHER (SPECIFY) — OTHER (SPECIFY)
21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE: Bentonite granular — BACKFILLED — MONITORING WELL — OTHER (SPECIFY)
23. SIGNATURE OF INSPECTOR: Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9801 - PBOW - 2BG
HOLE NO.: BH-16

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH16

PROJECT PBOW - ZBC

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SELECTED SAMPLE OR CORE RUN NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	0'-2.5', OH/OH, clay silty, organic, dark brown (10YR, 3/2), firm, low plasticity, moist.					
	2						
	3	2.5'-3.5', CL, clay, silty, light brown (10YR 4/6), firm, low plasticity, moist					
	4	3.5'-5.5', ML, silt some clay, light brown (10YR 4/3), soft, no to low plasticity, moist.					
	5						
	6	5.5-8.0' ML, clay, silty; firm to soft, low to medium plastic light brown (10YR, 5/3) moist.					
	7	silty zones at 6.25'-6.5'					
		silty zones at 7.25'-7.5'					
	9	8.0'-9.5', ML, silt w/ clay, light brown (10YR 5/3) grading to medium gray (10YR, 4/2) downwards, soft, low plasticity, wet.					
	10	9.5'-10', CL, clay, silty, gray (10YR, 5/1), firm, low to medium plasticity, wet.					

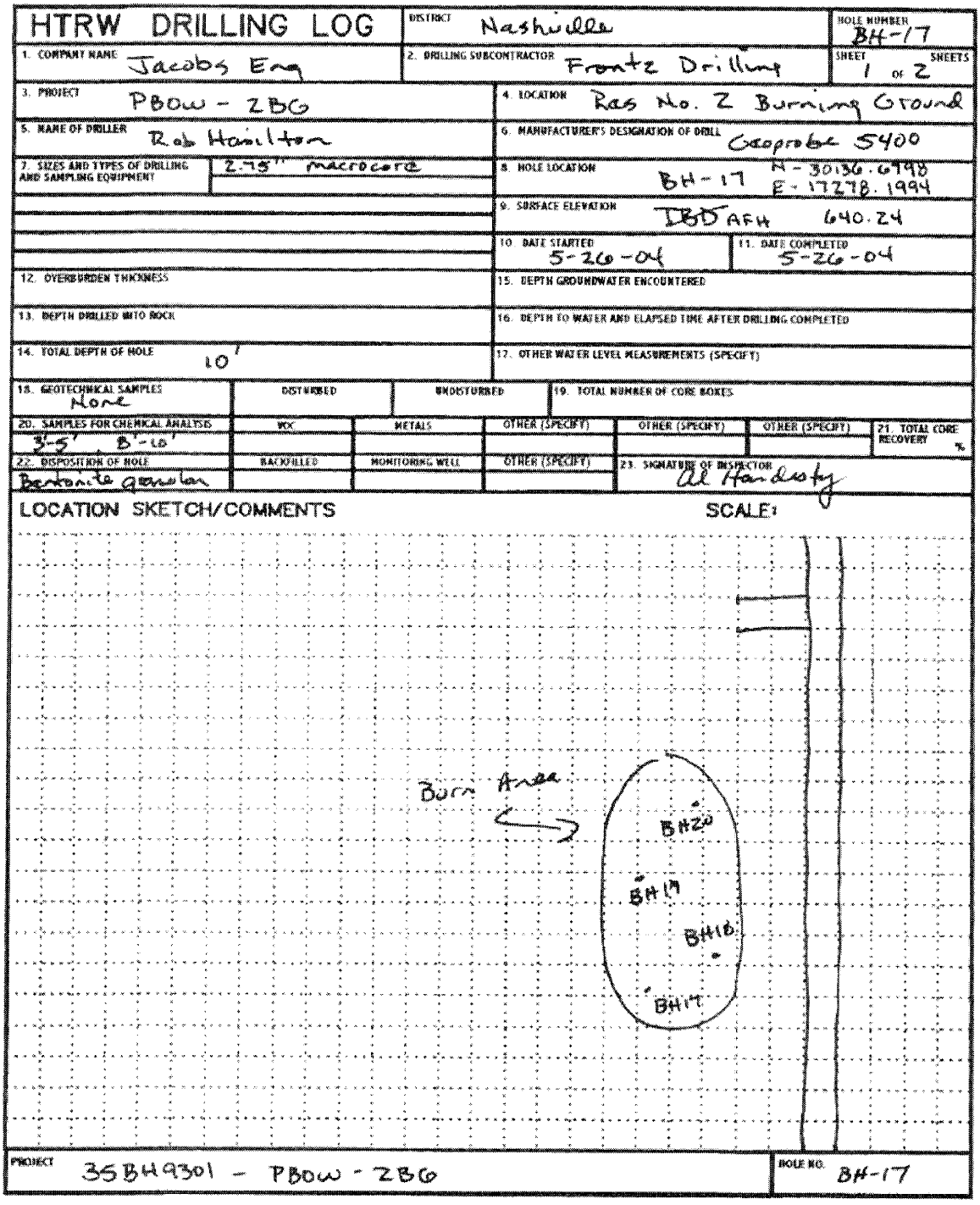
PROJECT 35BH9301 - PBOW - ZBC

HOLE NO. [redacted]-16

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville | HOLE NUMBER: BH-17

1. COMPANY NAME: Jacobs Eng | 2. DRILLING SUBCONTRACTOR: Frontz Drilling | SHEET 1 of 2 SHEETS

3. PROJECT: PBOW - ZBG | 4. LOCATION: Ras No. 2 Burning Ground

5. NAME OF DRILLER: Rob Hamilton | 6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore | 8. HOLE LOCATION: BH-17 N - 30136.6798 E - 17278.1994

9. SURFACE ELEVATION: DBD AFH 640.24

10. DATE STARTED: 5-26-04 | 11. DATE COMPLETED: 5-26-04

12. OVERBURDEN THICKNESS | 15. DEPTH GROUNDWATER ENCOUNTERED

13. DEPTH DRILLED INTO ROCK | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

14. TOTAL DEPTH OF HOLE: 10' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES: None | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES

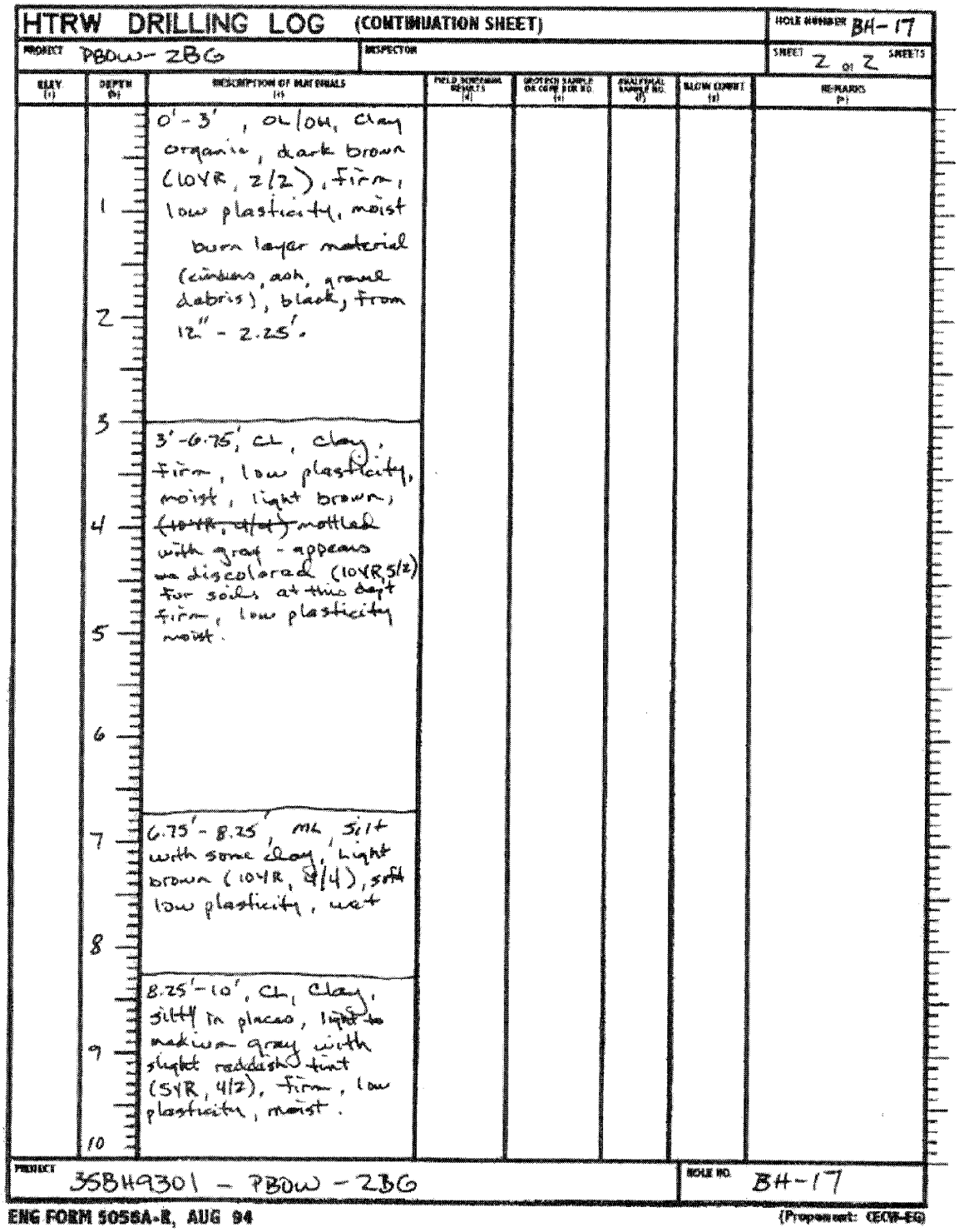
20. SAMPLES FOR CHEMICAL ANALYSIS: 3-5', 8-10' | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY %

22. DISPOSITION OF HOLE: Bentonite granular | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR: Al Handley

LOCATION SKETCH/COMMENTS | SCALE:

PROJECT: 35BH9301 - PBOW - ZBG | HOLE NO. BH-17

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH-17

PROJECT PBOW-ZBG

INSPECTOR

SHEET 2 of 2 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS (a)	FIELD SCREENING RESULTS (b)	SAMPLE OR CORE RUN NO. (c)	LABORATORY SAMPLE NO. (d)	BLOW COUNT (e)	REMARKS (f)
	1	0'-3', OL/OH, clay organic, dark brown (10YR, 2/2), firm, low plasticity, moist burn layer material (cinders, ash, gravel debris), black, from 12" - 2.25'.					
	5	3'-6.75', CL, clay, firm, low plasticity, moist, light brown, ~~(10YR, 4/4)~~ mottled with gray - appears as discolored (10YR 5/2) for soils at this dept firm, low plasticity moist.					
	7	6.75'-8.25', ML, silt with some clay, light brown (10YR, 6/4), soft low plasticity, wet					
	9	8.25'-10', CL, clay, silty in places, light to medium gray with slight reddish tint (5YR, 4/2), firm, low plasticity, moist.					
	10						

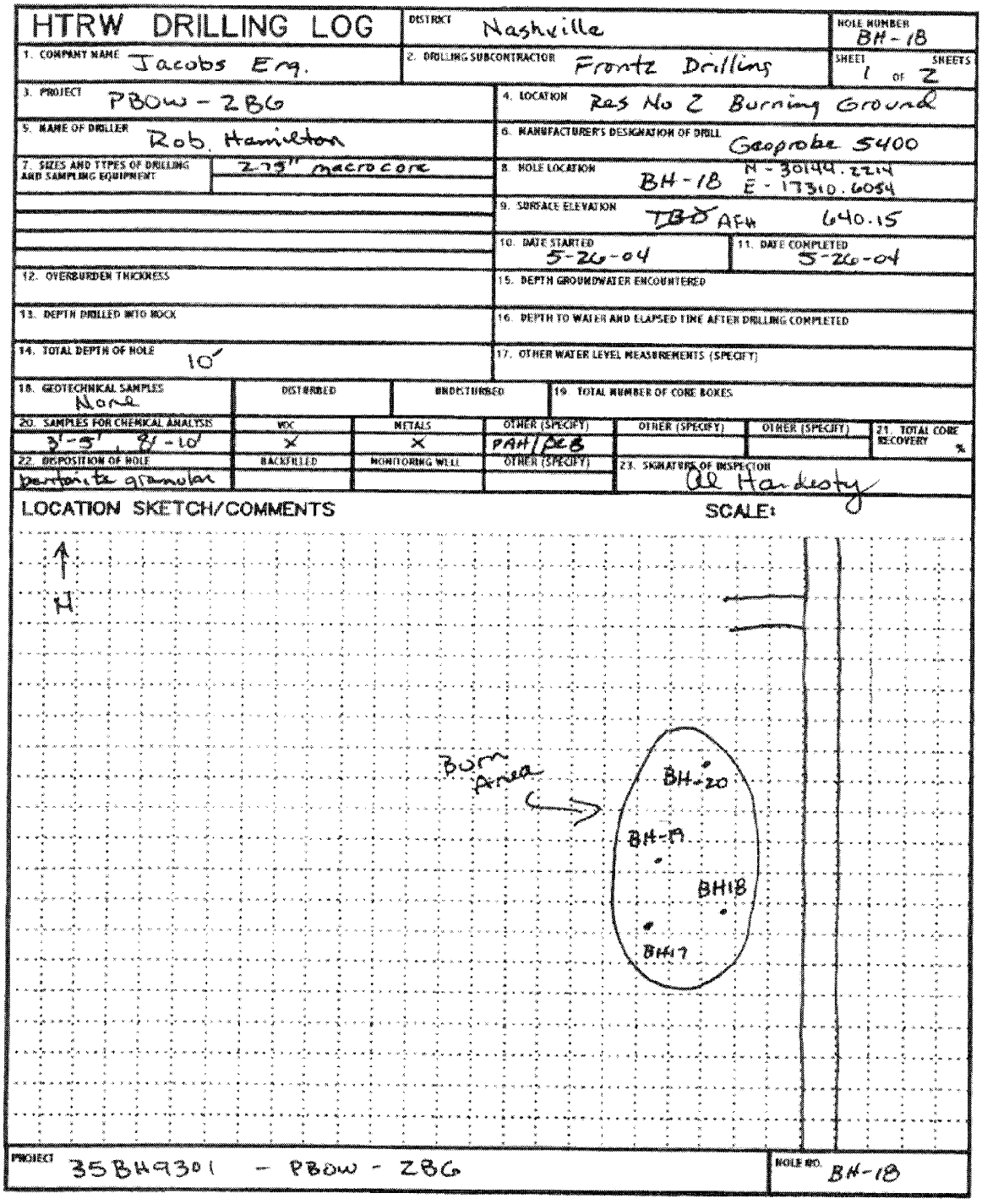
PROJECT 35814930I - PBOW-ZBG

HOLE NO. BH-17

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: BH-18

1. COMPANY NAME: Jacobs Eng.

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET: 1 OF 2 SHEETS

3. PROJECT: PBOW-286

4. LOCATION: Ras No 2 Burning Ground

5. NAME OF DRILLER: Rob. Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore

8. HOLE LOCATION: BH-18 N-30149.2214 E-17310.6054

9. SURFACE ELEVATION: TBD AFH 640.15

10. DATE STARTED: 5-26-04

11. DATE COMPLETED: 5-26-04

12. OVERBURDEN THICKNESS:

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE: 10'

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED:

19. TOTAL NUMBER OF CORE BOXES:

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5', 8'-10'	X	X	PAH/DRB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Bentonite granular				Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 - PBOW - 286 — HOLE NO.: BH-18

Figure 5-1

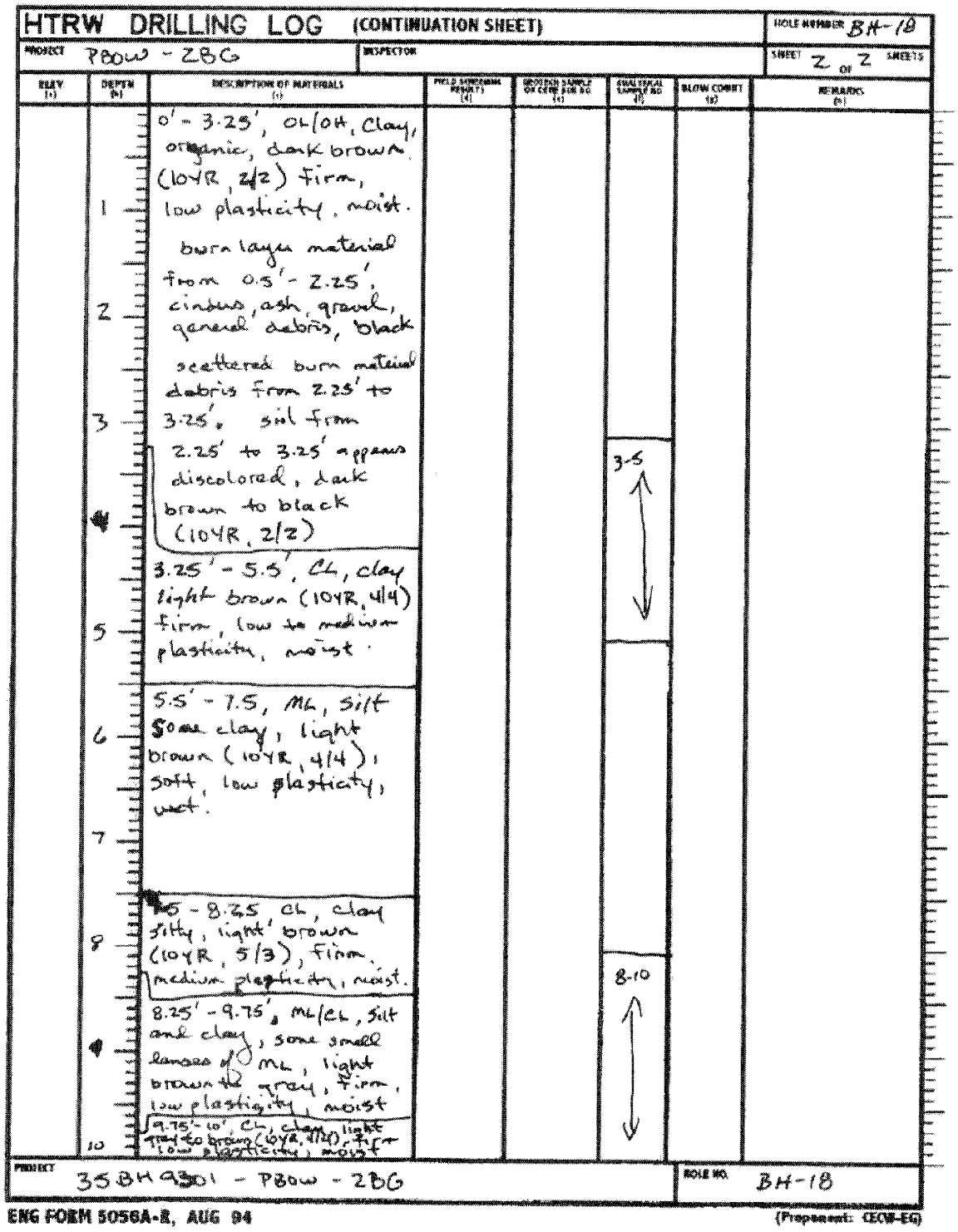
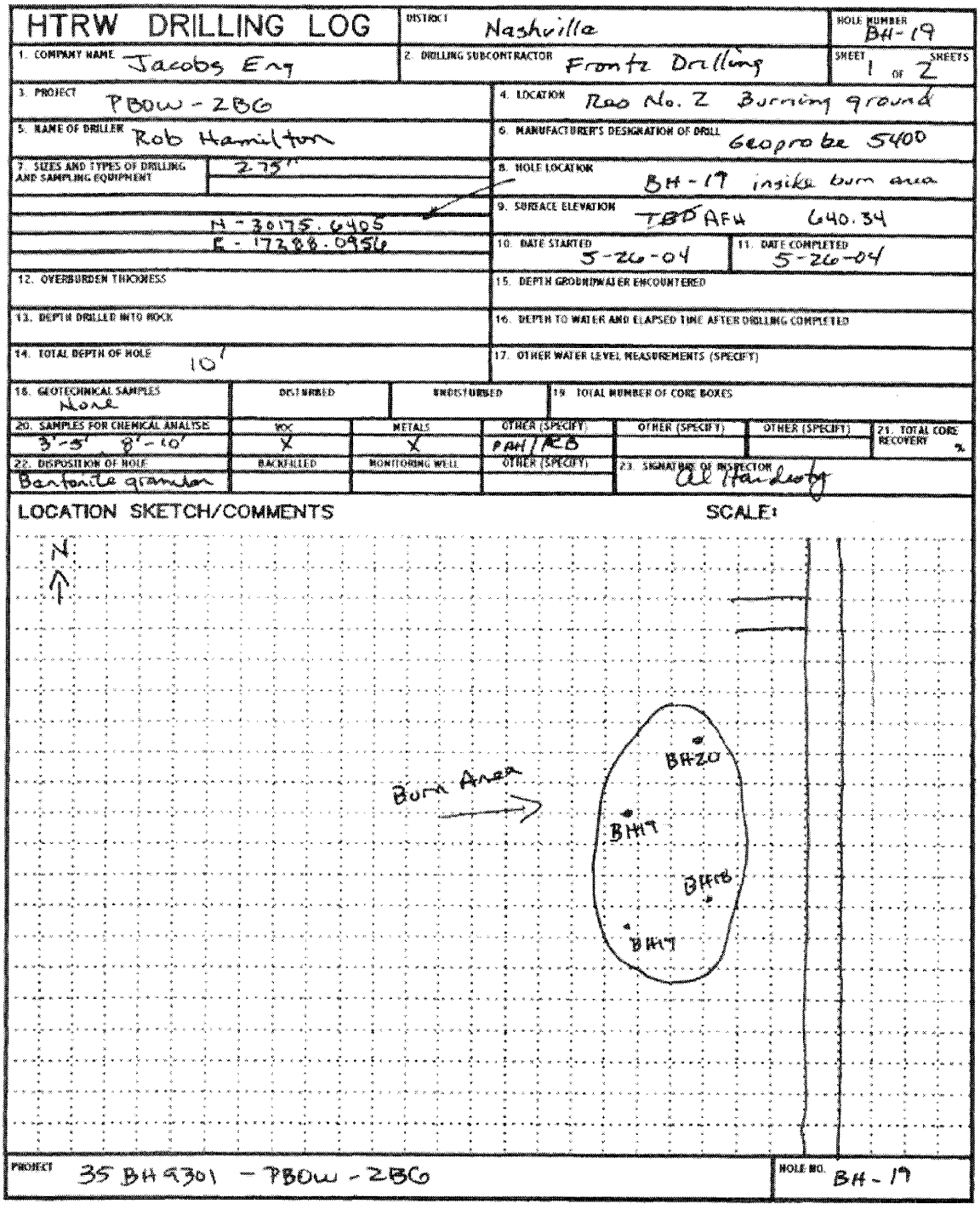


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville | HOLE NUMBER: BH-19

1. COMPANY NAME: Jacobs Eng | 2. DRILLING SUBCONTRACTOR: Frontz Drilling | SHEET: 1 OF 2 SHEETS

3. PROJECT: PBOW-2BC | 4. LOCATION: Rao No. 2 Burning ground

5. NAME OF DRILLER: Rob Hamilton | 6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" | 8. HOLE LOCATION: BH-19 inside burn area

N - 30175.6405
E - 17288.0956

9. SURFACE ELEVATION: TBD AFH 640.34

10. DATE STARTED: 5-26-04 | 11. DATE COMPLETED: 5-26-04

12. OVERBURDEN THICKNESS | 15. DEPTH GROUNDWATER ENCOUNTERED

13. DEPTH DRILLED INTO ROCK | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

14. TOTAL DEPTH OF HOLE: 10' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5' 8'-10'	X	X	PAH/TRB			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Bentonite granular				Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35 BH 9301 - PBOW-2BC | HOLE NO.: BH-19

Figure 5-1

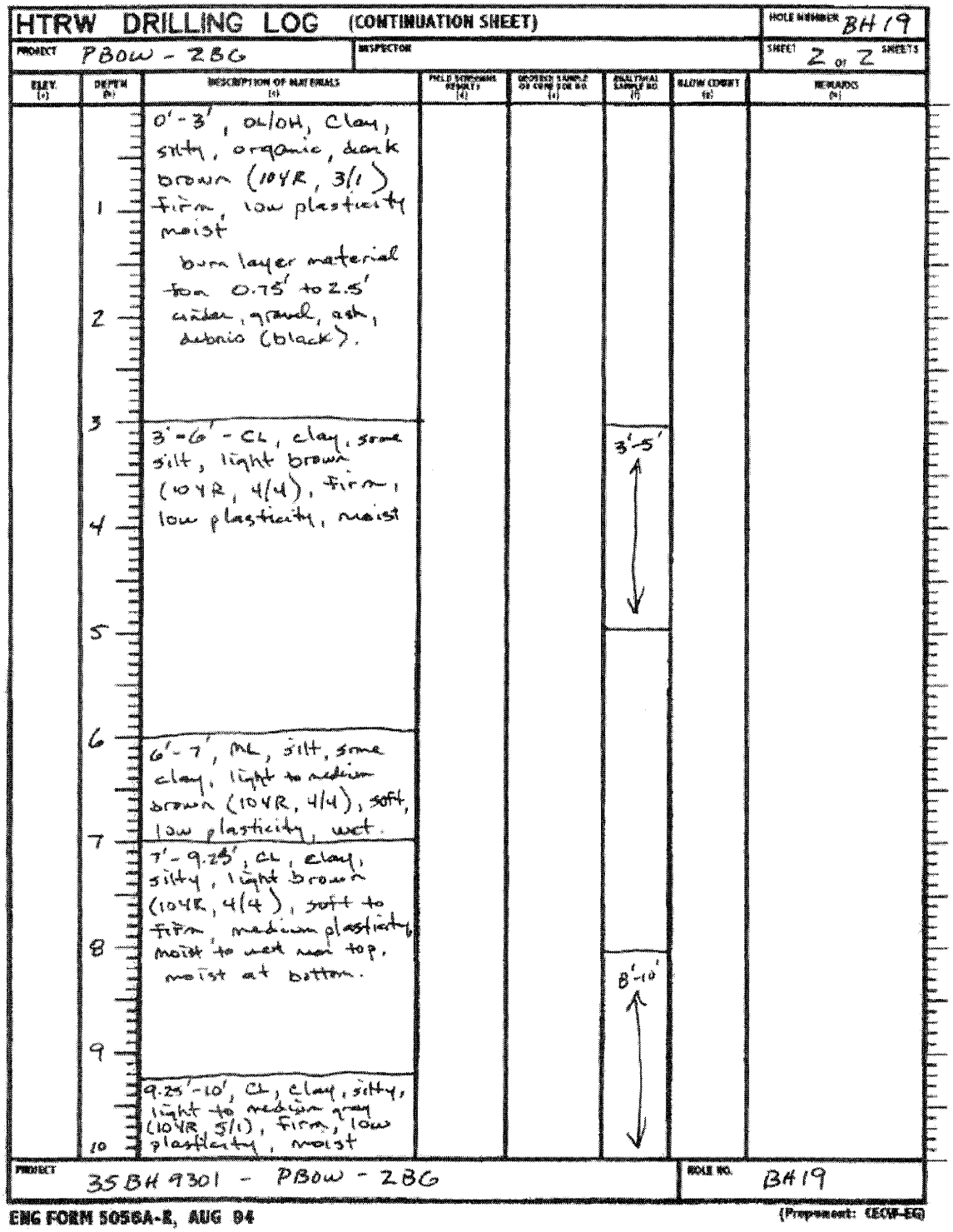
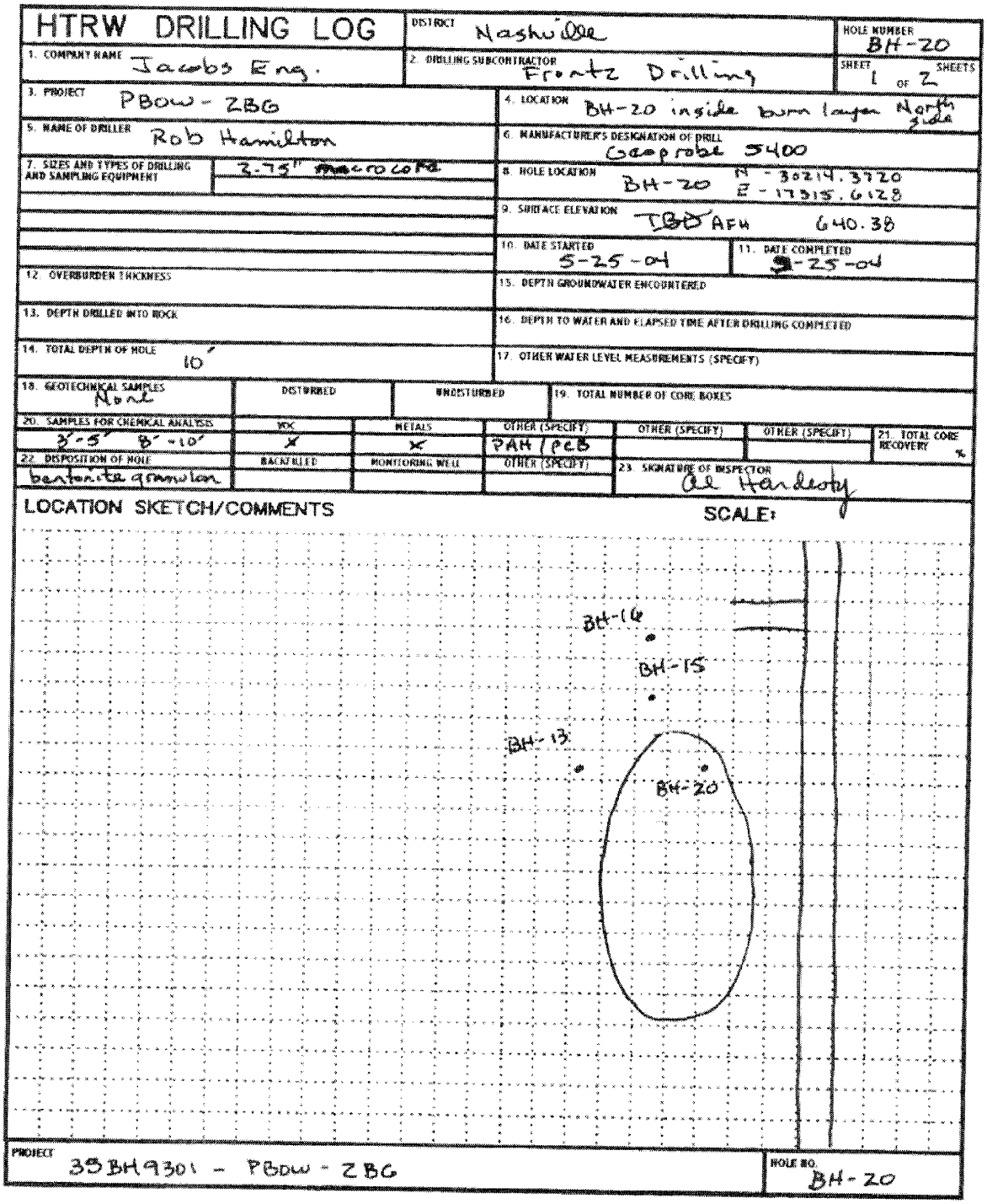


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: BH-20

1. COMPANY NAME: Jacobs Eng.

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET: 1 OF 2 SHEETS

3. PROJECT: PBOW - ZBG

4. LOCATION: BH-20 inside burn langer North side

5. NAME OF DRILLER: Rob Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3.75" macrocore

8. HOLE LOCATION: BH-20 N - 30214.3720 E - 17315.6128

9. SURFACE ELEVATION: TBD AFH 640.38

10. DATE STARTED: 5-25-04

11. DATE COMPLETED: 5-25-04

12. OVERBURDEN THICKNESS:

13. DEPTH DRILLED INTO ROCK:

14. TOTAL DEPTH OF HOLE: 10'

15. DEPTH GROUNDWATER ENCOUNTERED:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED: — 19. TOTAL NUMBER OF CORE BOXES:

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3'-5' B'-10'	X	X	PAH / PCB			

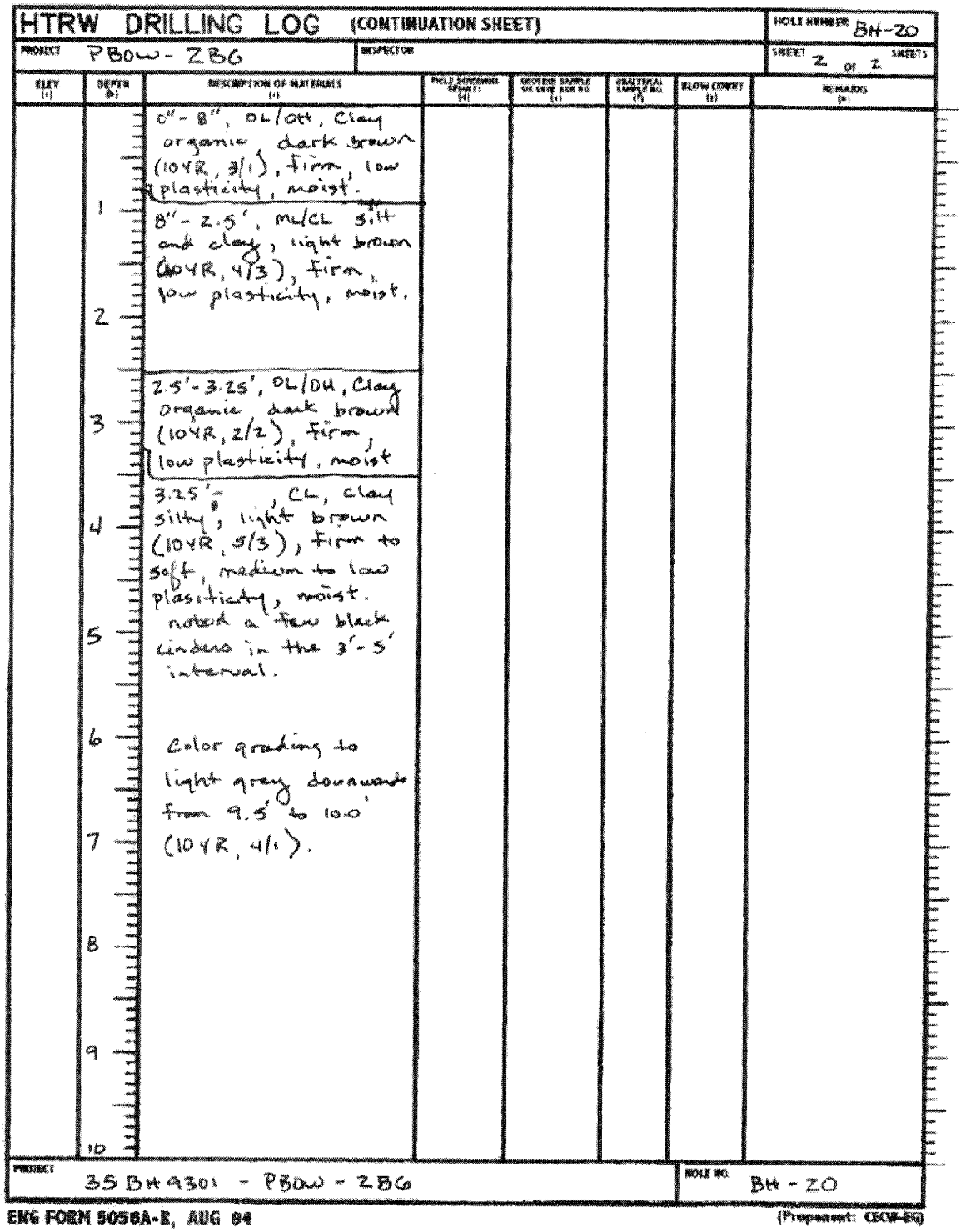
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
bentonite granular				Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 - PBOW - ZBG

HOLE NO.: BH-20

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER BH-20

PROJECT PBOW - ZBG

INSPECTOR

SHEET 2 OF 2 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS (ft)	FIELD SCREENING RESULTS (ft)	SECTION SAMPLE OR CORE RUN NO. (ft)	ANALYTICAL SAMPLE NO. (ft)	BLOW COUNT (ft)	REMARKS (ft)
	1	0"-8", OL/OH, Clay organic, dark brown (10YR, 3/1), firm, low plasticity, moist.					
	2	8"-2.5', ML/CL silt and clay, light brown (10YR, 4/3), firm, low plasticity, moist.					
	3	2.5'-3.25', OL/OH, Clay organic, dark brown (10YR, 2/2), firm, low plasticity, moist					
	4	3.25'-8', CL, clay silty, light brown (10YR, 5/3), firm to soft, medium to low plasticity, moist. noted a few black cinders in the 3'-5' interval.					
	5						
	6	Color grading to light gray downward from 9.5' to 10.0' (10YR, 4/1).					
	7						
	8						
	9						
	10						

PROJECT 35 BH 9301 - PBOW - ZBG

HOLE NO. BH - 20

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)

Appendix C
Monitoring Well and Piezometer Boring Logs.

HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: PZ01

1. COMPANY NAME: Jacobs Eng.

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET: 1 OF 3 SHEETS

3. PROJECT: 35 BH9301 - Rag Hog BCo

4. LOCATION: PZ01 - ZBG - PBOW

5. NAME OF DRILLER: Rob Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.95" Macrocore

8. HOLE LOCATION: South of Burn Area

N - 30024.1059
E - 17301.9269

9. SURFACE ELEVATION: TBD AFH 640.08

10. DATE STARTED: 5-20-04

11. DATE COMPLETED: 5-20-04

12. OVERBURDEN THICKNESS: 20'

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1.59 (2 days)

14. TOTAL DEPTH OF HOLE: 20'

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED: —

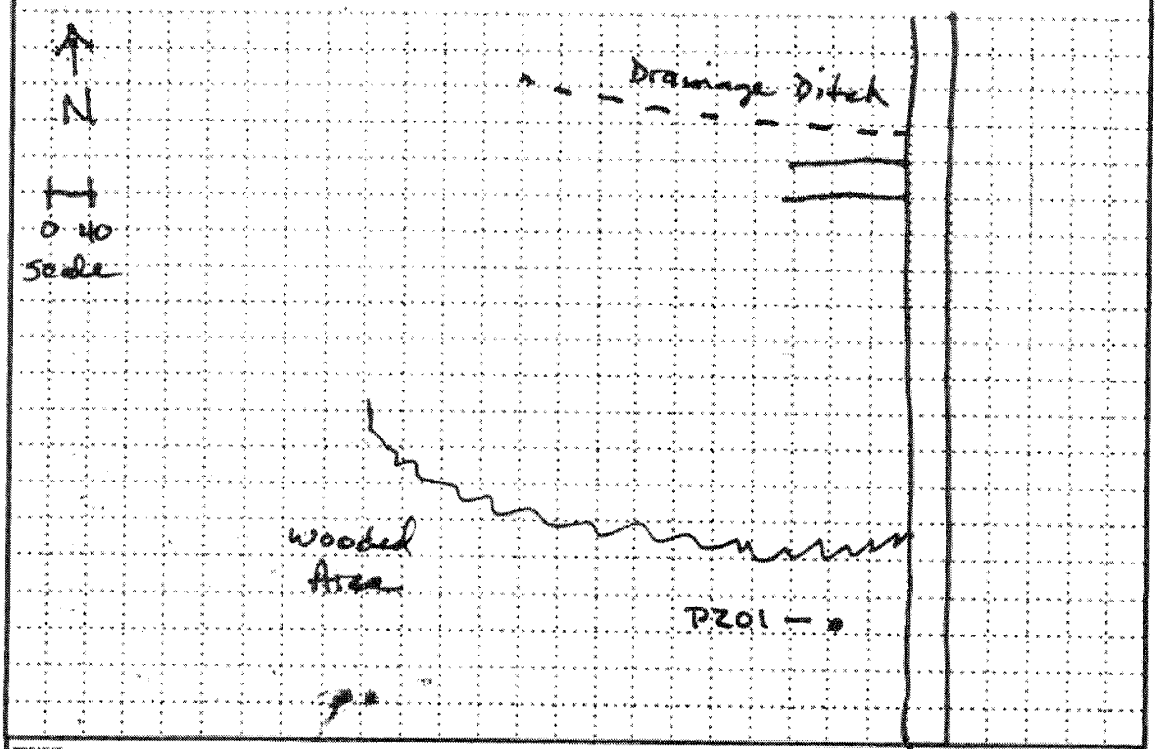
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
None						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Set piezometer				Al Hardesty

LOCATION SKETCH/COMMENTS

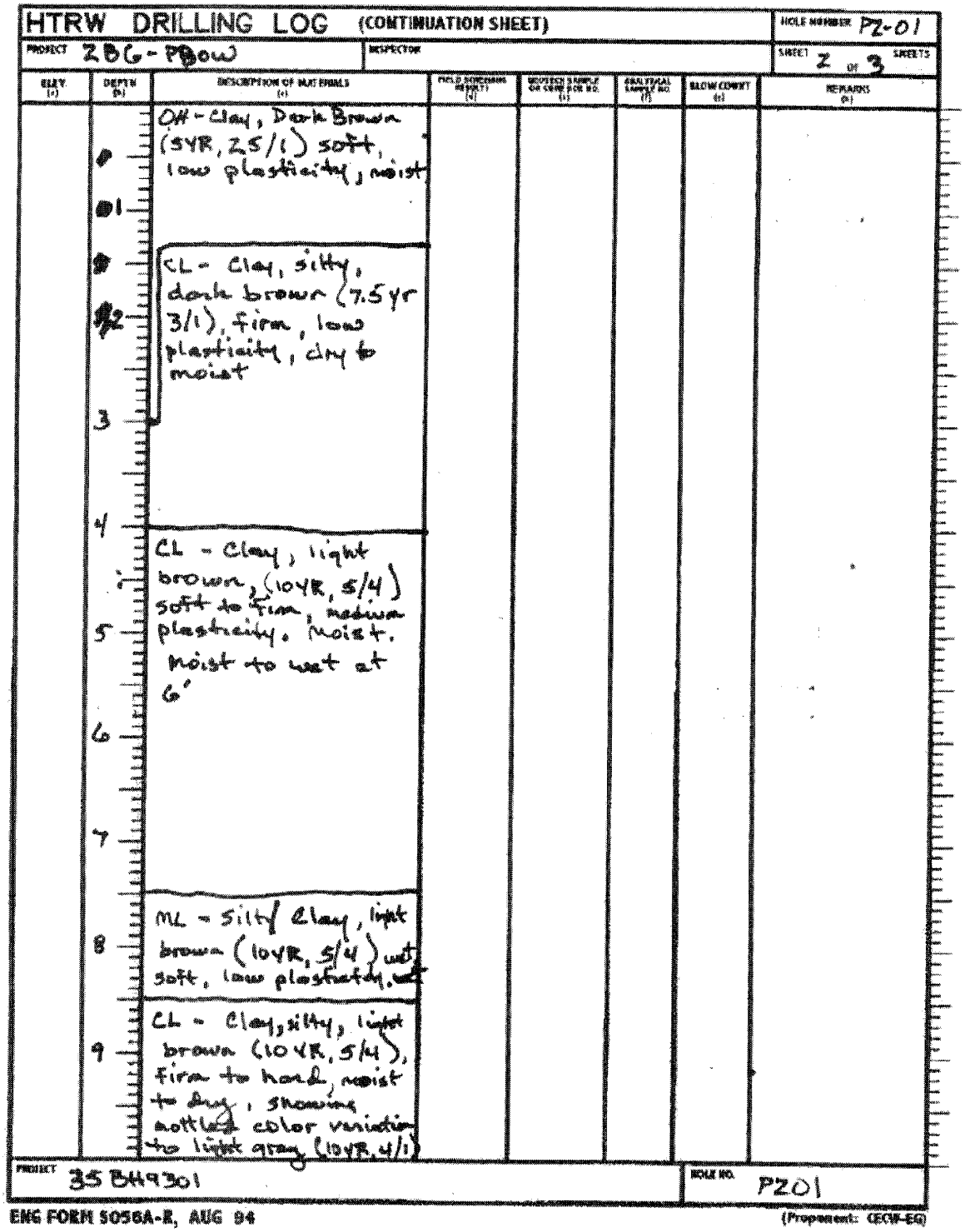
SCALE:



PROJECT: 35BH9301 - PBOW-ZBG

HOLE NO.: PZ01

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-01

PROJECT 2BG-PBOW

INSPECTOR

SHEET 2 OF 3 SHEETS

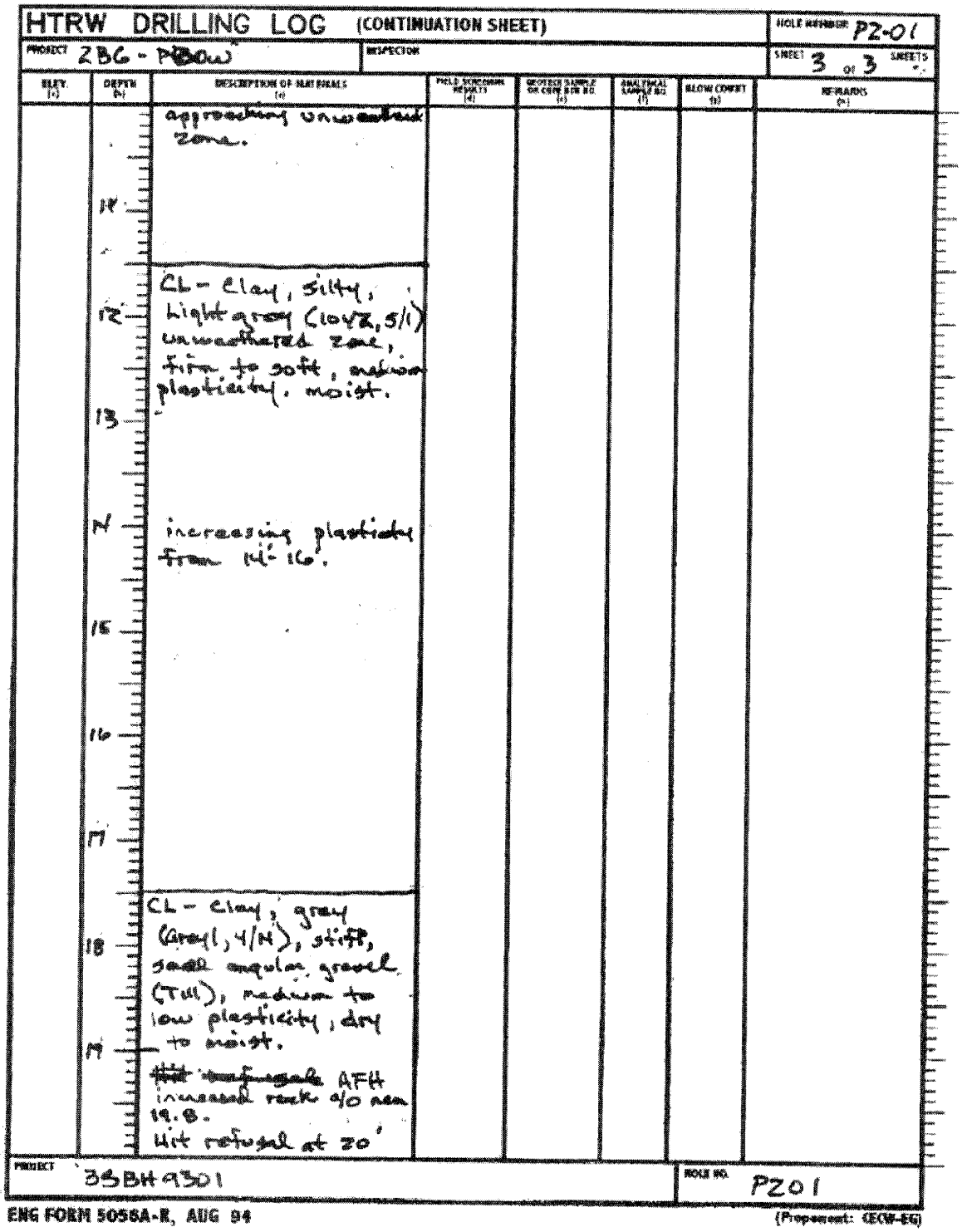
ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE FOR CHEM ANAL NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	0	OH - Clay, Dark Brown (5YR, 2.5/1) soft, low plasticity, moist					
	1						
	2	CL - Clay, silty, dark brown (7.5yr 3/1), firm, low plasticity, dry to moist					
	3						
	4	CL - Clay, light brown, (10YR, 5/4) soft to firm, medium plasticity. Moist. moist to wet at 6'					
	5						
	6						
	7						
	8	ML - Silty Clay, light brown (10YR, 5/4) wet soft, low plasticity, wet					
	9	CL - Clay, silty, light brown (10YR, 5/4), firm to hard, moist to dry, showing mottled color variation to light gray (10YR, 4/1)					

PROJECT 35 BH9301

HOLE NO. PZ01

EMG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PZ-01

PROJECT: 2BG - PBOW

INSPECTOR:

SHEET 3 of 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		approaching unweathered zone.					
	11						
	12	CL - Clay, silty, Light grey (10YZ, 5/1) unweathered zone, firm to soft, medium plasticity, moist.					
	13						
	14	increasing plasticity from 14'-16'.					
	15						
	16						
	17						
	18	CL - Clay, grey (Gray1, 4/N), stiff, small angular gravel (Till), medium to low plasticity, dry to moist.					
	19	~~Hit refusal~~ AFH increased rock c/o near 19.8. Hit refusal at 20'					

PROJECT: 3SBH9301

HOLE NO. PZ01

ENG FORM 5056A-R, AUG 94

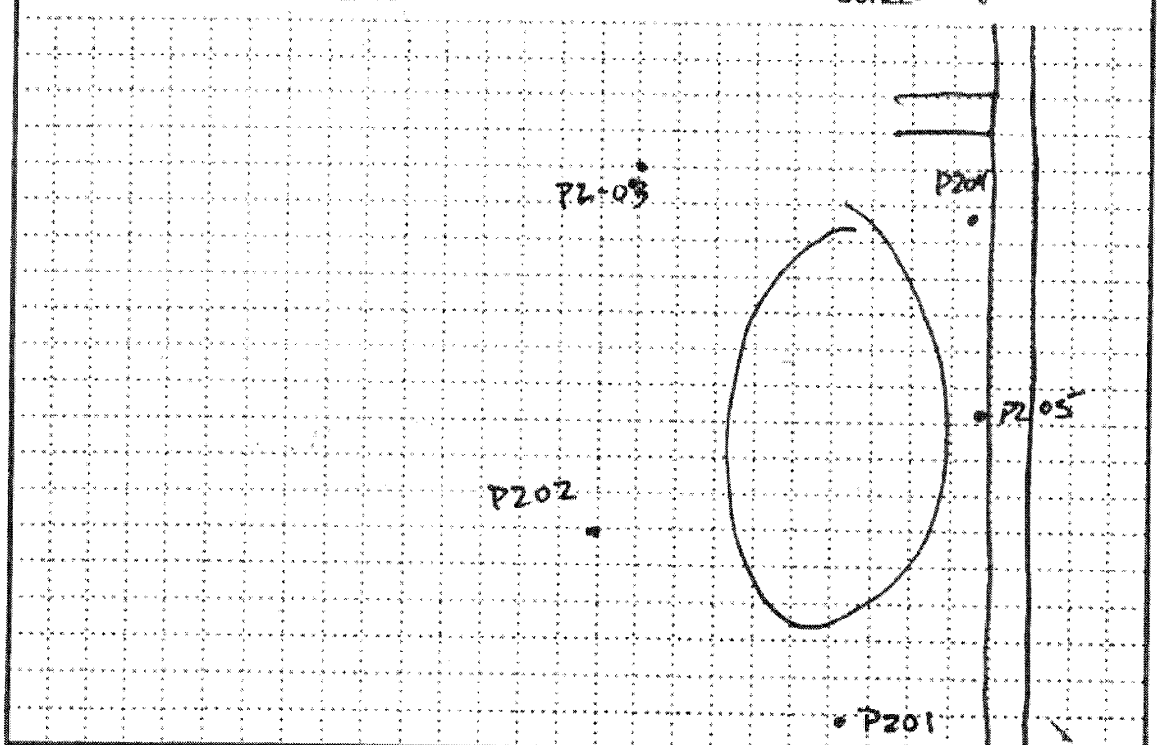
(Proponent: CECW-EG)

Figure 5-1 (continued)

HTRW DRILLING LOG

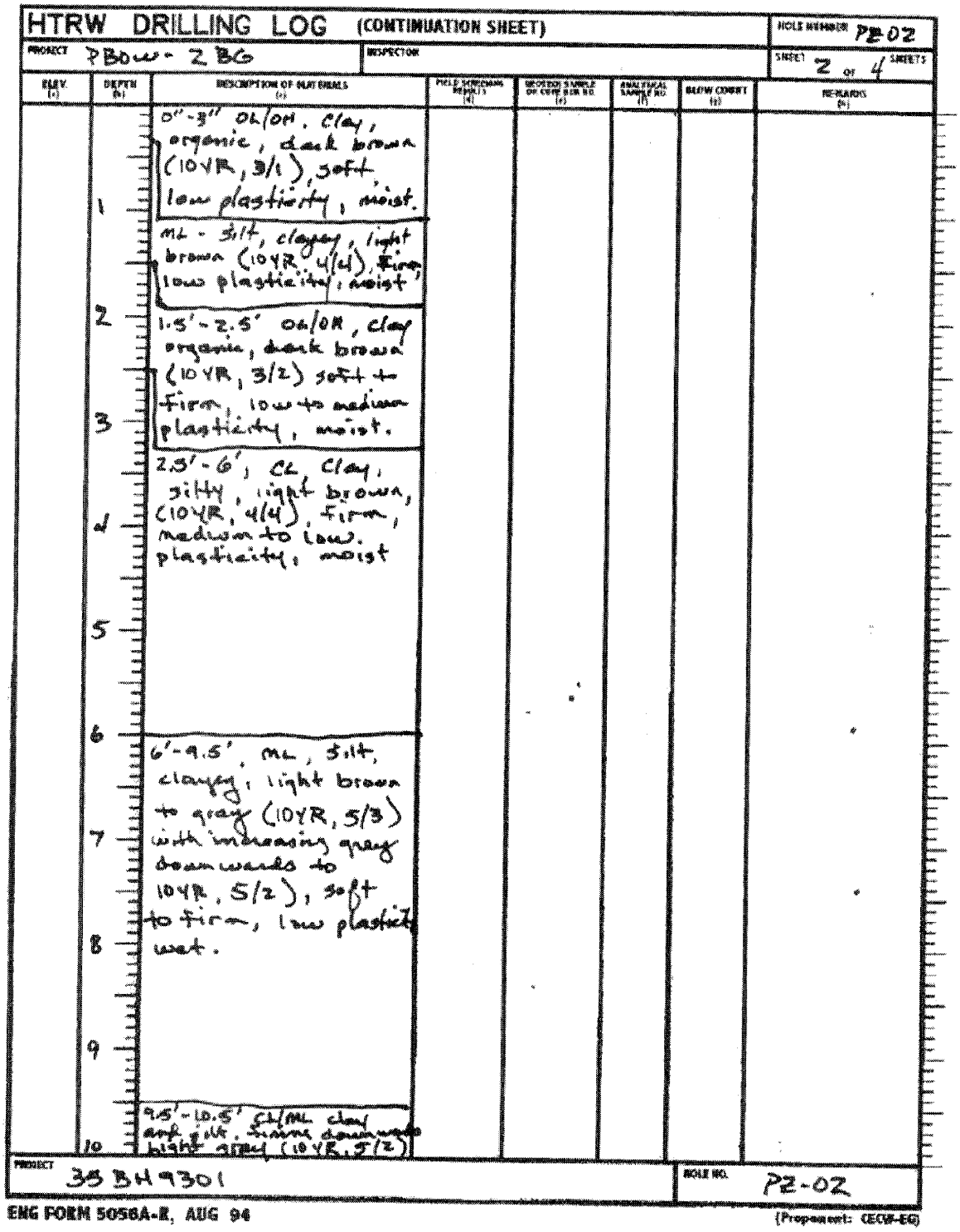
DISTRICT	Nashville
HOLE NUMBER	PZ-02
1. COMPANY NAME	Jacobs Eng.
2. DRILLING SUBCONTRACTOR	Frontz Drilling
SHEET	1 OF 4 SHEETS
3. PROJECT	PBOW - 2BG
4. LOCATION	AFH ~~BH~~ PZ-02
5. NAME OF DRILLER	Rob Hamilton
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2.75" macrocore
8. HOLE LOCATION	PZ-02 N - 30169.5009 E - 17174.1183
9. SURFACE ELEVATION	~~IBD~~ AFH 640.17
10. DATE STARTED	5-24-04
11. DATE COMPLETED	5-24-04
12. OVERBURDEN THICKNESS	21.5'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	21.5'
15. DEPTH GROUNDWATER ENCOUNTERED	
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	3.18' - 1 day
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	None
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	None
VOC	
METALS	
OTHER (SPECIFY)	
OTHER (SPECIFY)	
OTHER (SPECIFY)	
21. TOTAL CORE RECOVERY	%
22. DISPOSITION OF HOLE	Set piezometer
BACKFILLED	
MONITORING WELL	
OTHER (SPECIFY)	
23. SIGNATURE OF INSPECTOR	Al Hardesty

LOCATION SKETCH/COMMENTS SCALE:



PROJECT	35BH9301 - PBOW - 2BG
HOLE NO.	PZ02

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-02

PROJECT PBOW-ZBG

INSPECTOR

SHEET 2 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS (a)	PID & SCREENING RESULTS (d)	SELECTED SAMPLE OR CORE RUN NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	0"-3" OL/OH. Clay, organic, dark brown (10YR, 3/1), soft, low plasticity, moist.					
	2	ML - Silt, clayey, light brown (10YR 4/4), firm, low plasticity, moist					
	3	1.5'-2.5' OL/OH, clay organic, dark brown (10YR, 3/2) soft to firm, low to medium plasticity, moist.					
	4	2.5'-6', CL, Clay, silty, light brown, (10YR, 4/4), firm, medium to low. plasticity, moist					
	5						
	6	6'-9.5', ML, Silt, clayey, light brown to gray (10YR, 5/3) with increasing gray downwards to 10YR, 5/2), soft to firm, low plasticity wet.					
	7						
	8						
	9						
	10	9.5'-10.5' SL/ML clay and silt, trace dominantly light gray (10YR, 5/2)					

PROJECT 35 BH 9301

HOLE NO. PZ-02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-02

PROJECT PBDW - 2BG

INSPECTOR

SHEET 3 OF 4 SHEETS

ELEV (+)	DEPTH (ft)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SAMPLE OR CORE RUN NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	soft, medium to low plasticity, moist to wet.					
	11	10.5' - 13.5 CL/CH; clay light gray (10 YR, 4/1) soft, to firm, medium to high plasticity, moist.					
	12						
	13						
	14	13.5 - 17.5 CL clay light gray (7.5 YR, 5/1) firm to soft, medium to low plasticity, moist.					
	15						
	16						
	17	CL/CH from 17 to 17.5' high to medium plasticity, soft.					
	18	17.5' - 21.5' CL AEA clay light gray (7.5 YR, 5/1) small rock particles sand and small gravel (Angular) increasing in % down wall. AEG, firm low to medium plasticity moist. moist to dry at bottom.					
	19						
	20						

PROJECT 35 BH9301

HOLE NO. PZ-02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

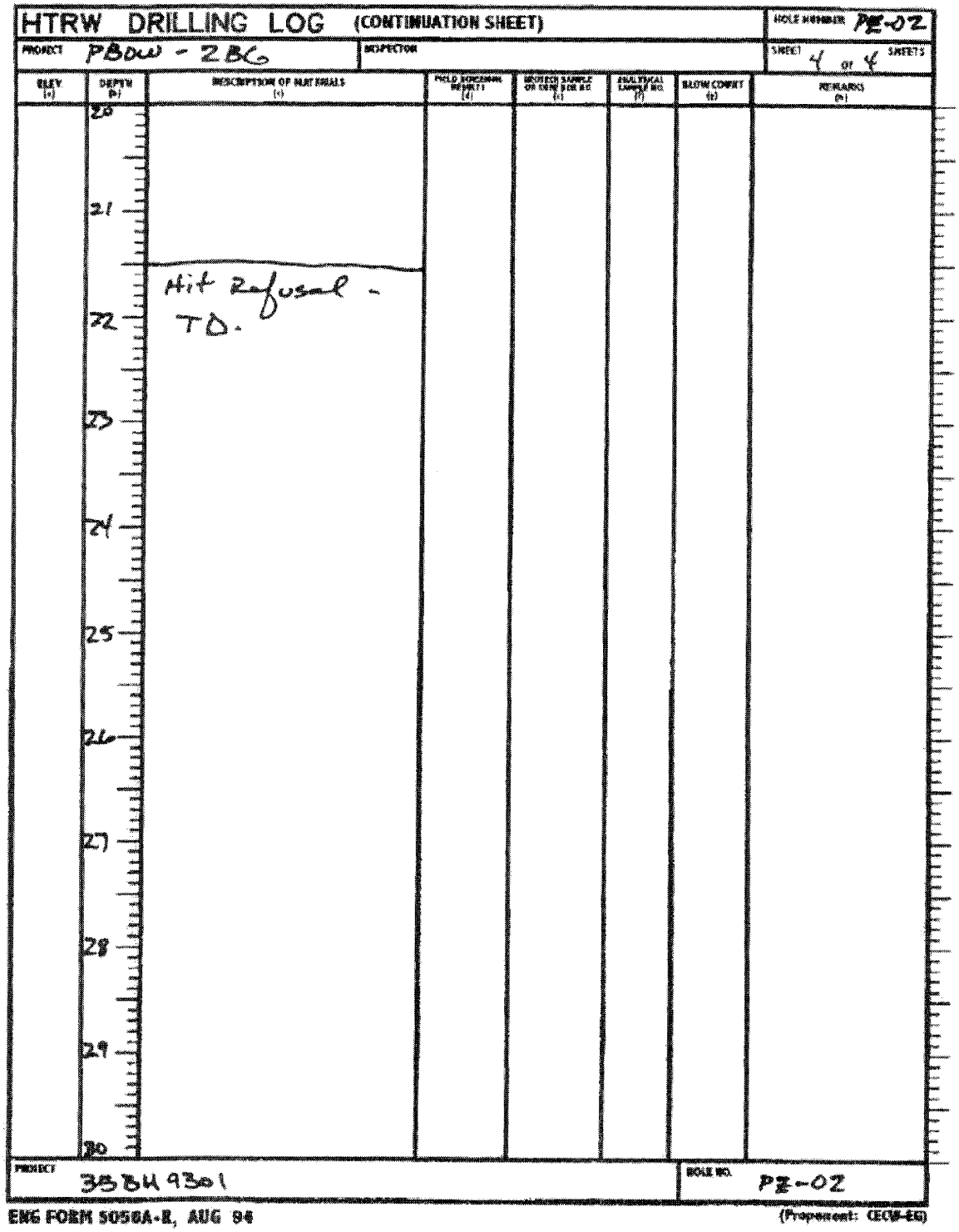


Figure 5-1 (continued)

HTRW DRILLING LOG

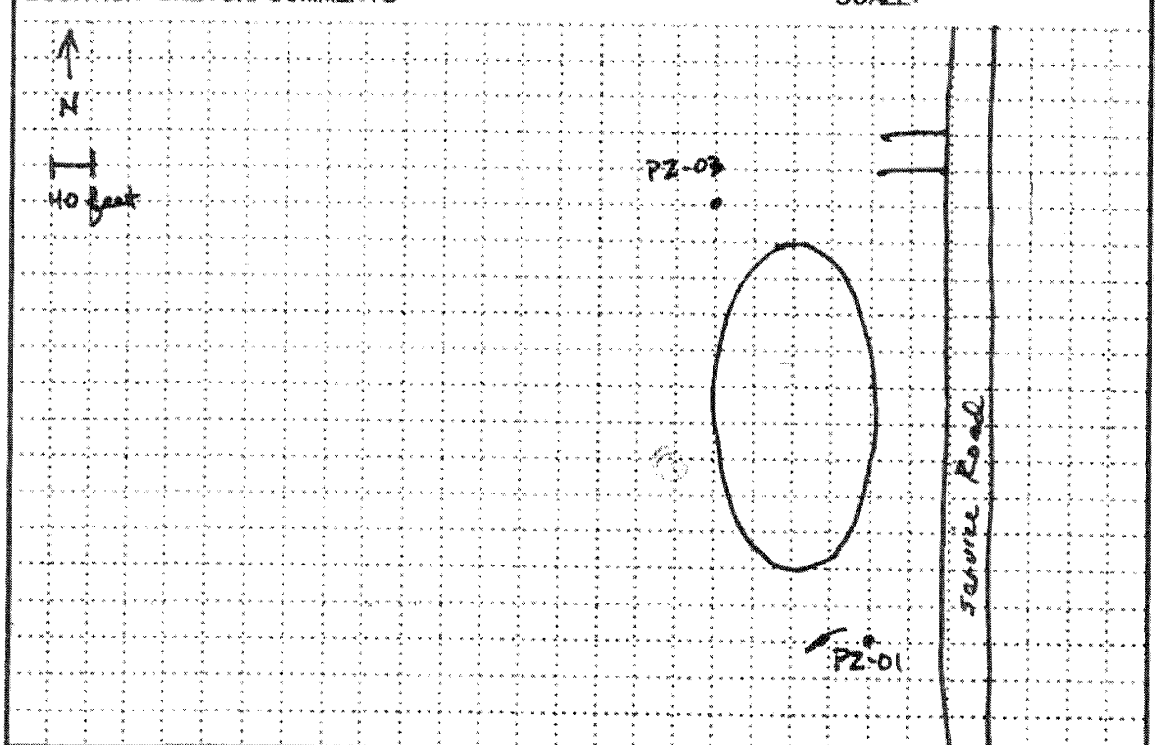
DISTRICT: Nashville		HOLE NUMBER: PZ-03
1. COMPANY NAME: Jacobs Eng.	2. DRILLING SUBCONTRACTOR: Frentz Drilling	SHEET 1 OF 4 SHEETS
3. PROJECT: 2B6 - PBOW	4. LOCATION: PZ-03	
5. NAME OF DRILLER: Rob Hamilton	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macrocore	8. HOLE LOCATION: NW side of burn layer	
N - 30306.2291	9. SURFACE ELEVATION: ~~TBD~~ AFH 639.57	
E - 17206.2972	10. DATE STARTED: 5-19-04	11. DATE COMPLETED: 5-19-04
12. OVERBURDEN THICKNESS: est 23.5'	15. DEPTH GROUNDWATER ENCOUNTERED: 6' - 8'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.73' - 2 days	
14. TOTAL DEPTH OF HOLE: 23.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
None						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Set piezometer				Al Hardesty

LOCATION SKETCH/COMMENTS SCALE:



PROJECT: 3SB49301 - PBOW - 2B6	HOLE NO. PZ-03

Figure 5-1

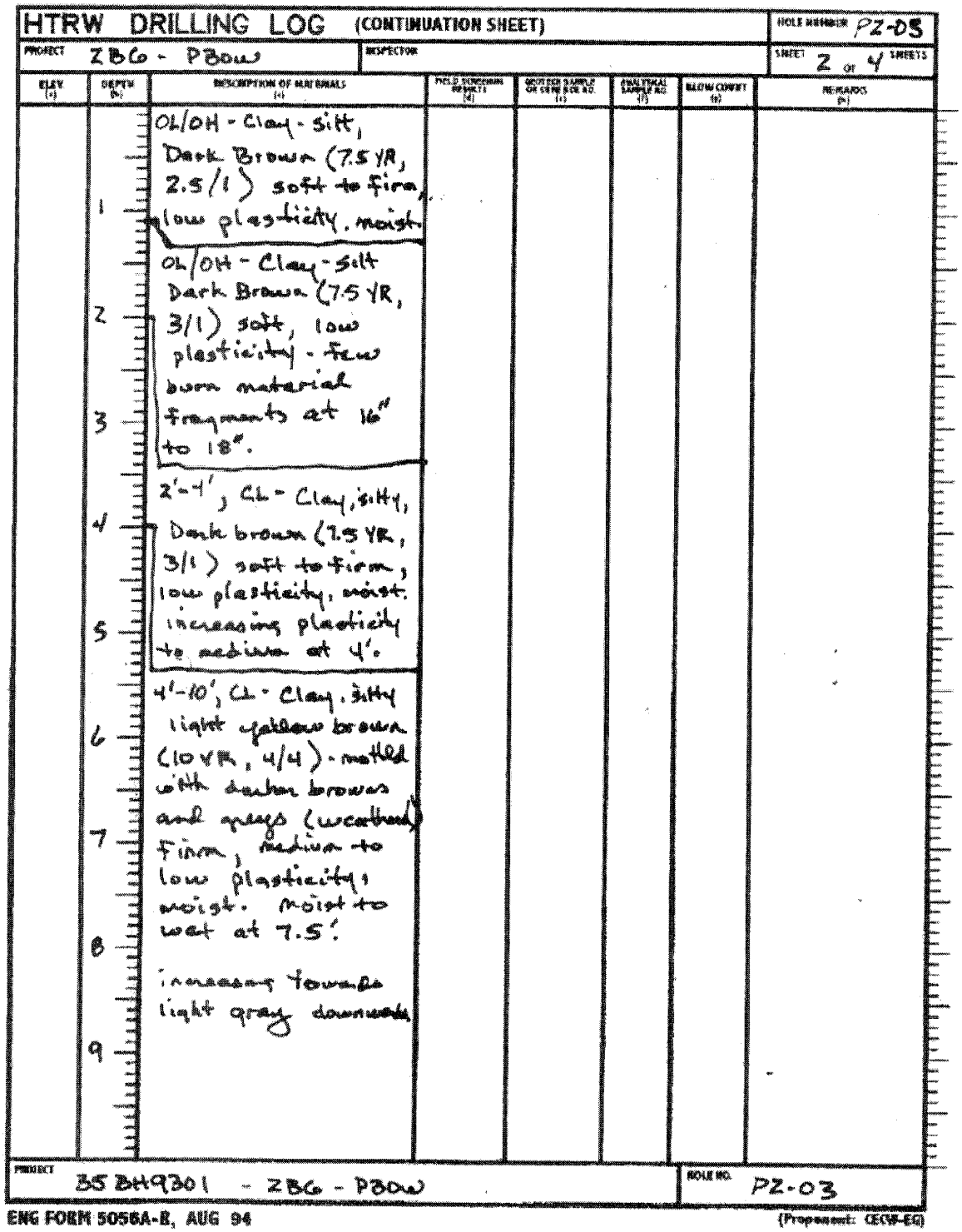
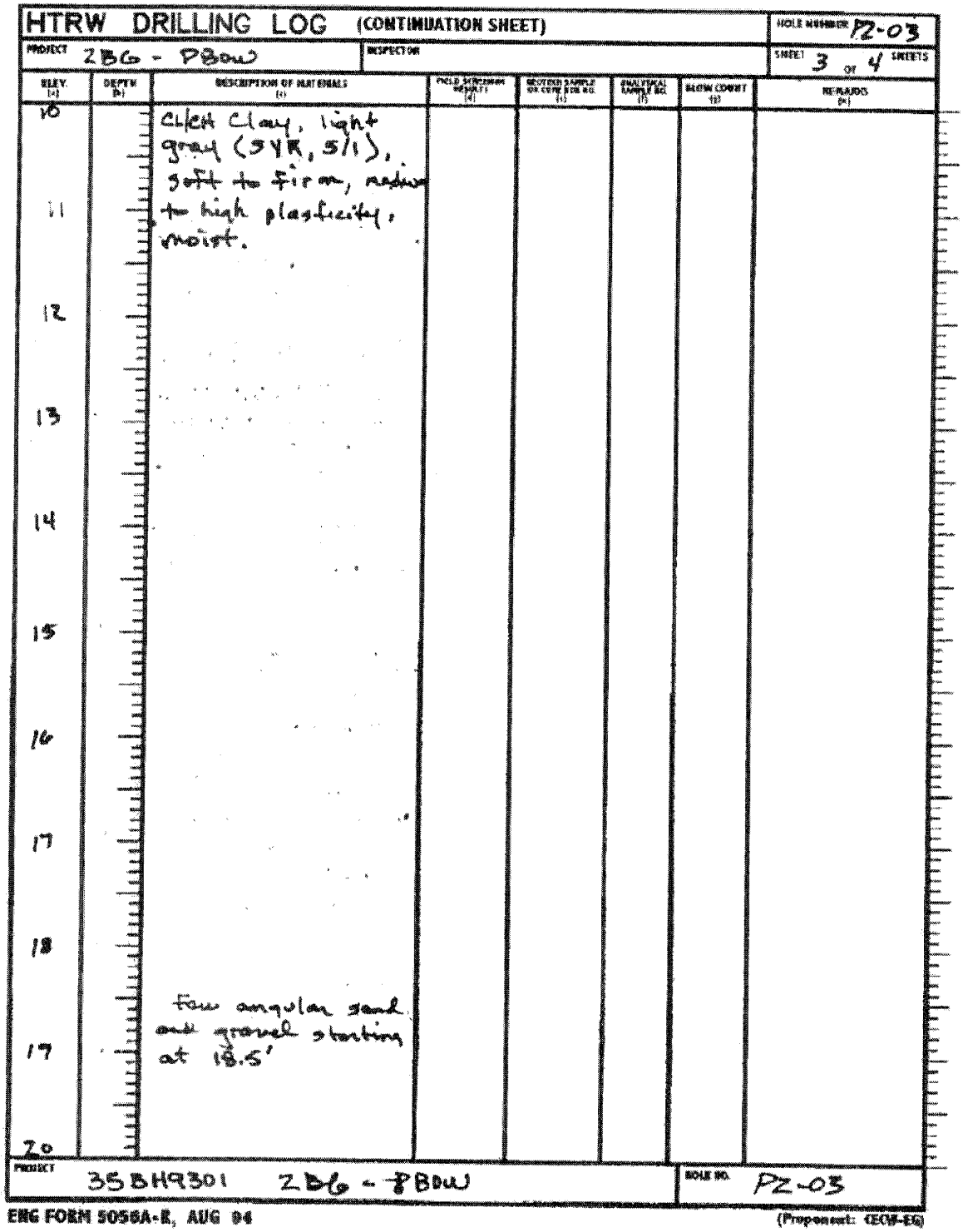


Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-03

PROJECT 2BG - PBOW

INSPECTOR

SHEET 3 OF 4 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	SECTION SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
10		CL/CH Clay, light gray (5YR, 5/1), soft to firm, medium to high plasticity, moist.					
11							
12							
13							
14							
15							
16							
17							
18							
17		few angular sand and gravel stringers at 18.5'					
20							

PROJECT 35BH9301 2BG - PBOW

HOLE NO. PZ-03

ENG FORM 5056A-R, AUG 94

(Proponent: CEOM-EG)

Figure 5-1 (continued)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-03

PROJECT ZBG - PBOW

INSPECTOR

SHEET 4 OF 4 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SECTION SAMPLE OR CORE & OR NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
20							
21							
22							
		CL - Clay, with sand + gravel (Till like) increasing to TD. Firm, low plasticity, dry. Light gray (5YR, 5/1)					
23							
		TD - Hit refusal					
24							

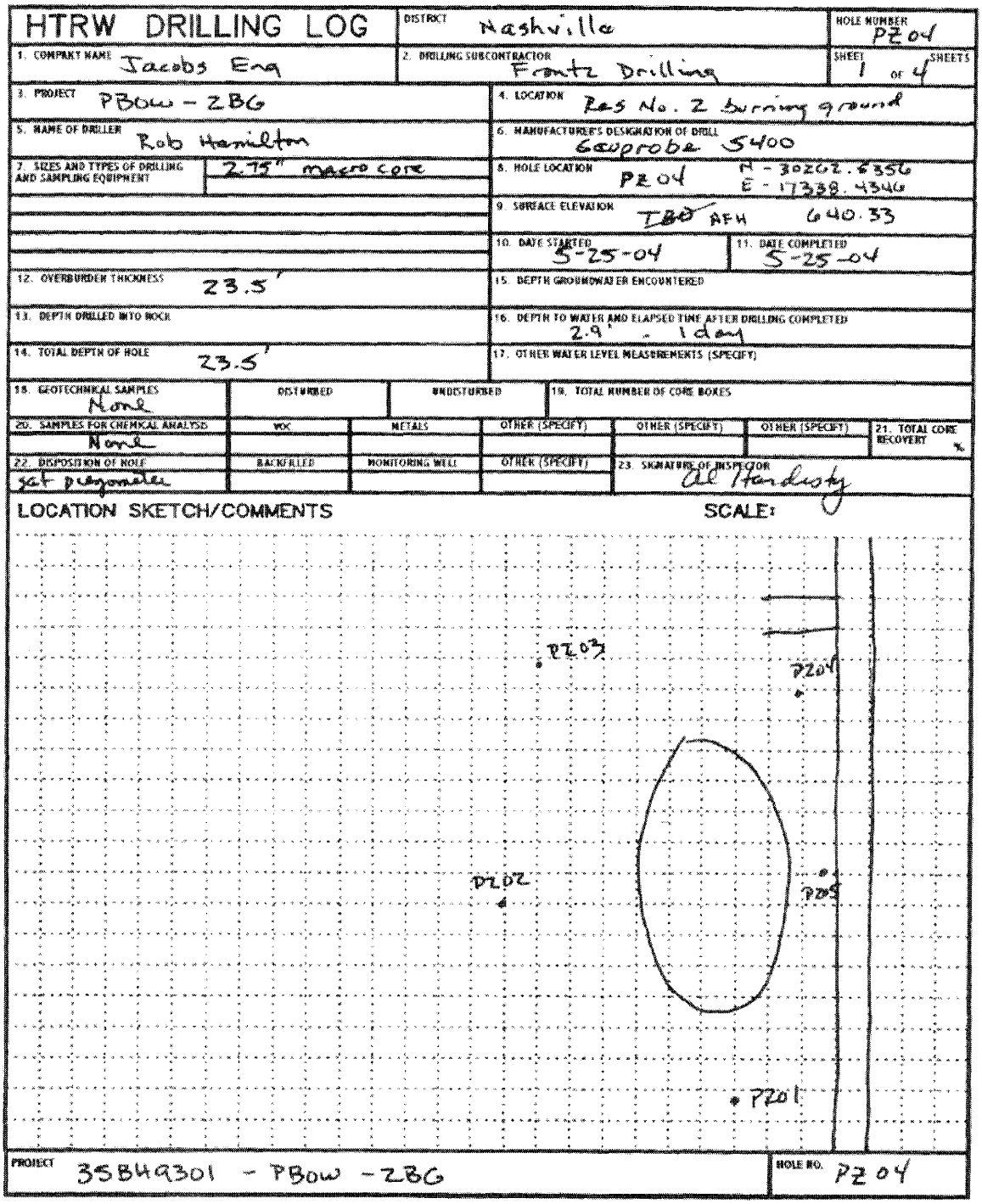
PROJECT 35 BH9301 ZBG - PBOW

BOLE NO. PZ-03

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville

HOLE NUMBER: PZ04

1. COMPANY NAME: Jacobs Eng

2. DRILLING SUBCONTRACTOR: Frontz Drilling

SHEET 1 OF 4 SHEETS

3. PROJECT: PBow - ZBG

4. LOCATION: Ras No. 2 burning ground

5. NAME OF DRILLER: Rob Hamilton

6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" macro core

8. HOLE LOCATION: PZ04 N - 30202.8356 E - 17338.4346

9. SURFACE ELEVATION: ~~TBD~~ AFH 640.33

10. DATE STARTED: 5-25-04

11. DATE COMPLETED: 5-25-04

12. OVERBURDEN THICKNESS: 23.5'

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 2.9' - 1 day

14. TOTAL DEPTH OF HOLE: 23.5'

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None — DISTURBED — UNDISTURBED

19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
None						

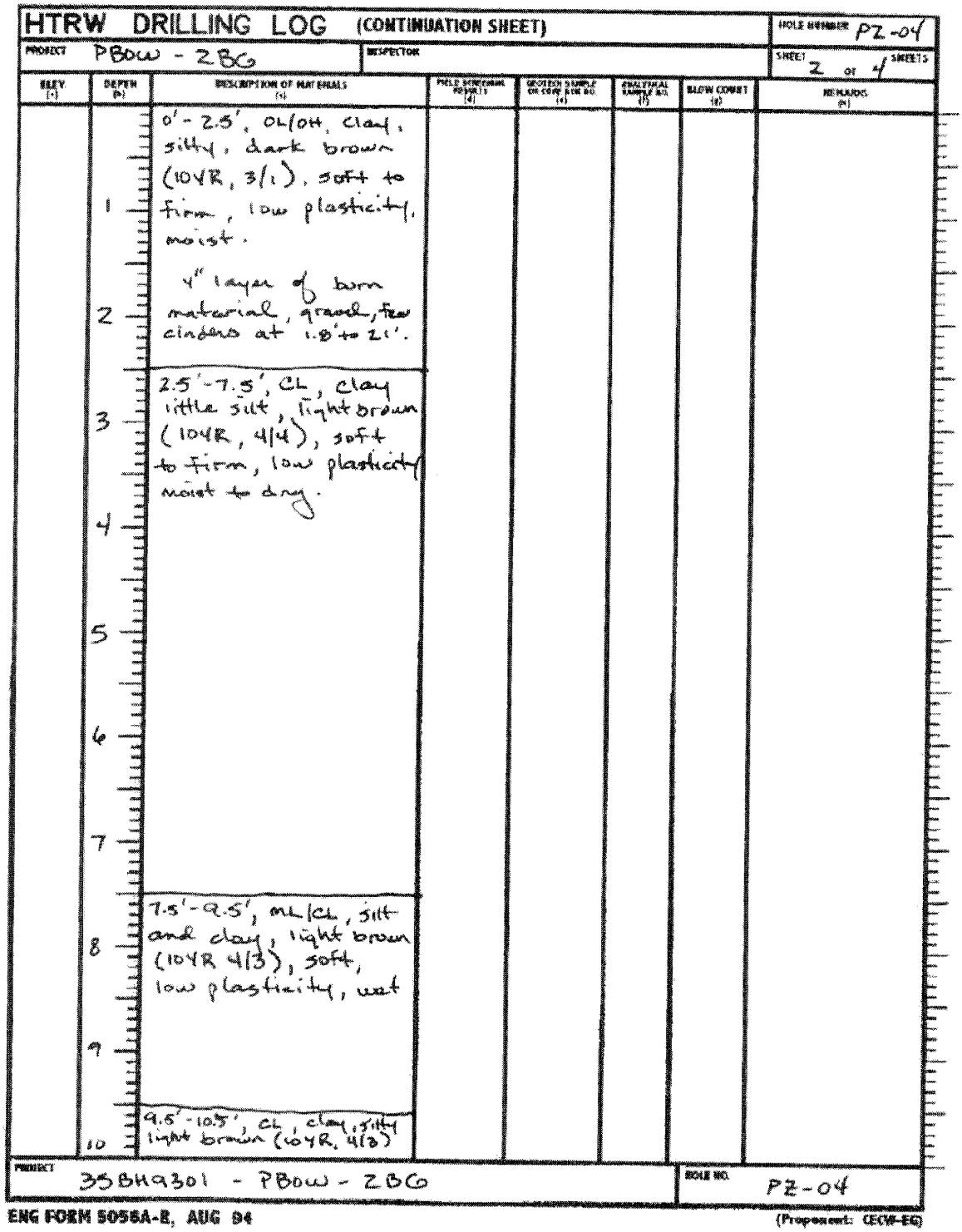
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Set Piezometer				Al Hardisty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35B49301 - PBow - ZBG

HOLE NO.: PZ04

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ-04

PROJECT PBOW - 2BG

INSPECTOR

SHEET 2 OF 4 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	1	0'-2.5', OL/OH, clay, silty, dark brown (10YR, 3/1), soft to firm, low plasticity, moist.					
	2	4" layer of born material, gravel, few cinders at 1.8' to 2'.					
	3	2.5'-7.5', CL, clay little silt, light brown (10YR, 4/4), soft to firm, low plasticity moist to dry.					
	4						
	5						
	6						
	7						
	8	7.5'-9.5', ML/CL, silt and clay, light brown (10YR 4/3), soft, low plasticity, wet					
	9						
	10	9.5'-10.5', CL, clay, silty light brown (10YR, 4/3)					

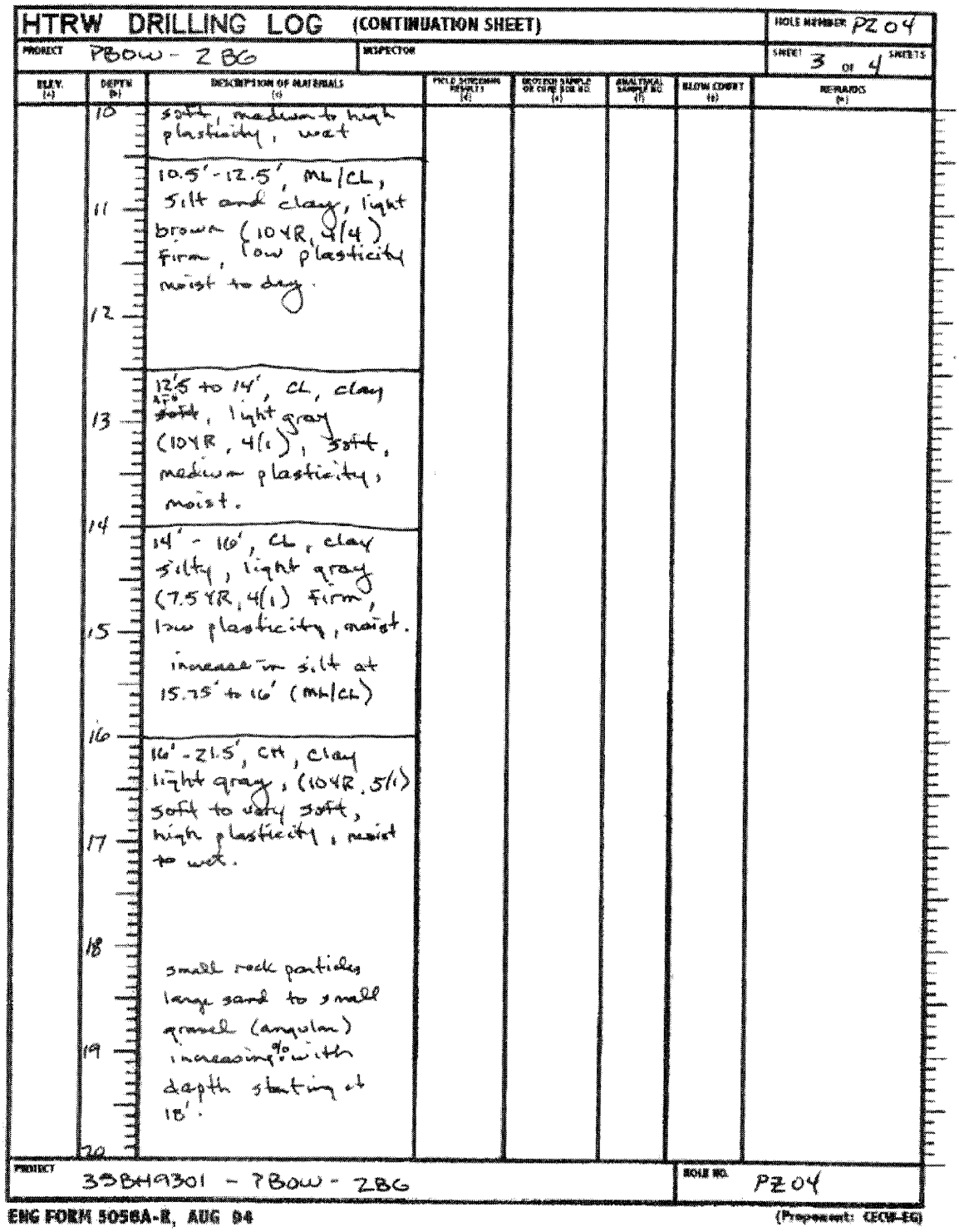
PROJECT 35BH9301 - PBOW - 2BG

HOLE NO. PZ-04

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ04

PROJECT PBOW - ZBG

INSPECTOR

SHEET 3 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SECTION SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOWS/6 INCHES	REMARKS
	10	soft, medium to high plasticity, wet					
	11	10.5'-12.5', ML/CL, silt and clay, light brown (10YR, 4/4) firm, low plasticity moist to dry.					
	12						
	13	12.5 to 14', CL, clay ~~soft~~ AFO, light gray (10YR, 4/1), soft, medium plasticity, moist.					
	14	14' - 16', CL, clay silty, light gray (7.5YR, 4/1) firm, low plasticity, moist. increase in silt at 15.75' to 16' (ML/CL)					
	15						
	16	16' - 21.5', CH, clay light gray, (10YR 5/1) soft to very soft, high plasticity, moist to wet.					
	17						
	18	small rock particles large sand to small gravel (angular) increasing % with depth starting at 18'.					
	19						
	20						

PROJECT 358H9301 - PBOW - ZBG

HOLE NO. PZ04

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)

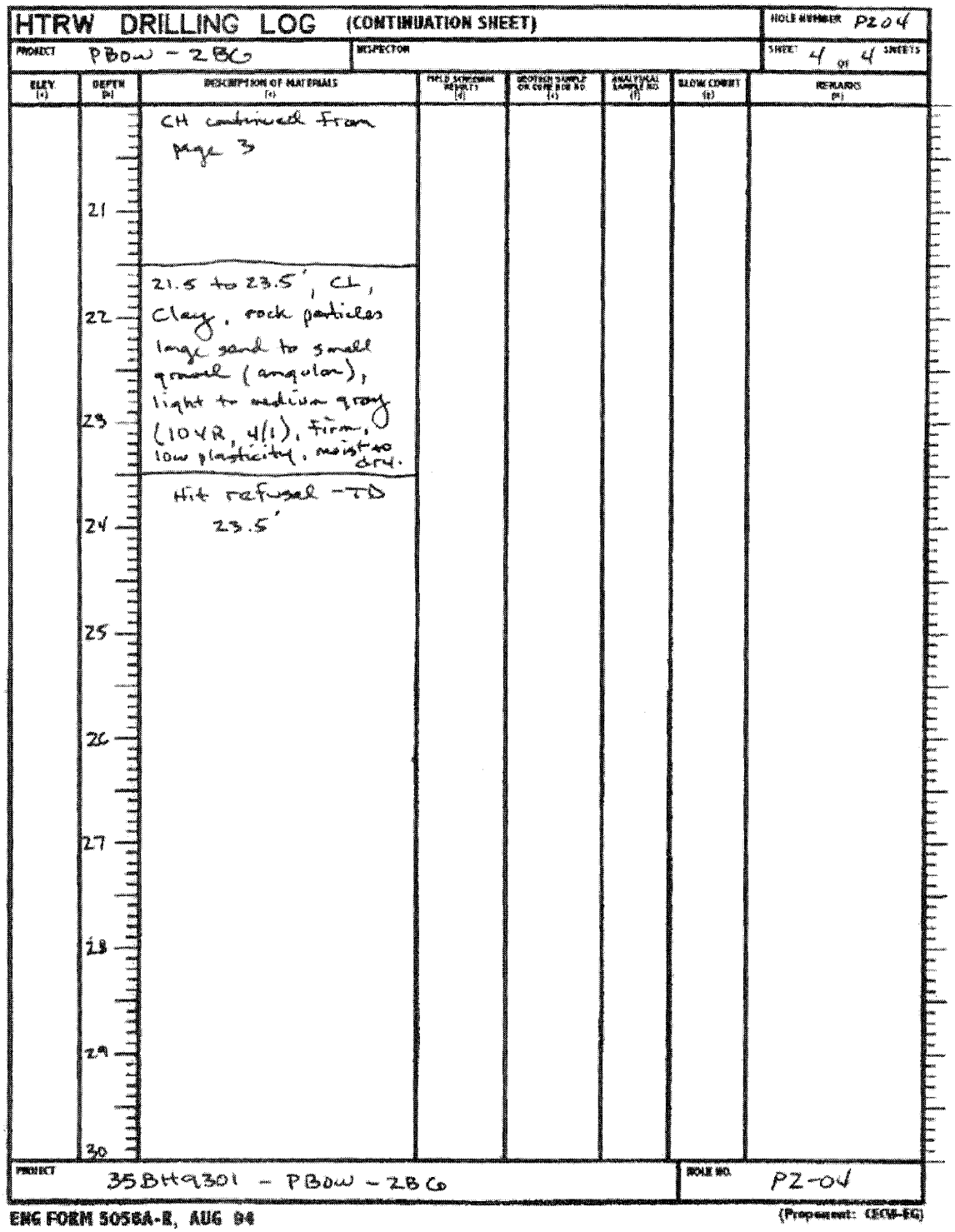
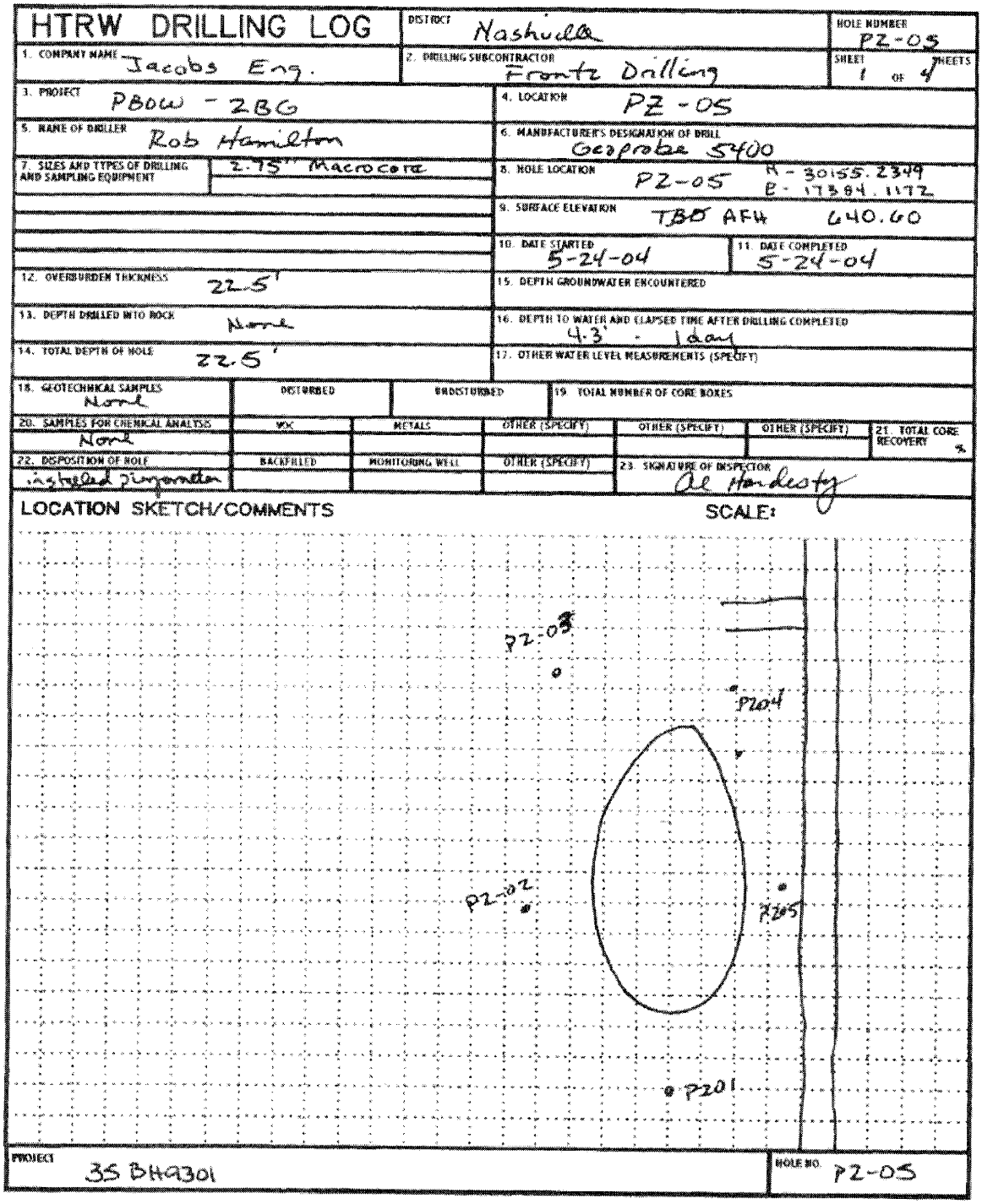


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: Nashville | HOLE NUMBER: PZ-05

1. COMPANY NAME: Jacobs Eng. | 2. DRILLING SUBCONTRACTOR: Frontz Drilling | SHEET: 1 OF 4 SHEETS

3. PROJECT: PBOW - 2BG | 4. LOCATION: PZ-05

5. NAME OF DRILLER: Rob Hamilton | 6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2.75" Macrocore | 8. HOLE LOCATION: PZ-05 N - 30155.2349 E - 17304.1172

9. SURFACE ELEVATION: TBO AFH 640.60

10. DATE STARTED: 5-24-04 | 11. DATE COMPLETED: 5-24-04

12. OVERBURDEN THICKNESS: 22.5' | 15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK: None | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.3' - 1 day

14. TOTAL DEPTH OF HOLE: 22.5' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: None | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES

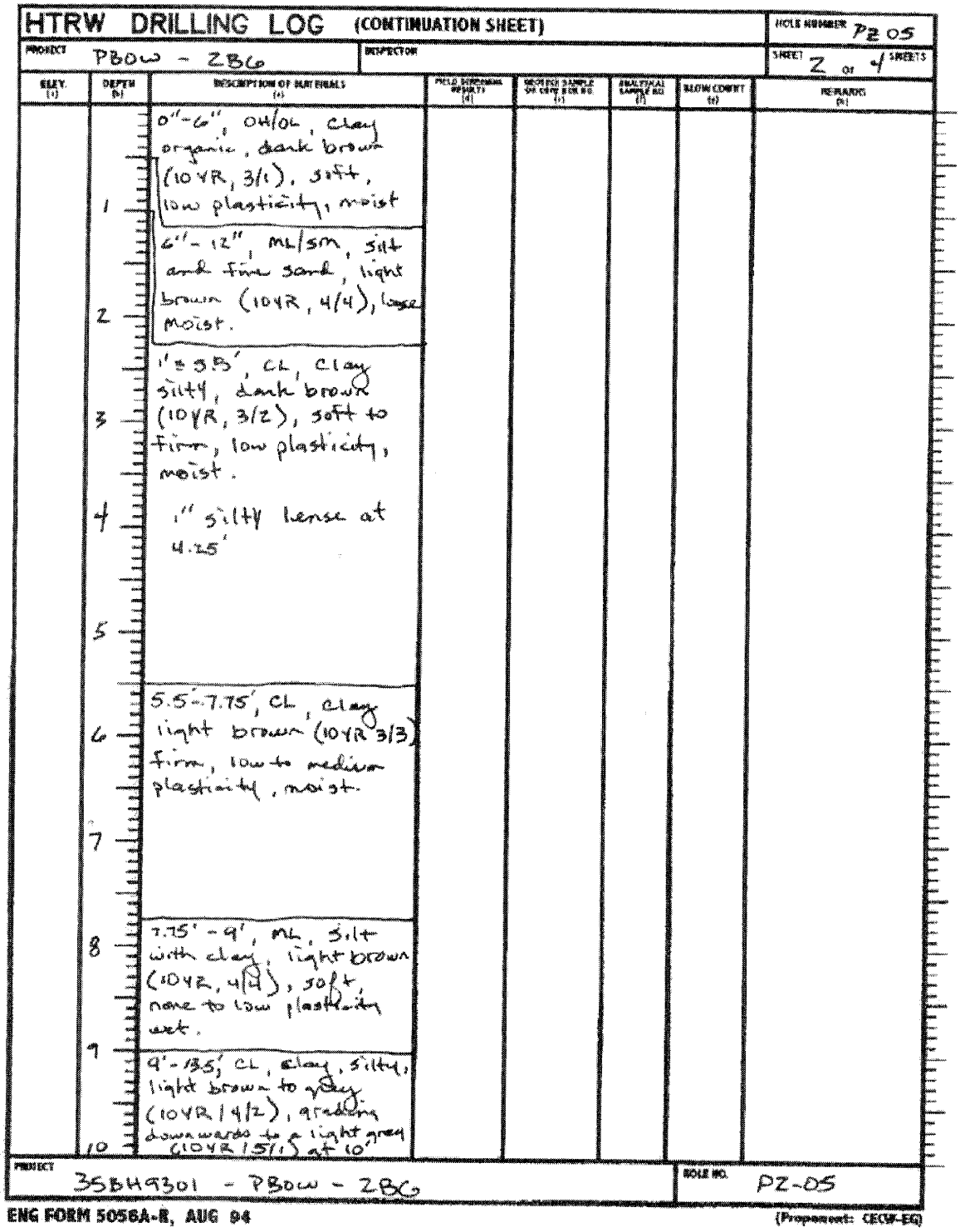
20. SAMPLES FOR CHEMICAL ANALYSIS	VOX	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
None						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
installed piezometer				Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35 BH9301 | HOLE NO.: PZ-05

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PZ 05

PROJECT PBOW - ZBC

INSPECTOR

SHEET 2 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SAMPLE NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	1	0"-6", OH/CL, clay organic, dark brown (10YR, 3/1), soft, low plasticity, moist					
	2	6"-12", ML/SM, silt and fine sand, light brown (10YR, 4/4), loose moist.					
	3	1'±3.5', CL, clay silty, dark brown (10YR, 3/2), soft to firm, low plasticity, moist.					
	4	1" silty lense at 4.25'					
	5						
	6	5.5'-7.75', CL, clay light brown (10YR 3/3) firm, low to medium plasticity, moist.					
	7						
	8	7.75'-9', ML, silt with clay, light brown (10YR, 4/4), soft, none to low plasticity wet.					
	9	9'-13.5', CL, clay, silty, light brown to gray (10YR 4/2), grading downwards to a light gray (10YR 7/1) at 10'					
	10						

PROJECT 35BH9301 - PBOW - ZBC

HOLE NO. PZ-05

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

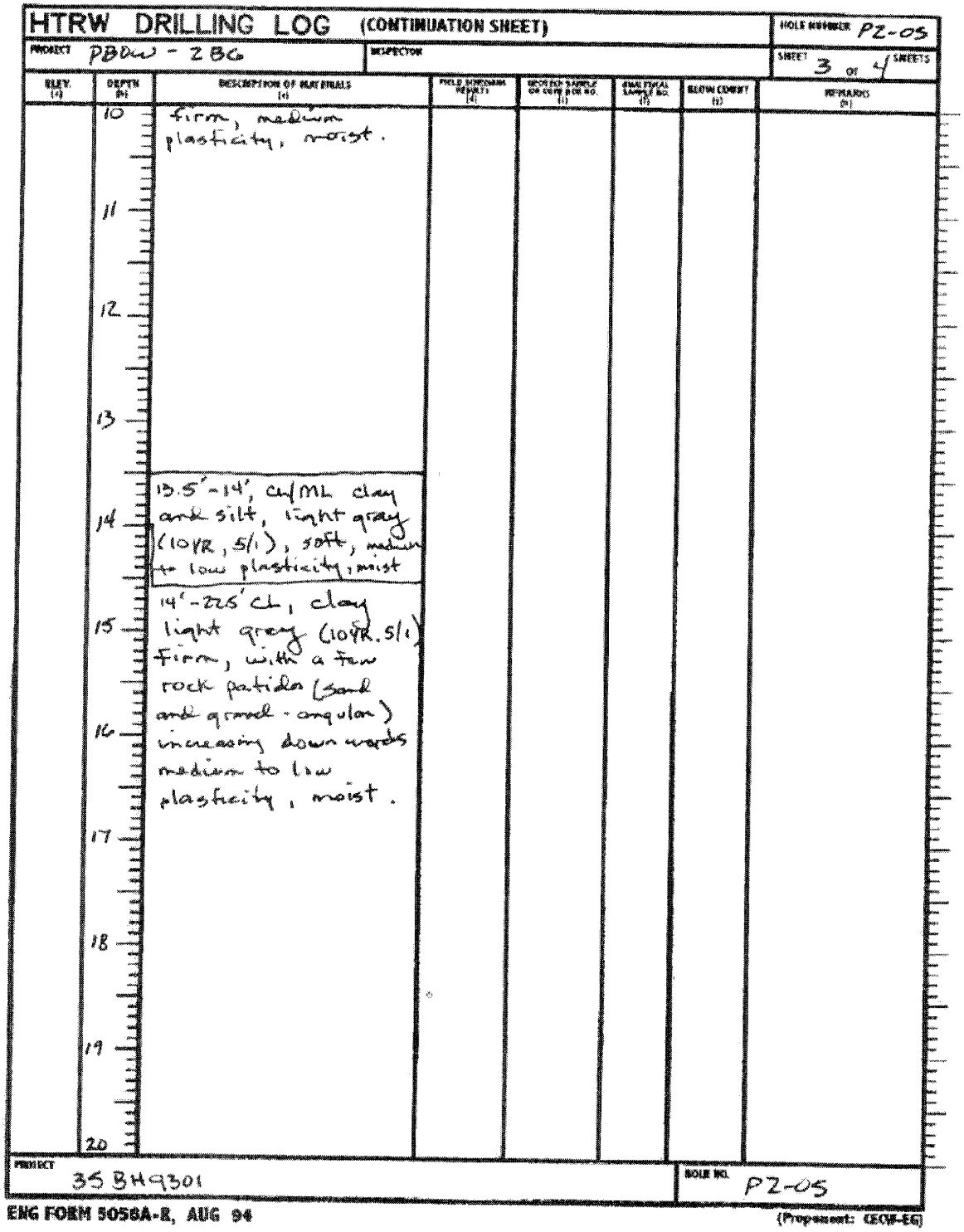


Figure 5-1 (continued)

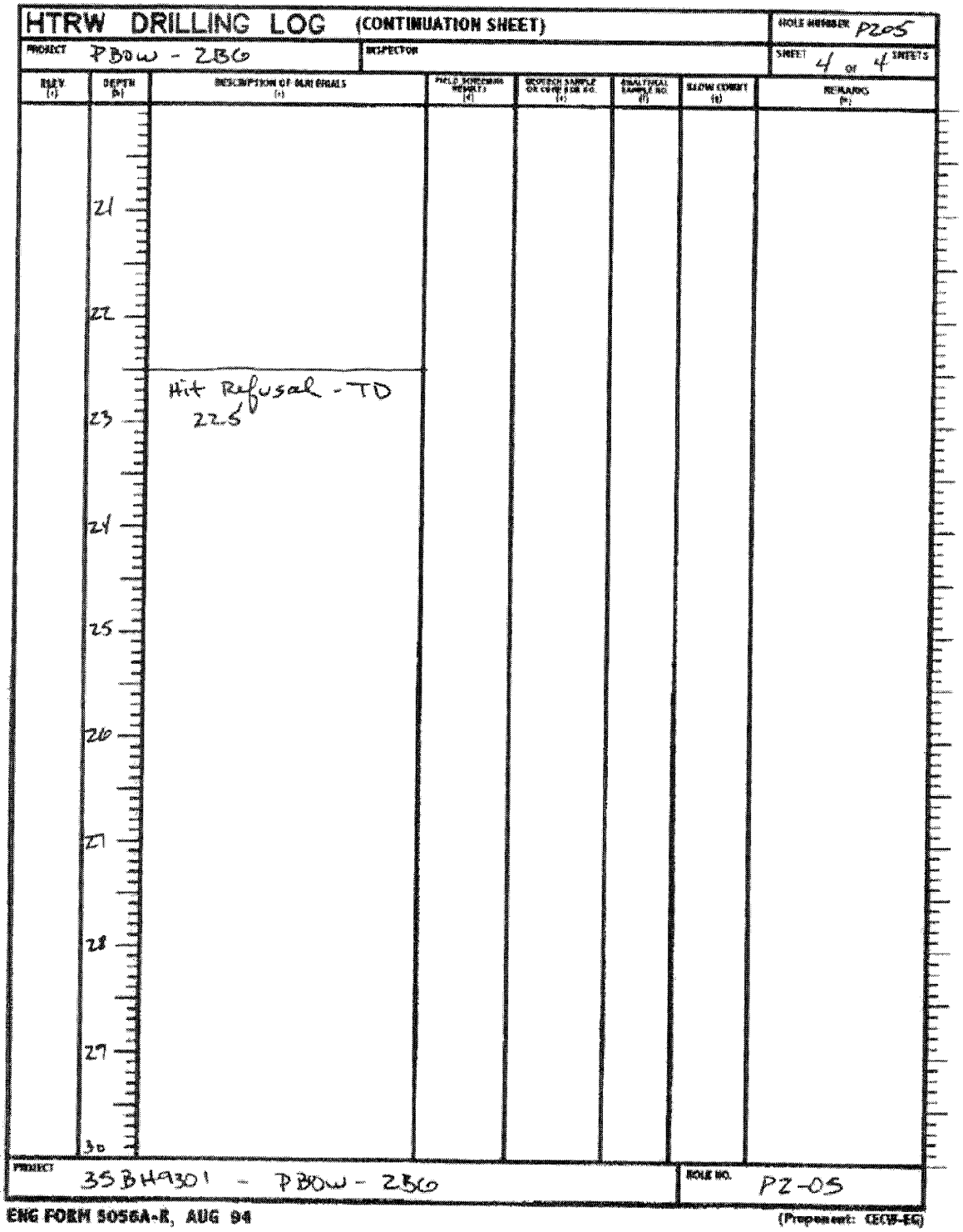
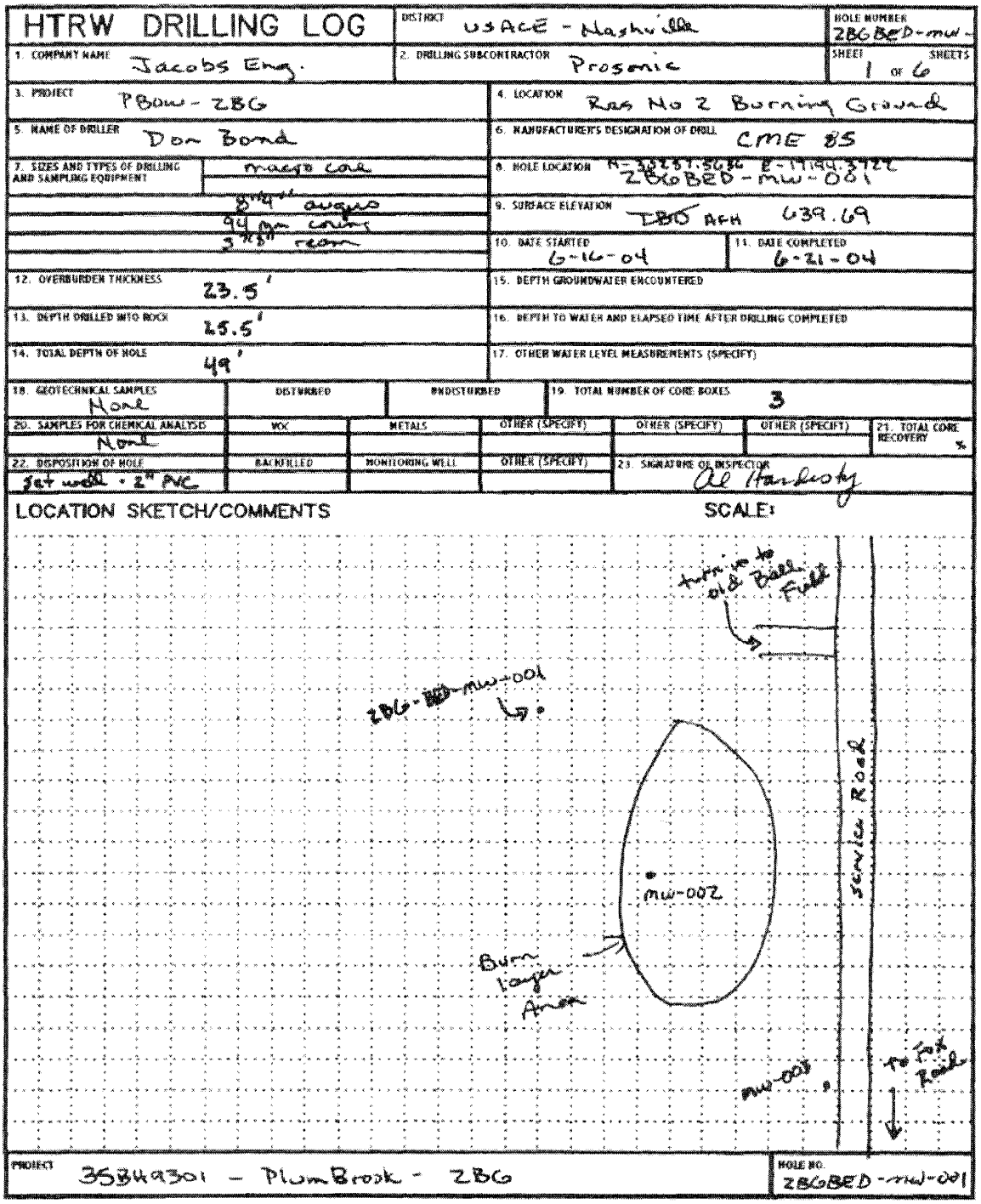


Figure 5-1 (continued)



HTRW DRILLING LOG

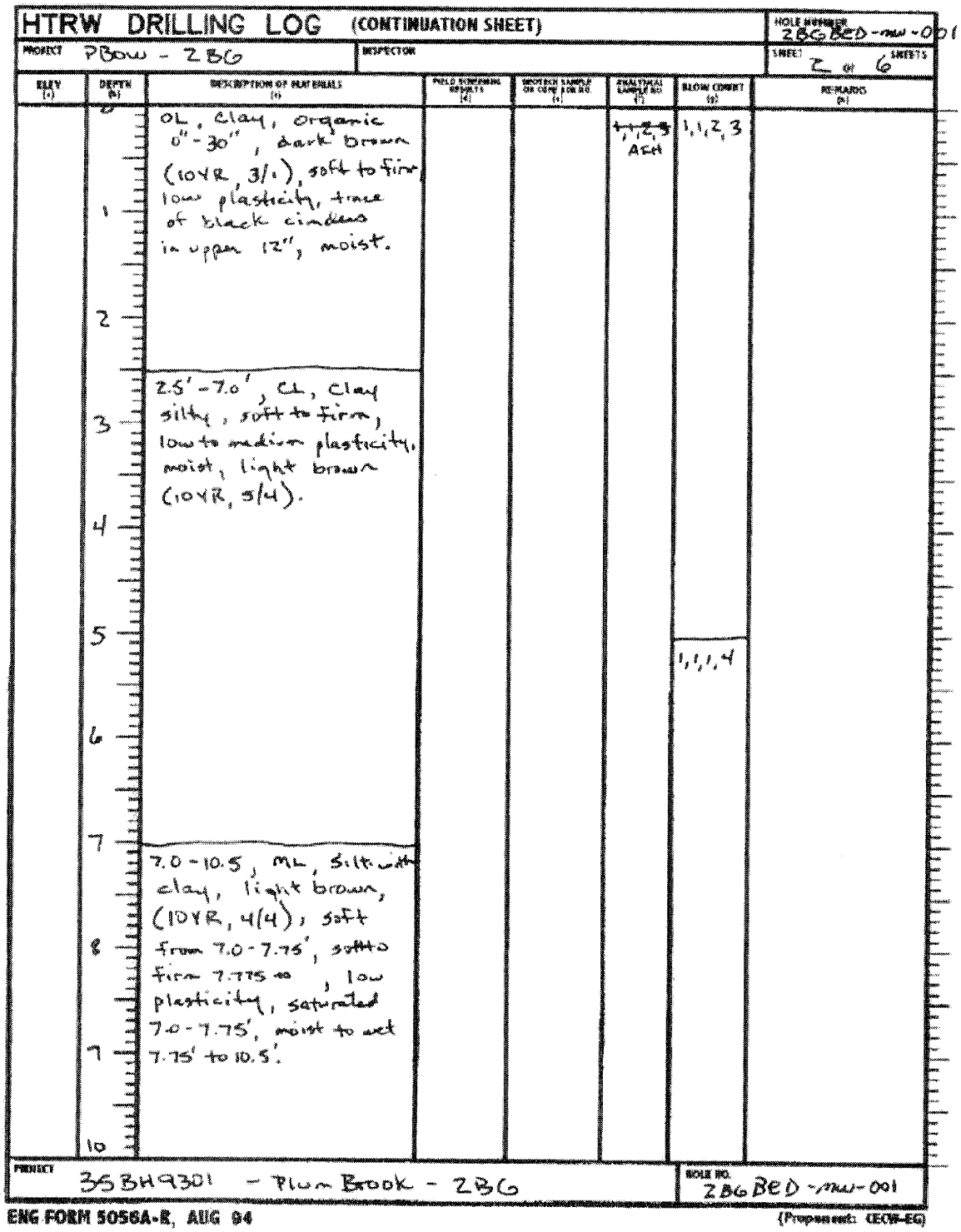
DISTRICT: USACE - Nashville
HOLE NUMBER: ZBGBED-MW-001
SHEET 1 OF 6 SHEETS

1. COMPANY NAME: Jacobs Eng.
2. DRILLING SUBCONTRACTOR: Prosonic
3. PROJECT: PBOW - ZBG
4. LOCATION: Ras No 2 Burning Ground
5. NAME OF DRILLER: Don Bond
6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: macro core; 8" hsa augers; 4" nx core barrel; 3" ssa reamer
8. HOLE LOCATION: N-30281.5086 E-19199.3722 ZBGBED-MW-001
9. SURFACE ELEVATION: ZBG AFH 639.69
10. DATE STARTED: 6-16-04
11. DATE COMPLETED: 6-21-04
12. OVERBURDEN THICKNESS: 23.5'
13. DEPTH DRILLED INTO ROCK: 25.5'
14. TOTAL DEPTH OF HOLE: 49'
15. DEPTH GROUNDWATER ENCOUNTERED
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)
18. GEOTECHNICAL SAMPLES: None — DISTURBED — UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES: 3
20. SAMPLES FOR CHEMICAL ANALYSIS: None — VOC — METALS — OTHER (SPECIFY) — OTHER (SPECIFY) — OTHER (SPECIFY)
21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE: Set well - 2" PVC — BACKFILLED — MONITORING WELL — OTHER (SPECIFY)
23. SIGNATURE OF INSPECTOR: Al Hardesty

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35349301 - PlumBrook - ZBG
HOLE NO.: ZBGBED-MW-001

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: ZBGBED-mw-001

PROJECT: PBow - ZBG

INSPECTOR:

SHEET: 2 of 6 SHEETS

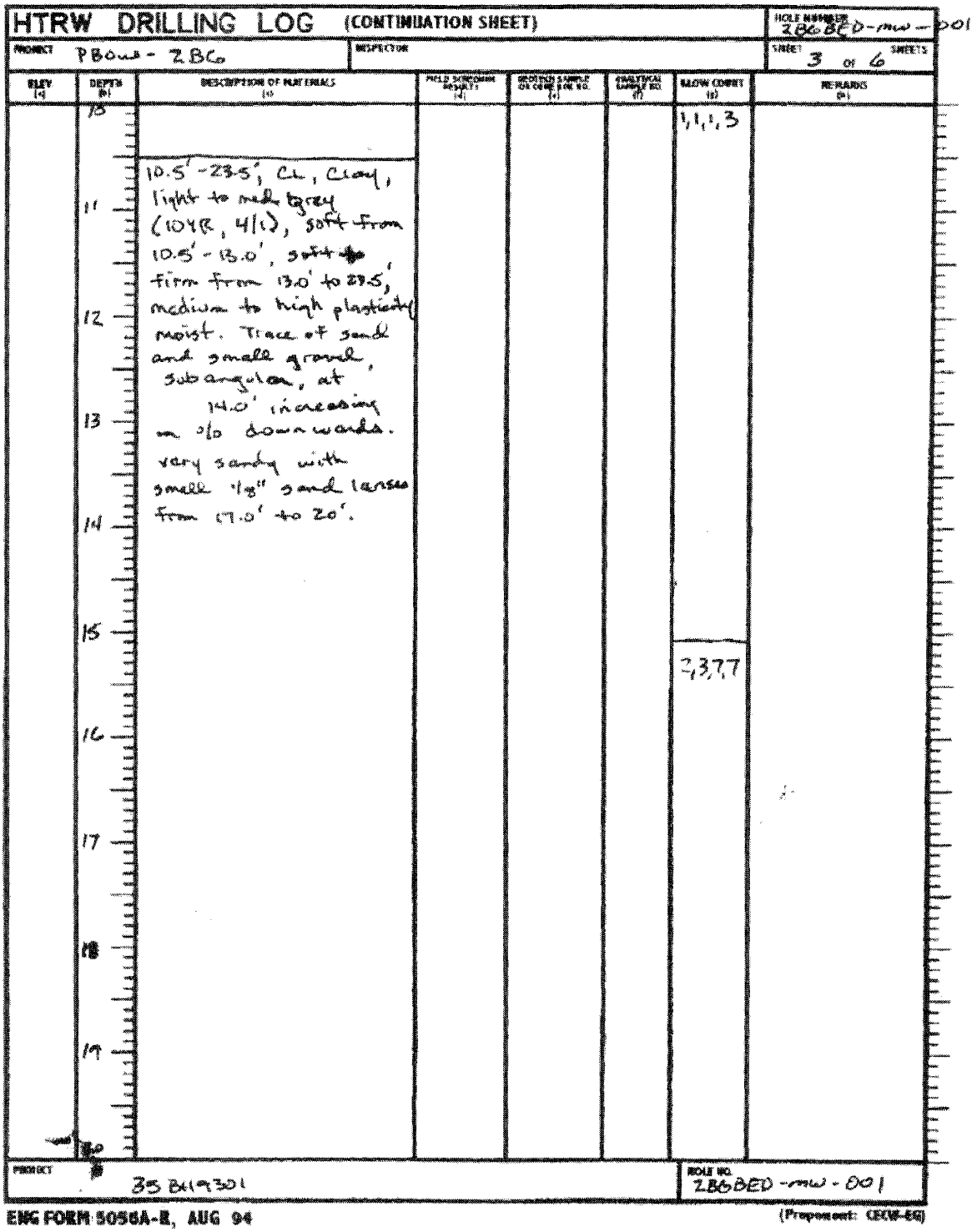
ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	0	OL, clay, organic 0"-30", dark brown (10YR, 3/1), soft to firm, low plasticity, trace of black cinders in upper 12", moist.			~~1,2,3~~ ASH	1,1,2,3	
	1						
	2						
	3	2.5'-7.0', CL, clay silty, soft to firm, low to medium plasticity, moist, light brown (10YR, 5/4).					
	4						
	5					1,1,1,4	
	6						
	7	7.0-10.5, ML, Silt with clay, light brown, (10YR, 4/4), soft from 7.0-7.75', soft to firm 7.775 to , low plasticity, saturated 7.0-7.75', moist to wet 7.75' to 10.5'.					
	8						
	9						
	10						

PROJECT: 35BH9301 - Plum Brook - ZBG

BOLE NO.: ZBGBED-mw-001

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER 286BED-mw-001

PROJECT PBOus - 286

INSPECTOR

SHEET 3 OF 6 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS (a)	FIELD SCREENING RESULTS (b)	SAMPLE OR CORE RUN NO. (c)	ANALYTICAL SAMPLE NO. (d)	BLOW COUNT (e)	REMARKS (f)
	10					1,1,1,3	
	10.5' - 28.5', CL, Clay, light to med grey (10YR, 4/1), soft from 10.5' - 13.0', soft to firm from 13.0' to 28.5', medium to high plasticity moist. Trace of sand and small gravel, subangular, at 14.0' increasing in % downwards. very sandy with small 1/8" sand lenses from 17.0' to 20'.						
	11						
	12						
	13						
	14						
	15					2,3,7,7	
	16						
	17						
	18						
	19						
	20						

PROJECT 35 B419301

HOLE NO. 286BED-mw-001

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

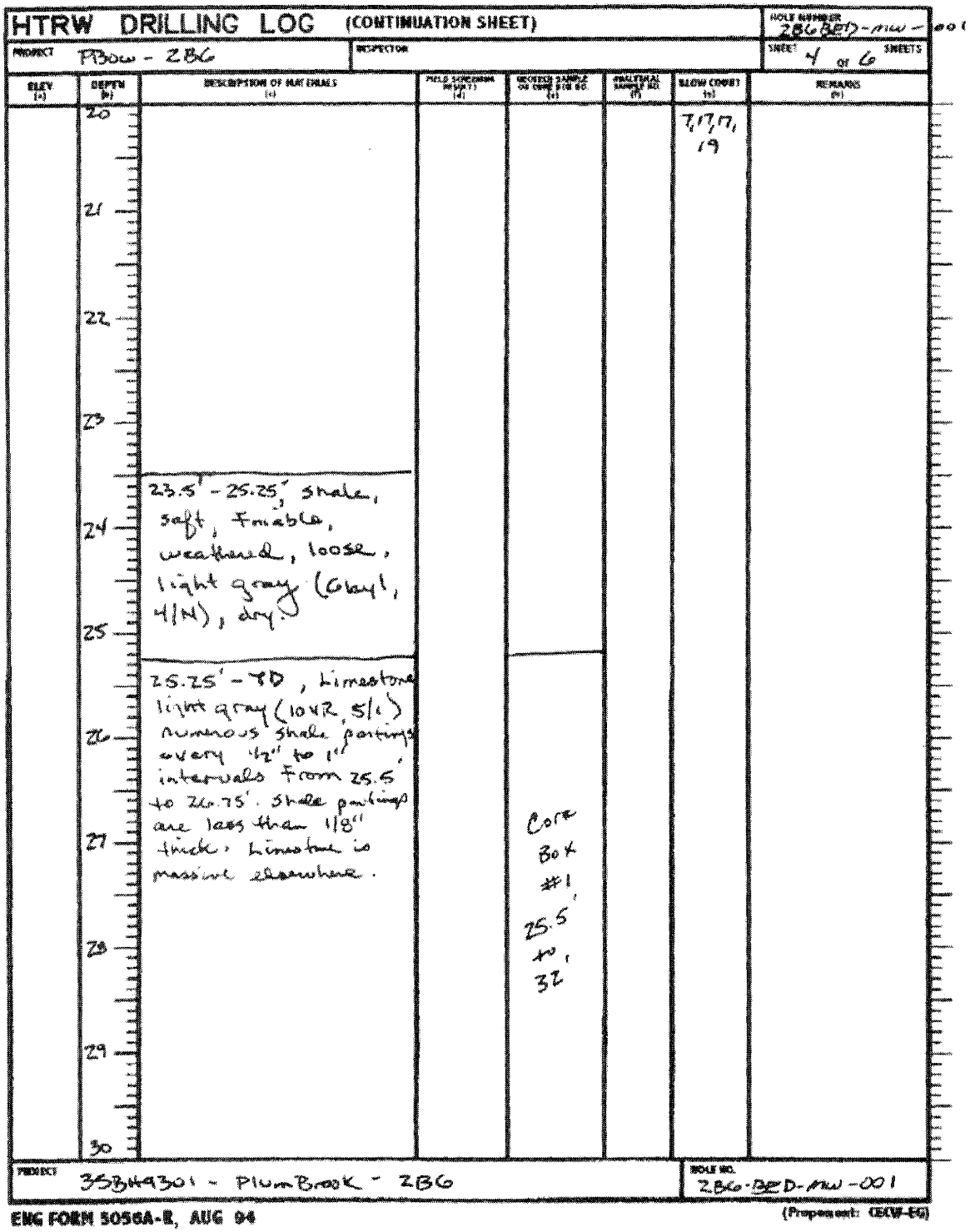


Figure 5-1 (continued)

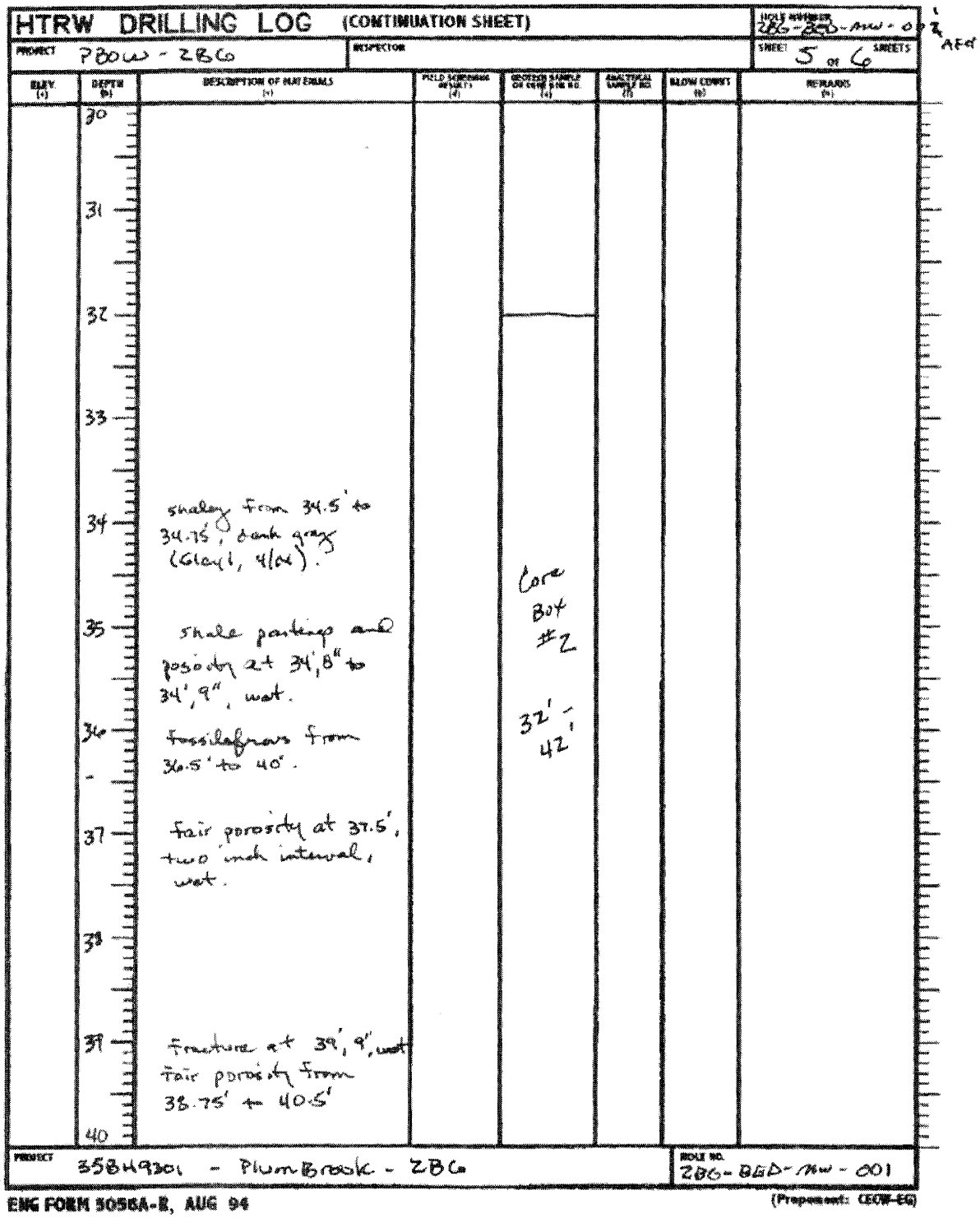


Figure 5-1 (continued)

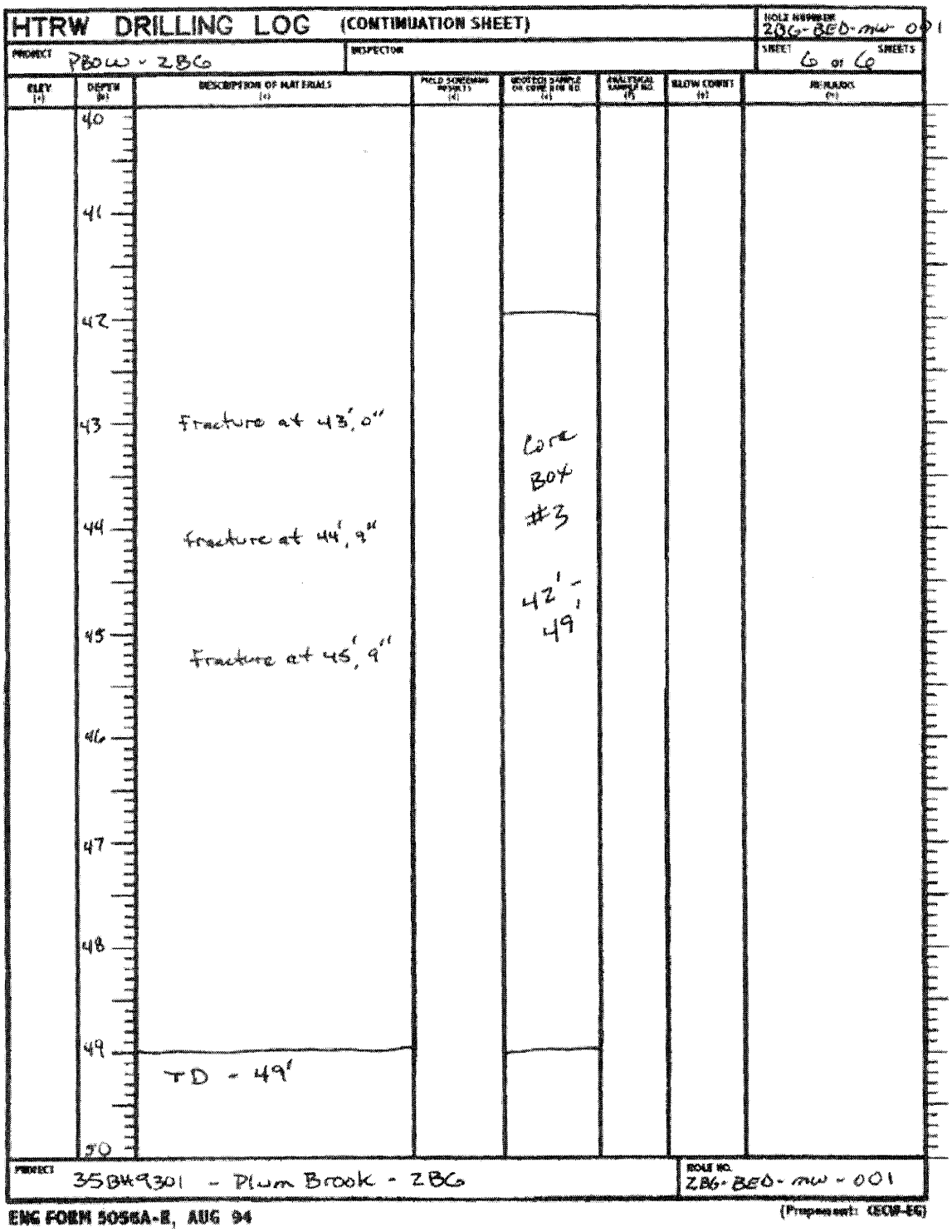
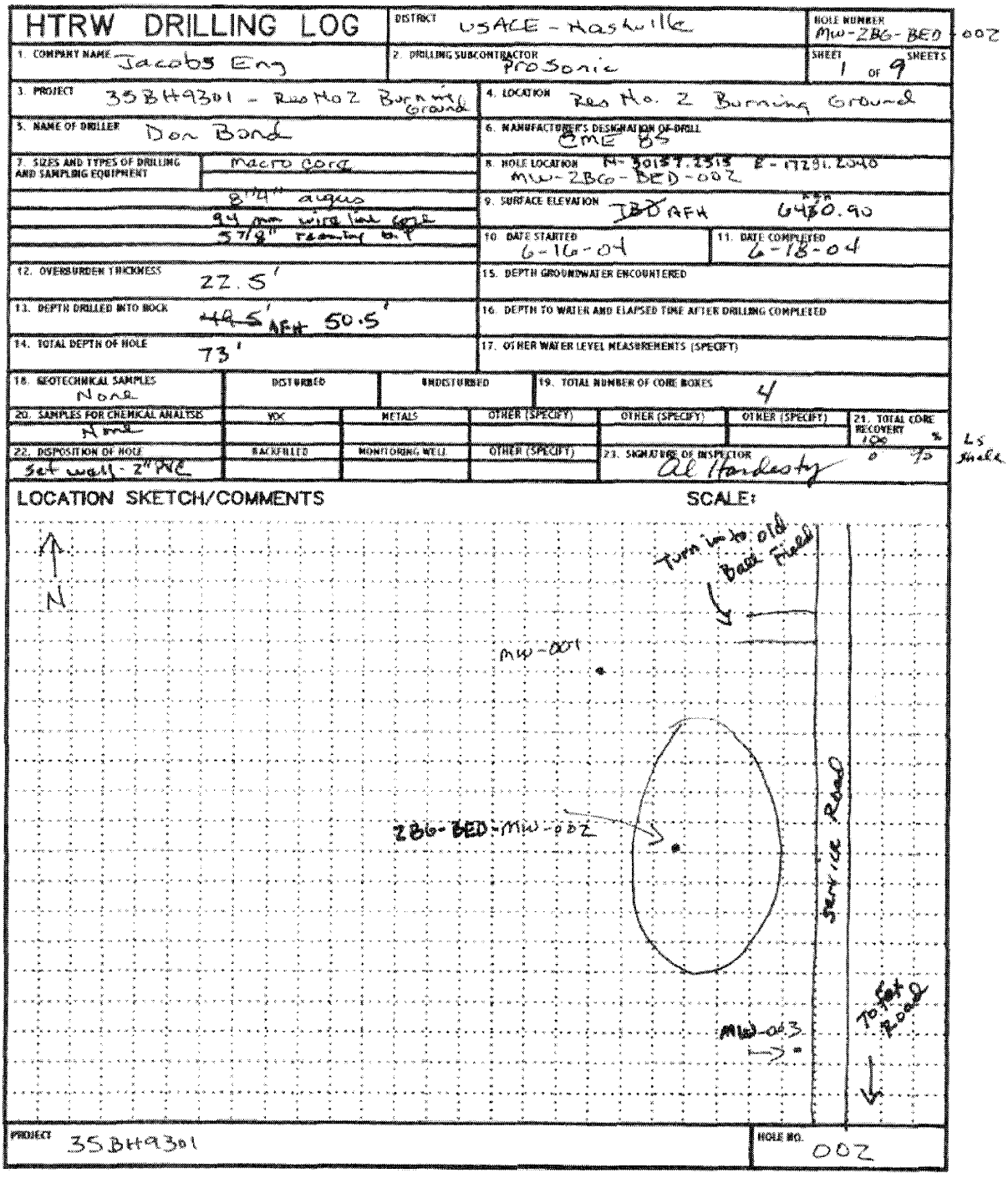


Figure 5-1 (continued)



HTRW DRILLING LOG

DISTRICT: USACE - Nashville
HOLE NUMBER: MW-ZBG-BED-002
SHEET: 1 OF 9 SHEETS

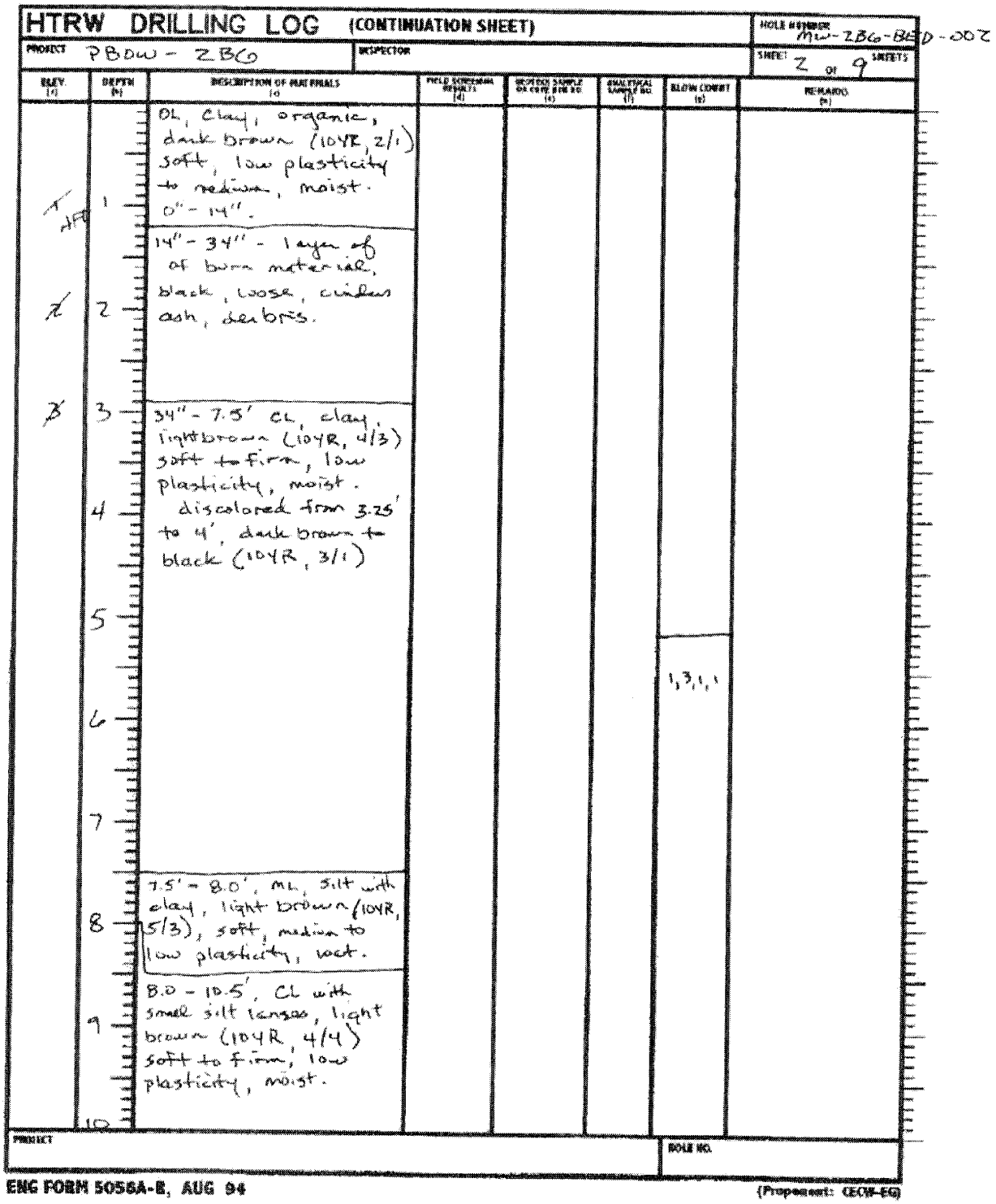
1. COMPANY NAME: Jacobs Eng
2. DRILLING SUBCONTRACTOR: ProSonic
3. PROJECT: 35BH9301 - Res No 2 Burning Ground
4. LOCATION: Res No. 2 Burning Ground
5. NAME OF DRILLER: Don Bond
6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Macro Core; 8"/4" augus; 94 mm wireline core; 5 7/8" reaming bit
8. HOLE LOCATION: N- 50187.2515 E- 17291.2040; MW-ZBG-BED-002
9. SURFACE ELEVATION: IBD AFH 6480.90
10. DATE STARTED: 6-16-04
11. DATE COMPLETED: 6-18-04
12. OVERBURDEN THICKNESS: 22.5'
13. DEPTH DRILLED INTO ROCK: ~~49.5'~~ AFH 50.5'
14. TOTAL DEPTH OF HOLE: 73'
15. DEPTH GROUNDWATER ENCOUNTERED:
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
18. GEOTECHNICAL SAMPLES: None — DISTURBED: — UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: 4
20. SAMPLES FOR CHEMICAL ANALYSIS: None — VOX: — METALS: — OTHER (SPECIFY): — OTHER (SPECIFY): — OTHER (SPECIFY):
21. TOTAL CORE RECOVERY: 100 %
22. DISPOSITION OF HOLE: Set well - 2" PVC — BACKFILLED: — MONITORING WELL: — OTHER (SPECIFY):
23. SIGNATURE OF INSPECTOR: Al Hardesty — 0 %

LS Shale

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT: 35BH9301 — HOLE NO.: 002

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER MW-2BG-BED-002

PROJECT PBDW - 2BG

INSPECTOR

SHEET 2 OF 9 SHEETS

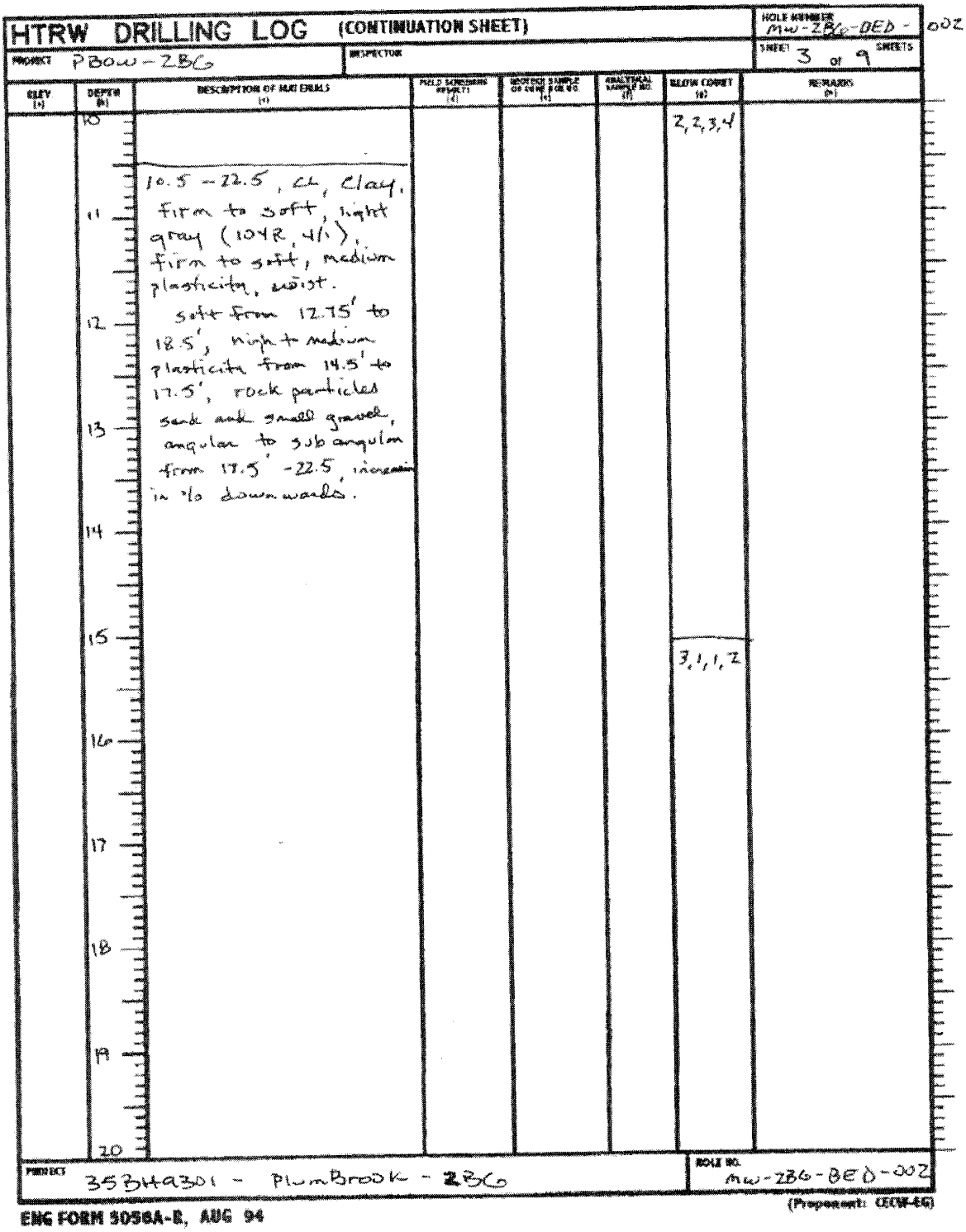
ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	1	OL, clay, organic, dark brown (10YR, 2/1) soft, low plasticity to medium, moist. 0" - 14".					
	2	14" - 34" - layer of of burn material, black, loose, cinders ash, debris.					
	3	34" - 7.5' CL, clay, light brown (10YR, 4/3) soft to firm, low plasticity, moist.					
	4	discolored from 3.25' to 4', dark brown to black (10YR, 3/1)					
	5					1,3,1,1	
	6						
	7						
	8	7.5' - 8.0', ML, silt with clay, light brown (10YR, 5/3), soft, medium to low plasticity, wet.					
	9	8.0 - 10.5', CL with small silt lenses, light brown (10YR, 4/4) soft to firm, low plasticity, moist.					
	10						

PROJECT

HOLE NO.

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER MW-2BG-BED-002

PROJECT PBOW-2BG

INSPECTOR

SHEET 3 OF 9 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	10					2,2,3,4	
	11	10.5 - 22.5', CL, Clay, firm to soft, light gray (10YR, 4/1), firm to soft, medium plasticity, moist. Soft from 12.75' to 18.5', high to medium plasticity from 14.5' to 17.5', rock particles sand and small gravel, angular to sub angular from 17.5' - 22.5', increasing in % downwards.					
	12						
	13						
	14						
	15					3,1,1,2	
	16						
	17						
	18						
	19						
	20						

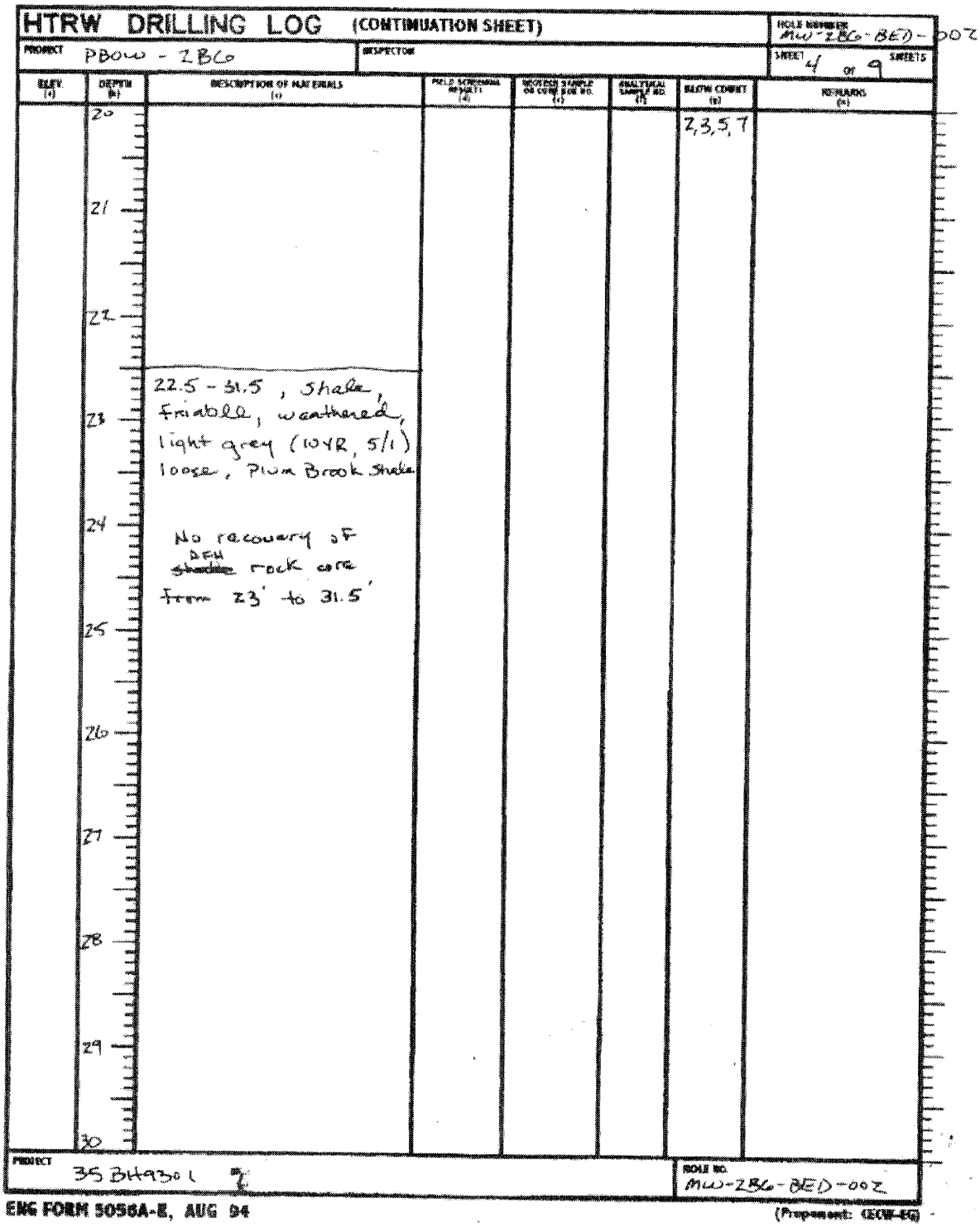
PROJECT 353H49301 - PlumBrook - 2BG

HOLE NO. MW-2BG-BED-002

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER MW-28C-BED-002

PROJECT PBOW - 28C

INSPECTOR

SHEET 4 OF 9 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	20					2,3,5,7	
	21						
	22						
	23	22.5 - 31.5, Shale, friable, weathered, light grey (10YR, 5/1) loose, Plum Brook Shale					
	24	No recovery of DFN ~~shale~~ rock core from 23' to 31.5'					
	25						
	26						
	27						
	28						
	29						
	30						

PROJECT 35 BH4930 1

HOLE NO. MW-28C-BED-002

ENG FORM 5056A-E, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)

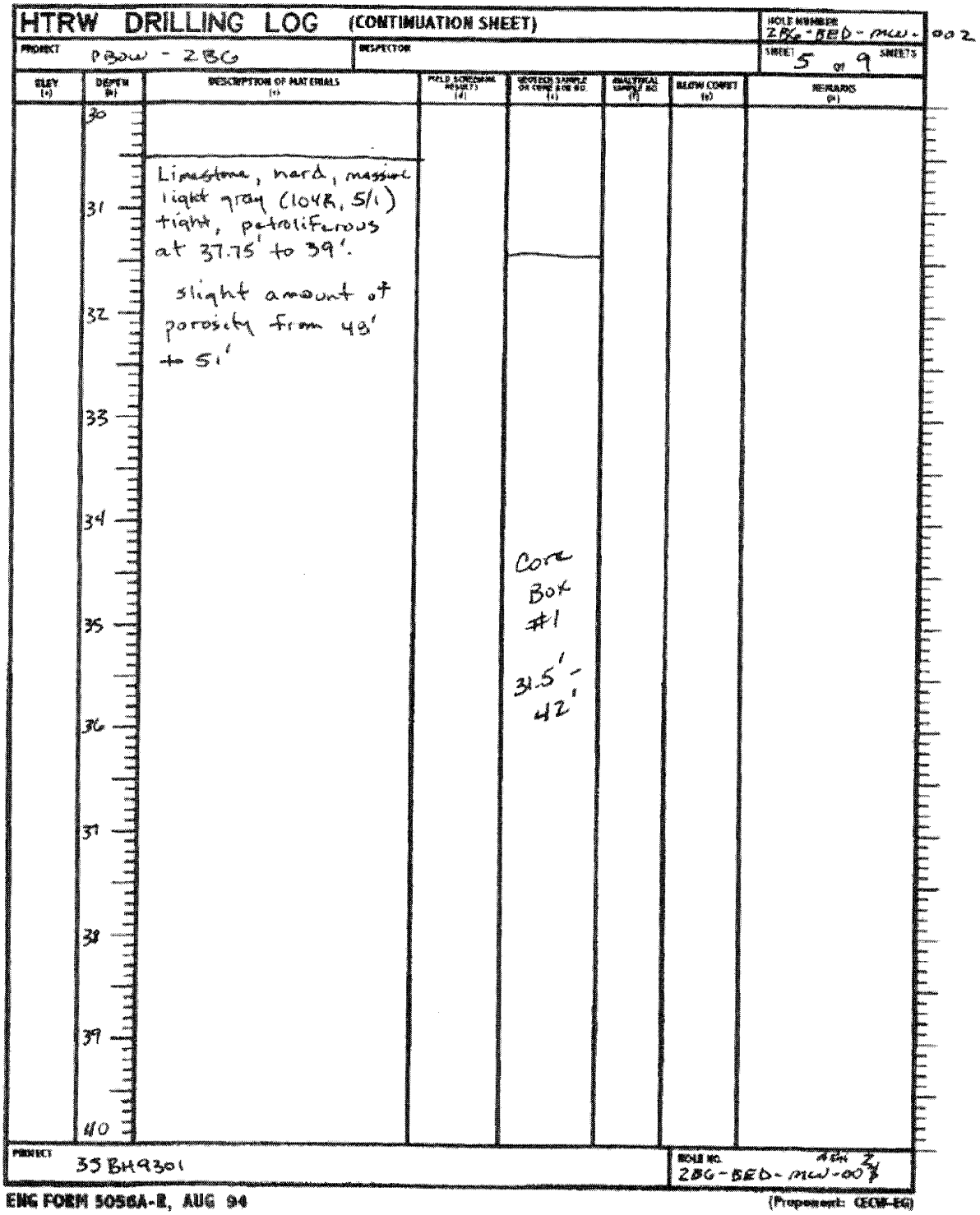


Figure 5-1 (continued)

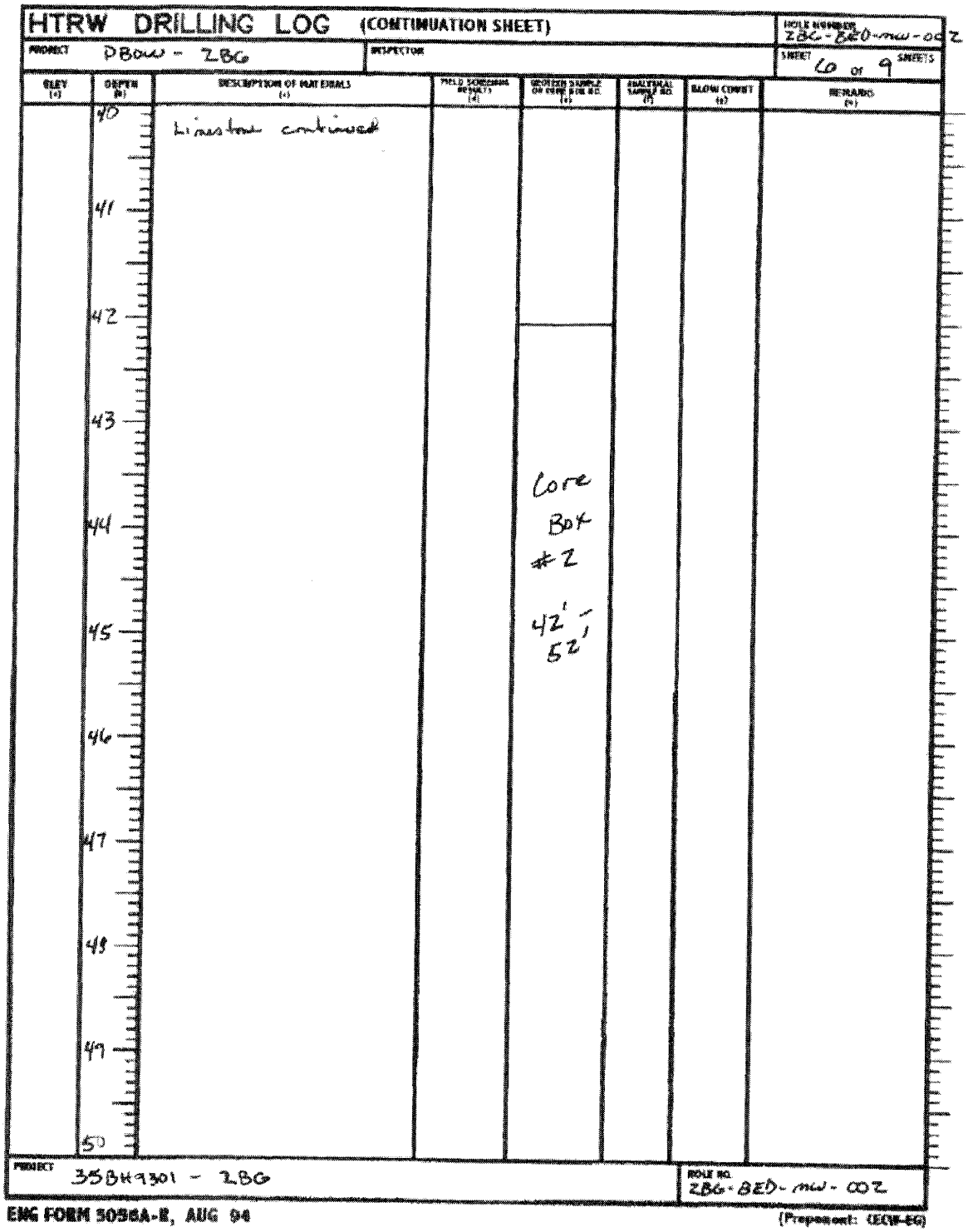


Figure 5-1 (continued)

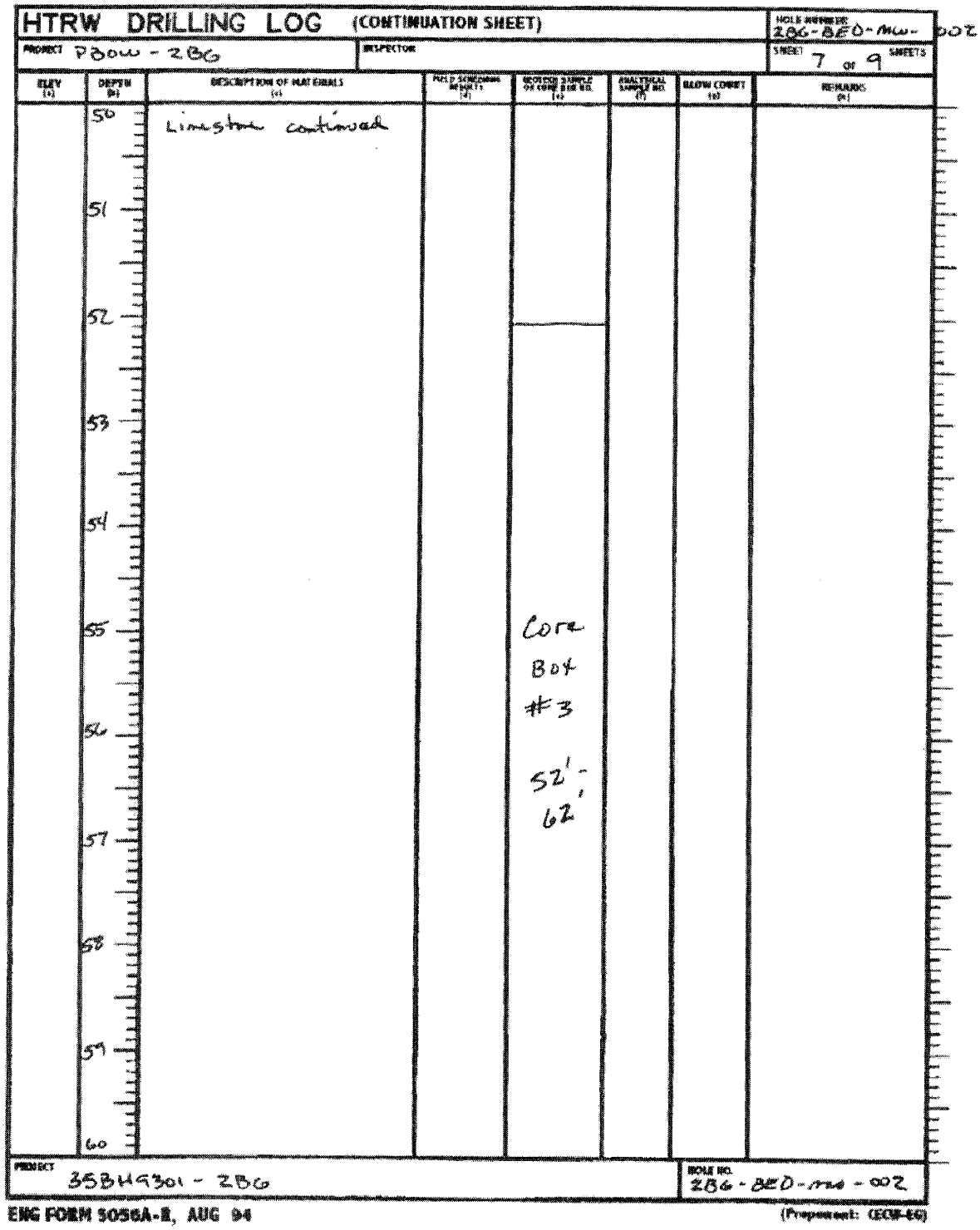


Figure 5-1 (continued)

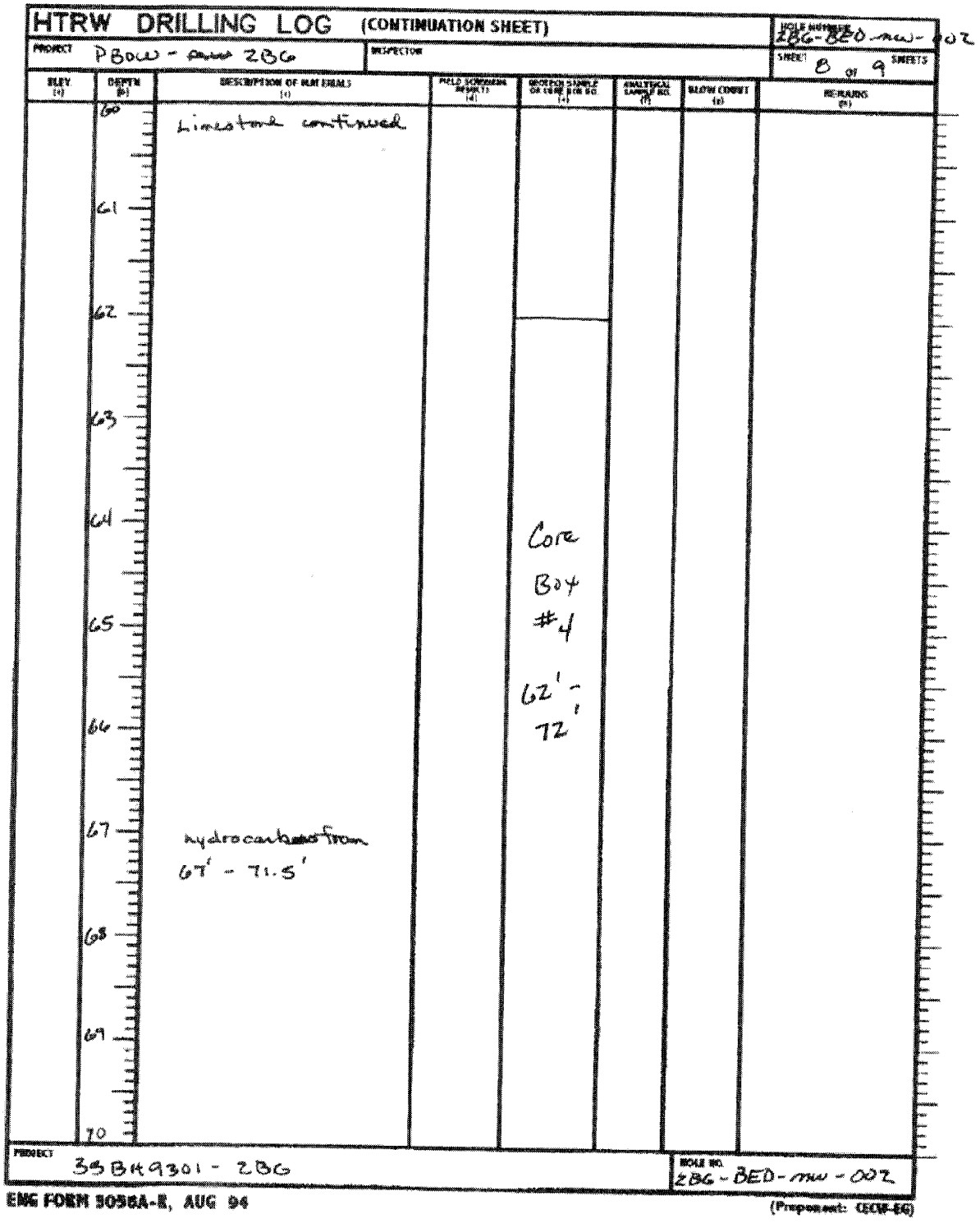


Figure 5-1 (continued)

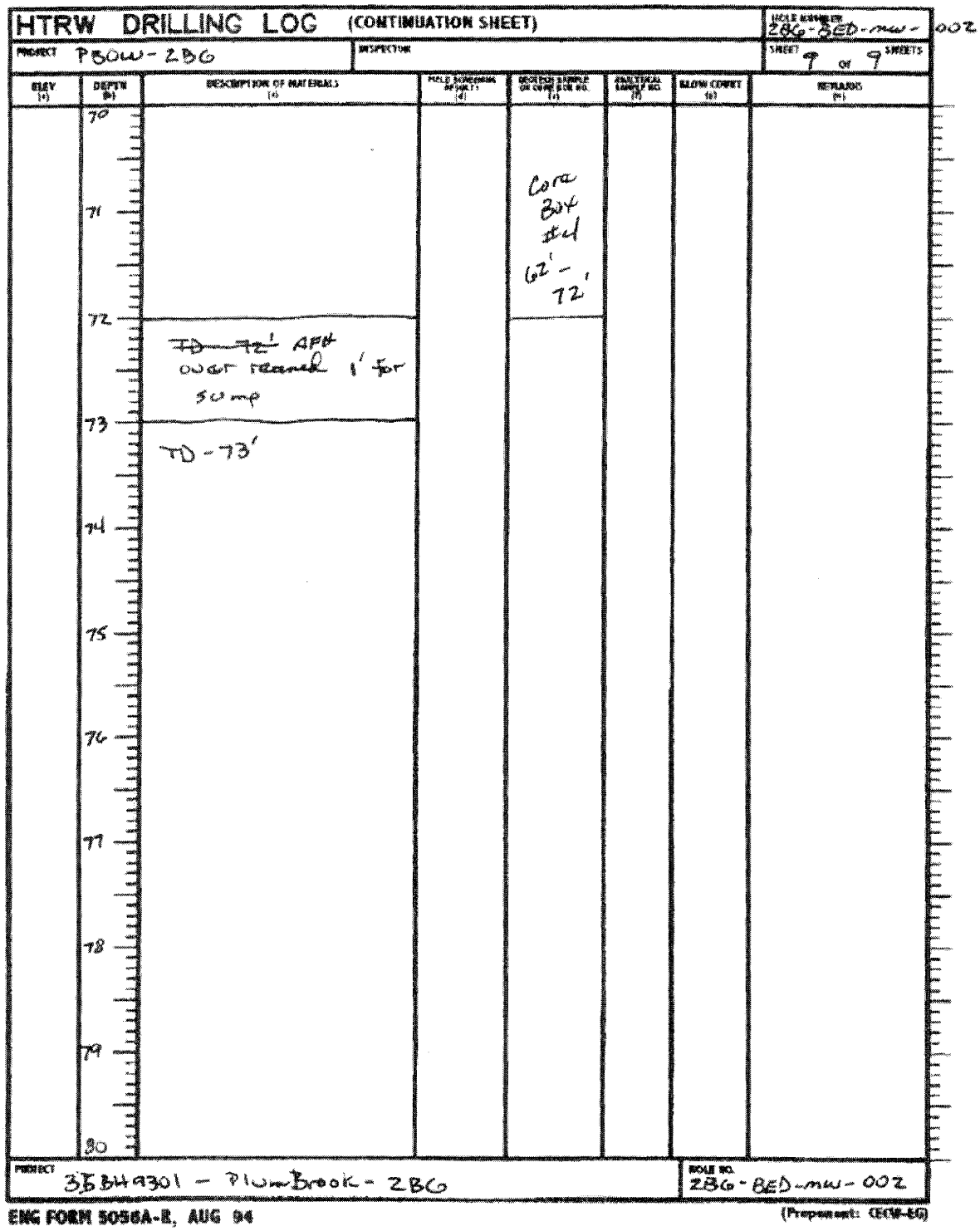


Figure 5-1 (continued)

HTRW DRILLING LOG

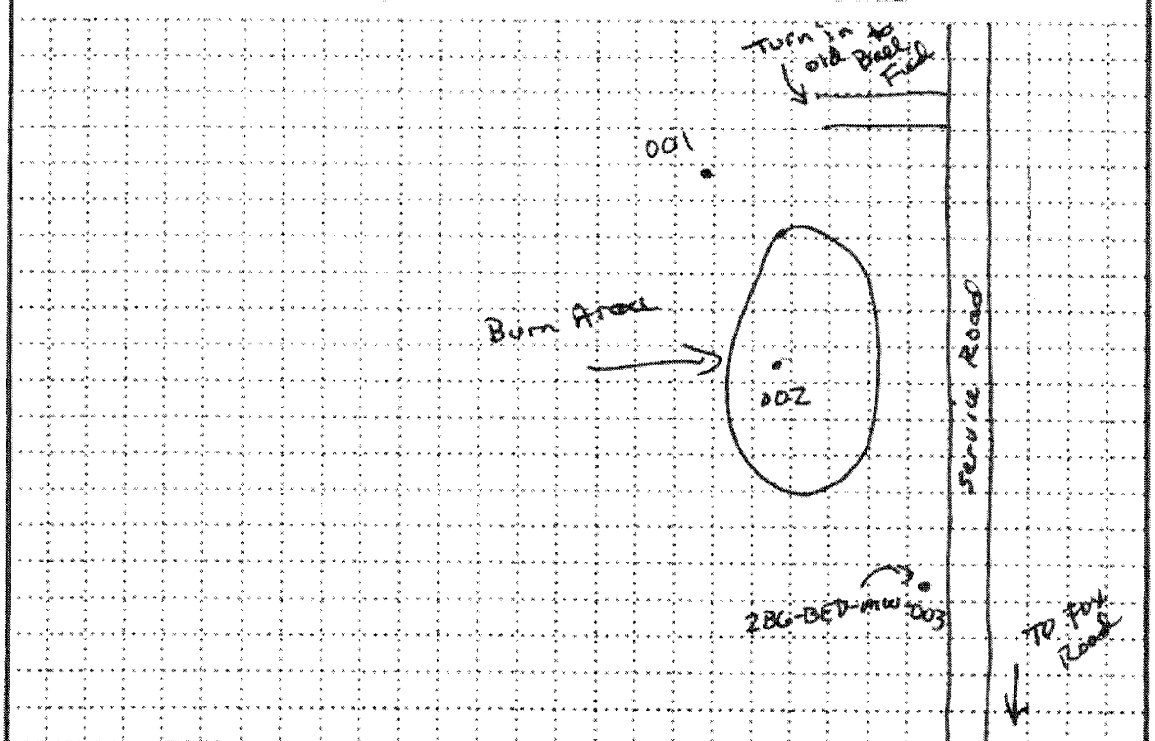
DISTRICT: USACE - Nashville		HOLE NUMBER: 2BG-BED-MW-003
1. COMPANY NAME: Jacobs Eng	2. DRILLING SUBCONTRACTOR: Prosonic	SHEET 1 OF 8 SHEETS
3. PROJECT: PBOW - 2BG	4. LOCATION: Res No. 2 Burning Ground	
5. NAME OF DRILLER: Don Bond	6. MANUFACTURER'S DESIGNATION OF DRILL: CME 85	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: macro core; 8 1/4" augers; 94 mm coring; 5 1/4 roaring bit	8. HOLE LOCATION: N-29998.7463 E-17381.3125 2BG-BED-MW-003	
	9. SURFACE ELEVATION: ~~IBD~~ AFH 640.86	
	10. DATE STARTED: 6-17-04	11. DATE COMPLETED: 6-23-04
12. OVERBURDEN THICKNESS: 19.5'	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: ~~19.5'~~ 42.5'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 62'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			4 boxes

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
None						%

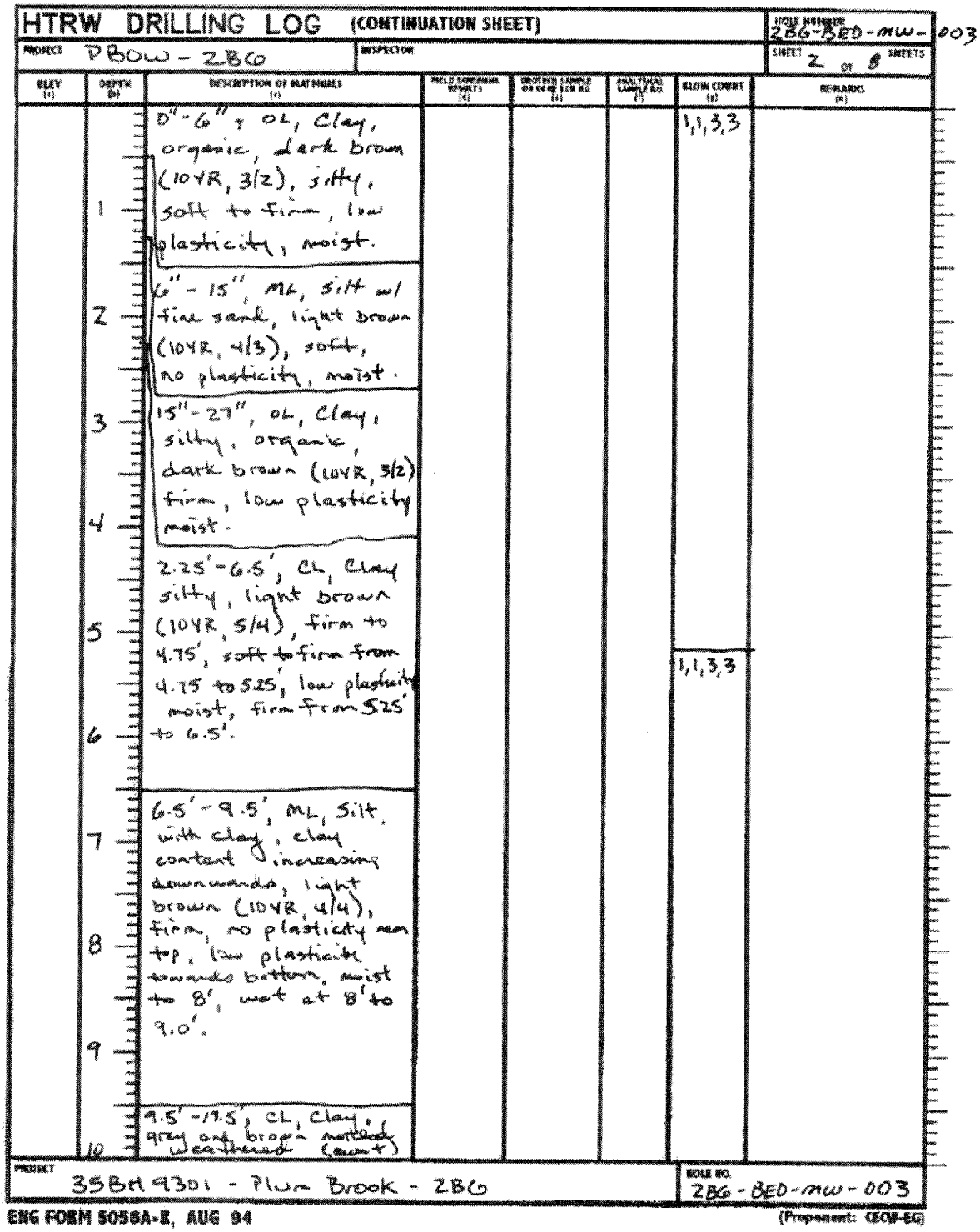
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Set well				Al Hardesty

LOCATION SKETCH/COMMENTS SCALE:



PROJECT: 35BH9301 - Plum Brook - 2BG	HOLE NO. 2BG-BED-MW-003

Figure 5-1



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER 2BG-BED-MW-003

PROJECT PBOW - 2BG

INSPECTOR

SHEET 2 OF 8 SHEETS

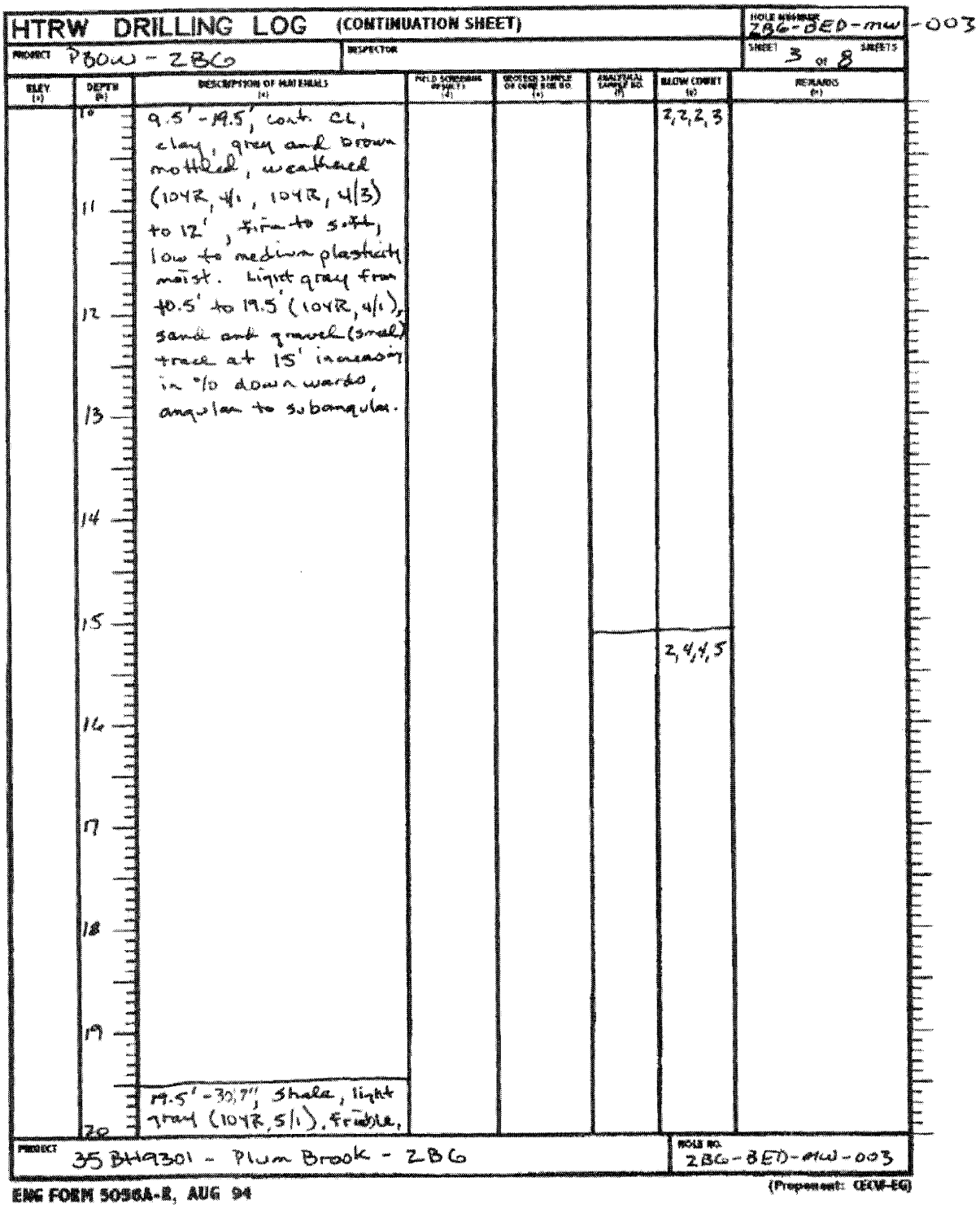
ELEV. (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	SELECTED SAMPLE FOR LAB TESTING	ANALYTICAL SAMPLE NO.	BLOW COUNT	REMARKS
	1	0"-6", OL, Clay, organic, dark brown (10YR, 3/2), silty, soft to firm, low plasticity, moist.				1,1,3,3	
	2	6"-15", ML, Silt w/ fine sand, light brown (10YR, 4/3), soft, no plasticity, moist.					
	3	15"-27", OL, Clay, silty, organic, dark brown (10YR, 3/2) firm, low plasticity moist.					
	4						
	5	2.25'-6.5', CL, Clay silty, light brown (10YR, 5/4), firm to 4.75', soft to firm from 4.75 to 5.25', low plasticity moist, firm from 5.25' to 6.5'.				1,1,3,3	
	6						
	7	6.5'-9.5', ML, Silt with clay, clay content increasing downwards, light brown (10YR, 4/4), firm, no plasticity near top, low plasticity towards bottom, moist to 8', wet at 8' to 9.0'.					
	8						
	9						
	10	9.5'-12.5', CL, Clay, grey and brown mottled, weathered (cont)					

PROJECT 35BH9301 - Plum Brook - 2BG

HOLE NO. 2BG-BED-MW-003

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-1 (continued)



HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER ZBG-BED-mw-003

PROJECT PBOW - ZBG

INSPECTOR

SHEET 3 OF 8 SHEETS

ELEV (ft)	DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING OR PID (ppm)	SECTION SAMPLE OR CORE RUN NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT (#)	REMARKS
	10	9.5'-19.5', cont. CL, clay, grey and brown mottled, weathered (10YR, 4/1, 10YR, 4/3) to 12', firm to soft, low to medium plasticity moist. Light grey from 10.5' to 19.5' (10YR, 4/1), sand and gravel (small) trace at 15' increasing in % downwards, angular to subangular.				2,2,2,3	
	11						
	12						
	13						
	14						
	15					2,4,4,5	
	16						
	17						
	18						
	19						
	20	19.5'-30.7', Shale, light grey (10YR, 5/1), friable,					

PROJECT 35 BH9301 - Plum Brook - ZBG

HOLE NO. ZBG-BED-mw-003

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Figure 5-1 (continued)

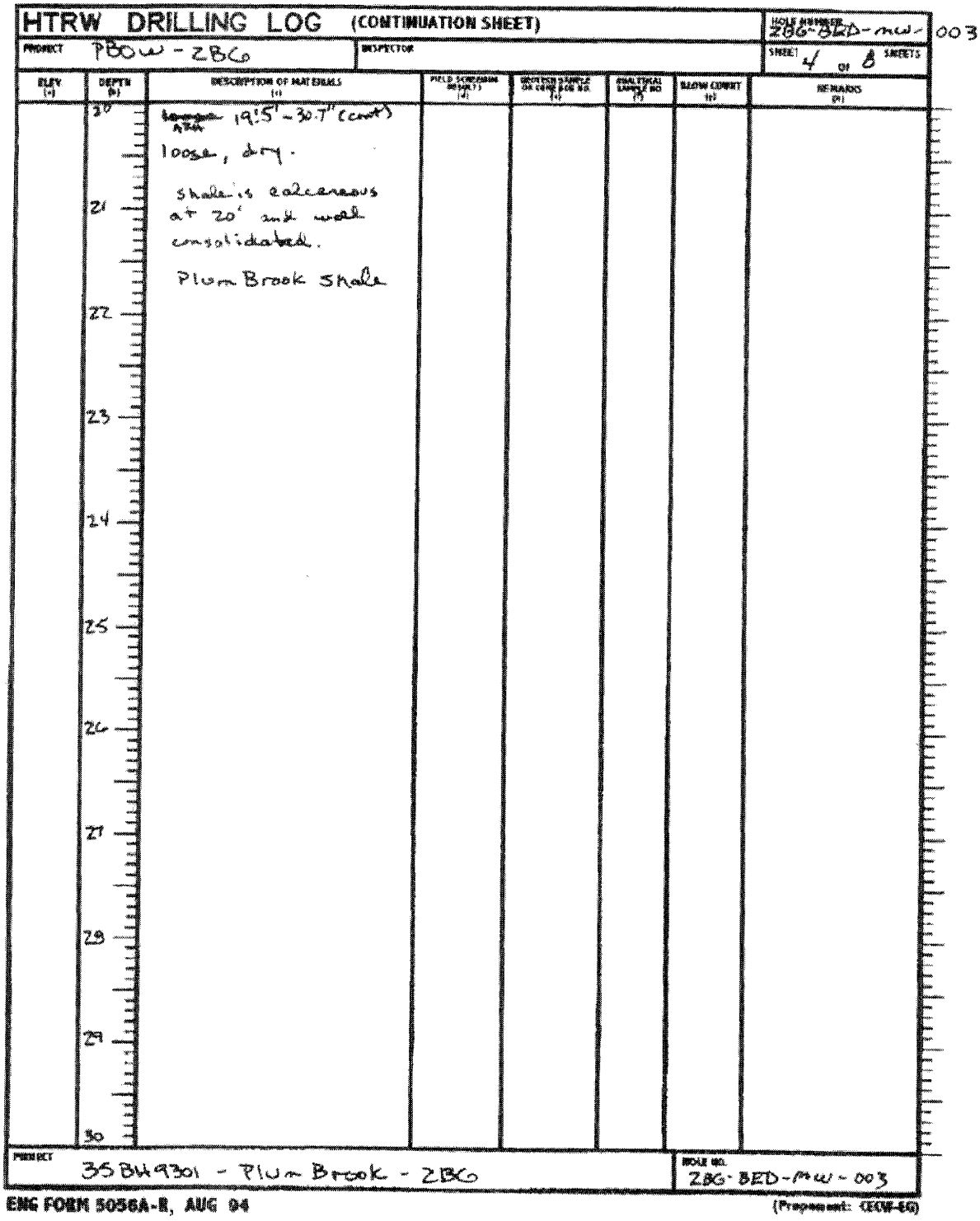


Figure 5-1 (continued)

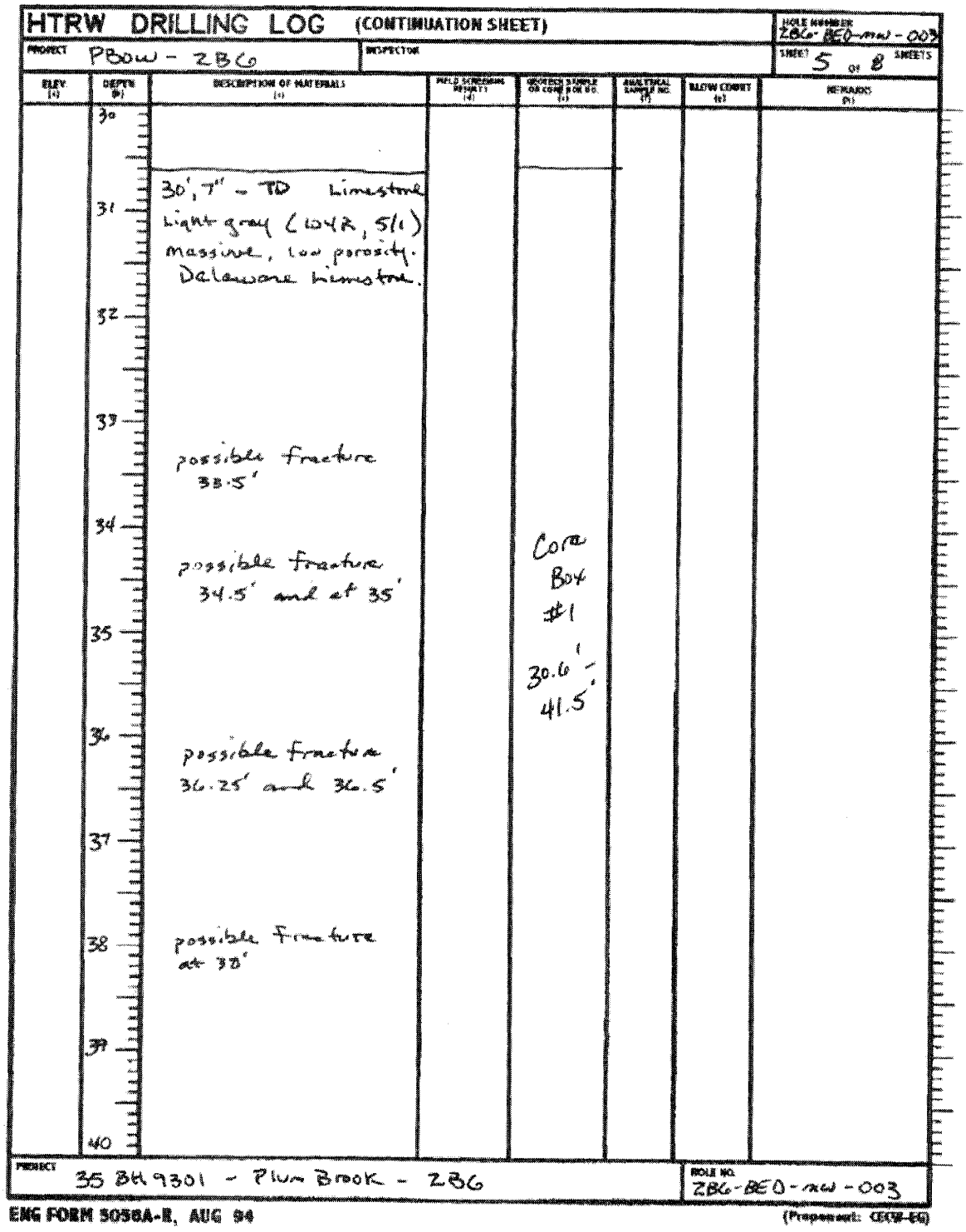


Figure 5-1 (continued)

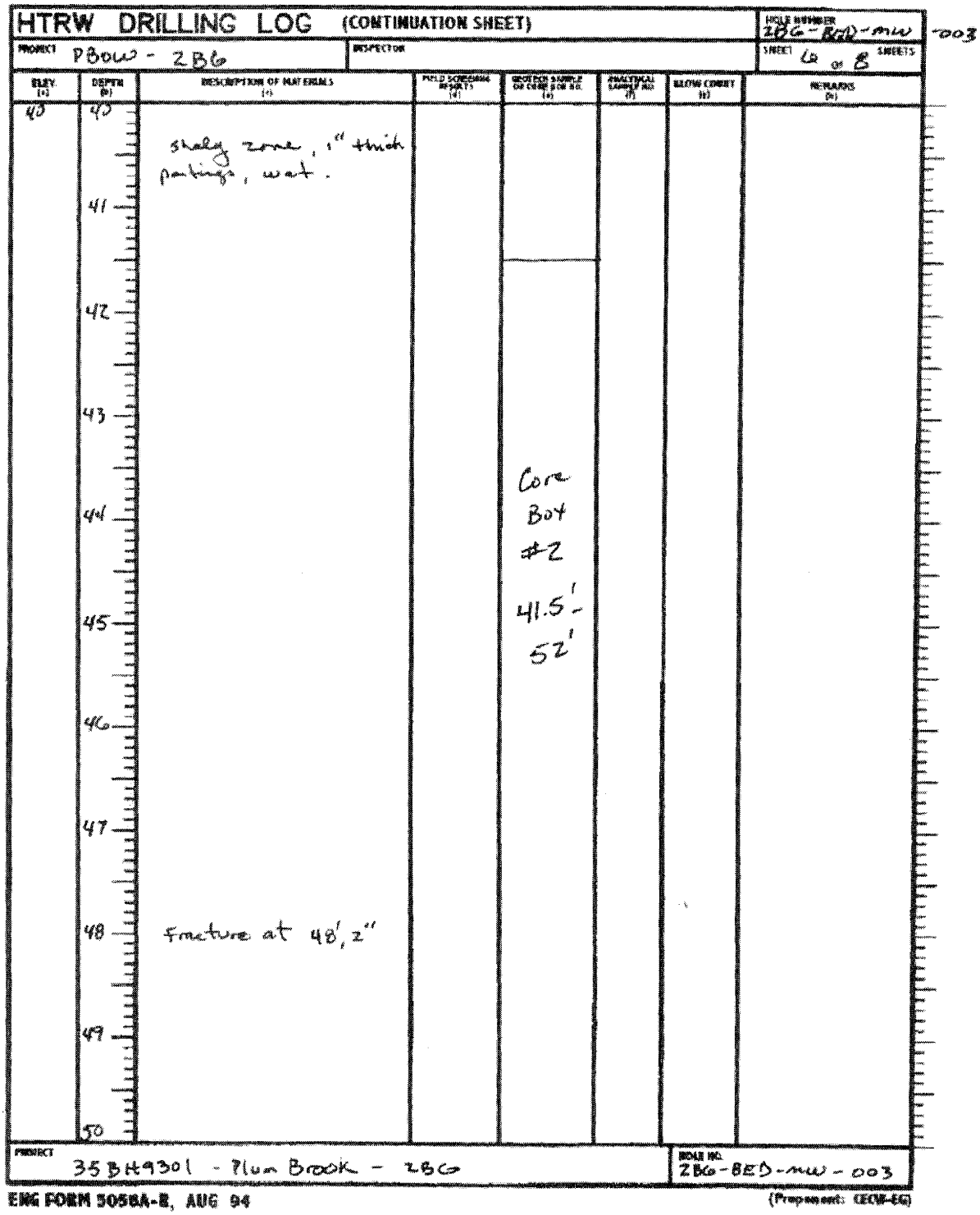


Figure 5-1 (continued)

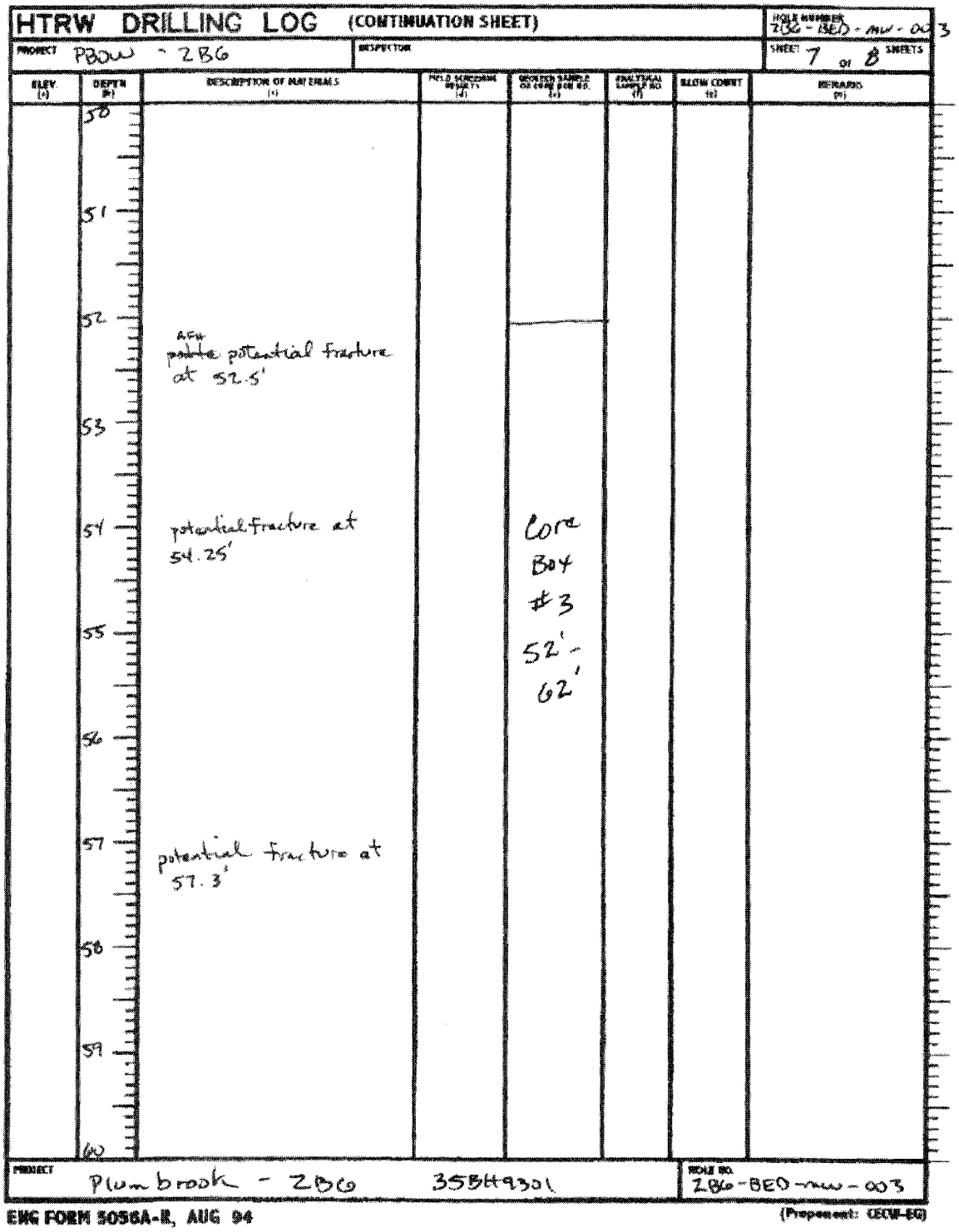


Figure 5-1 (continued)

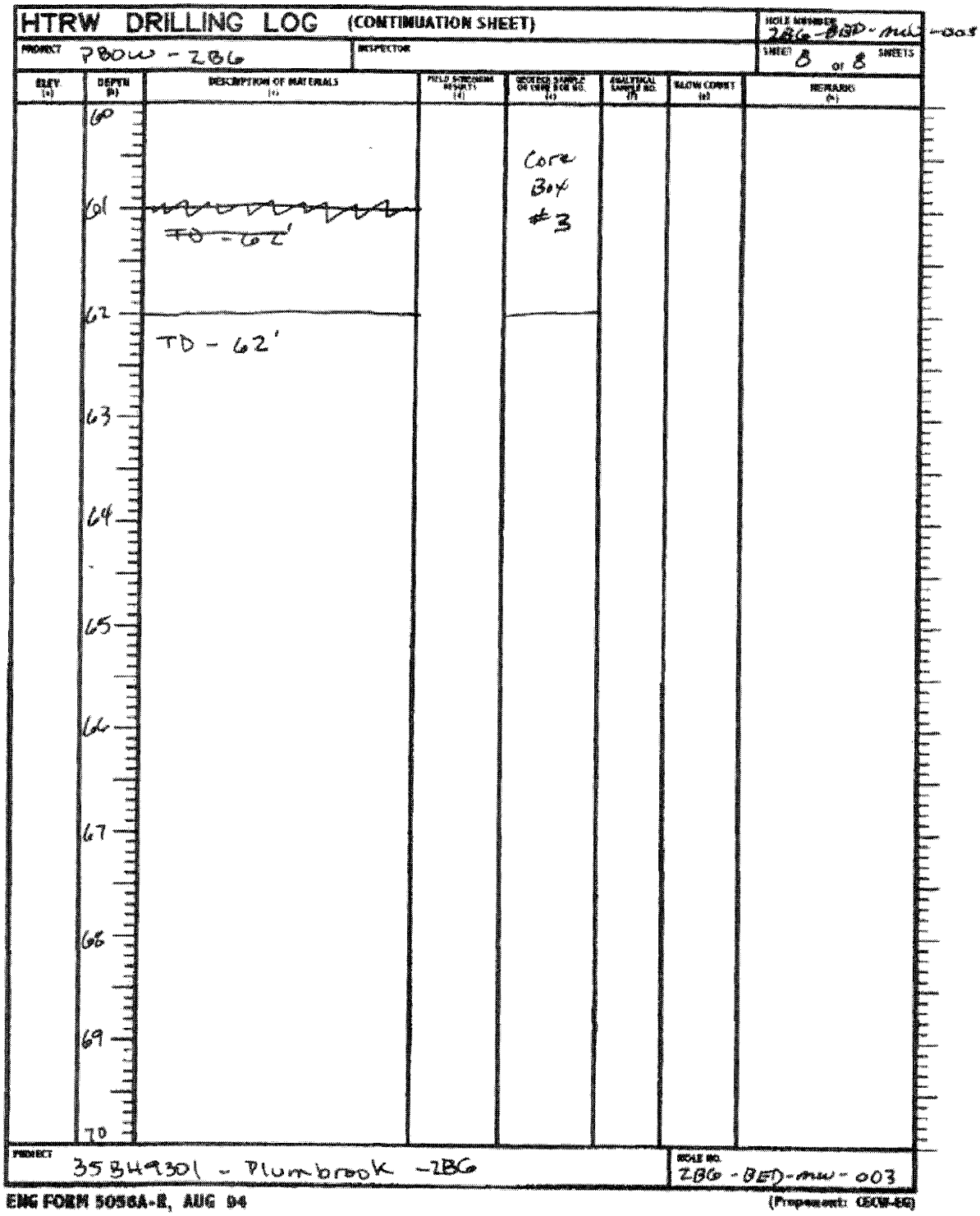


Figure 5-1 (continued)

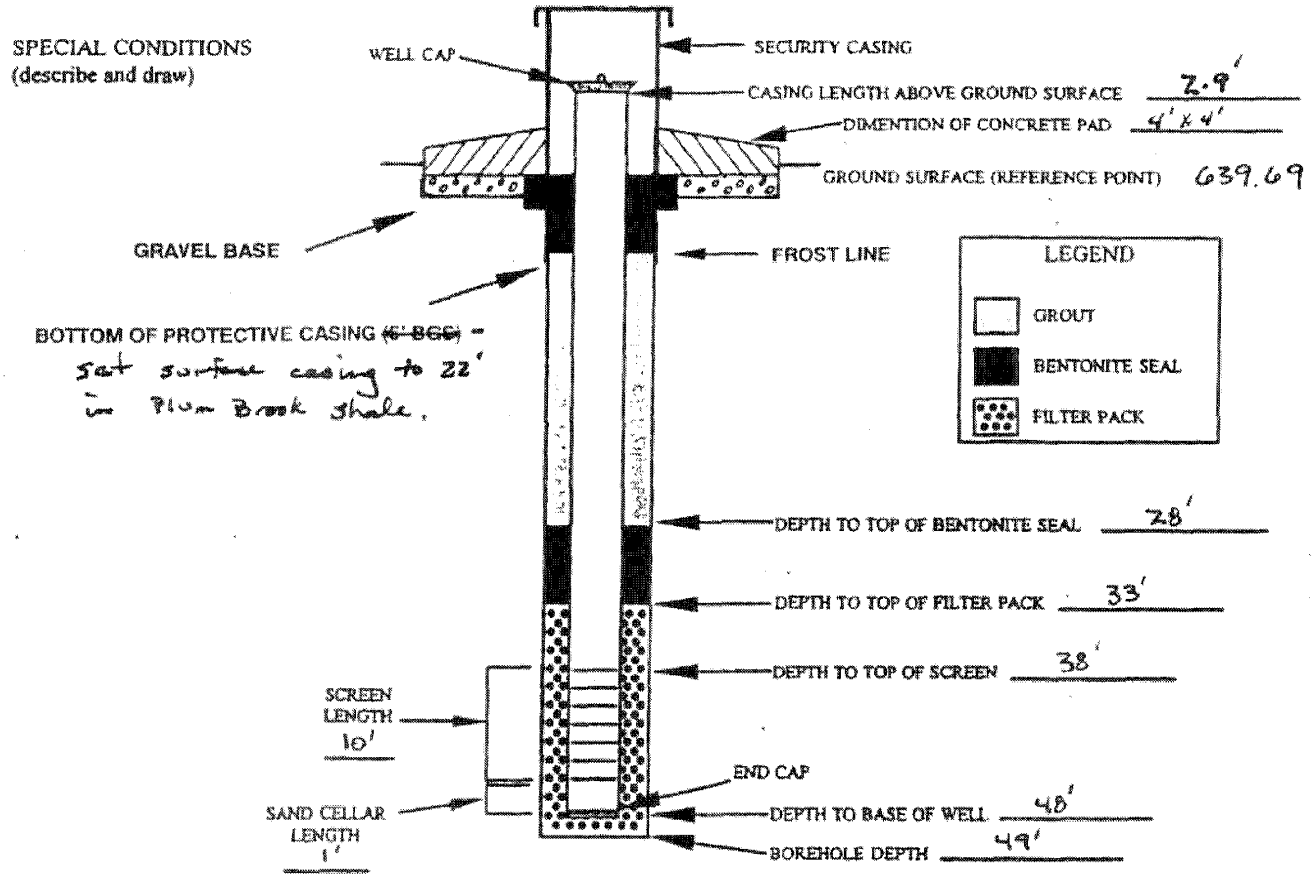
Appendix D
Monitoring Well Construction Diagrams.

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Al Hardesty
DRILLING CONTRACTOR: Prosmic
DRILLING TECHNIQUE: Rotary / water CME 85
AUGER SIZE AND TYPE: 5 7/8" bit
BOREHOLE IDENTIFICATION: ZBG-BED-MW-001
BOREHOLE DIAMETER: 5 7/8"
WELL IDENTIFICATION: ZBG-BED-MW-001
WELL CONSTRUCTION START DATE: 6/1/04
WELL CONSTRUCTION COMPLETE DATE: 6/2/04
SCREEN MATERIAL: PVC - schedule 40 - 0.010 slot
SCREEN DIAMETER: 2" ID
STRATUM-SCREENED INTERVAL (FT): 38'-48'
CASING MATERIAL: PVC - schedule 40
CASING DIAMETER: 2" ID

TYPE OF FILTER PACK: Sand
GRADIATION: 20/40
AMOUNT OF FILTER PACK USED: 260 lbs
TYPE OF BENTONITE: 3/8" hole plug
AMOUNT BENTONITE USED: 75 lbs
TYPE OF CEMENT: Portland cement
AMOUNT CEMENT USED: 50 gallons
GROUT MATERIALS USED: portland cement
DIMENSIONS OF SECURITY CASING: 6" steel
TYPE OF WELL CAP: J-plug
TYPE OF END CAP: 3" pointed
COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Don Bond - Prosmic
INSTALLATION OBSERVED BY: Jim Branson - USACE - Nashville

DISCREPANCIES:

Figure 5-2

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Al Hardesty
DRILLING CONTRACTOR: Pro Sonic
DRILLING TECHNIQUE: Rotary 94 mm coring / 5 7/8 ream
AUGER SIZE AND TYPE:

BOREHOLE IDENTIFICATION: ZBG-BED-mw-002
BOREHOLE DIAMETER: 8" surface, 5 7/8" rock
WELL IDENTIFICATION: ZBG-BED-mw-002

WELL CONSTRUCTION START DATE: 6/16/04
WELL CONSTRUCTION COMPLETE DATE: 6/18/04

SCREEN MATERIAL: 2" ID PVC - 0.010 slot
SCREEN DIAMETER: 2"
STRATUM-SCREENED INTERVAL (FT): 42' - 72'

CASING MATERIAL: 2" ID PVC
CASING DIAMETER: 2" ID

TYPE OF FILTER PACK: 20/40 sand
GRADIATION: 20/40
AMOUNT OF FILTER PACK USED: 800 lbs

TYPE OF BENTONITE: 3/8" hole plug
AMOUNT BENTONITE USED: 50 lbs

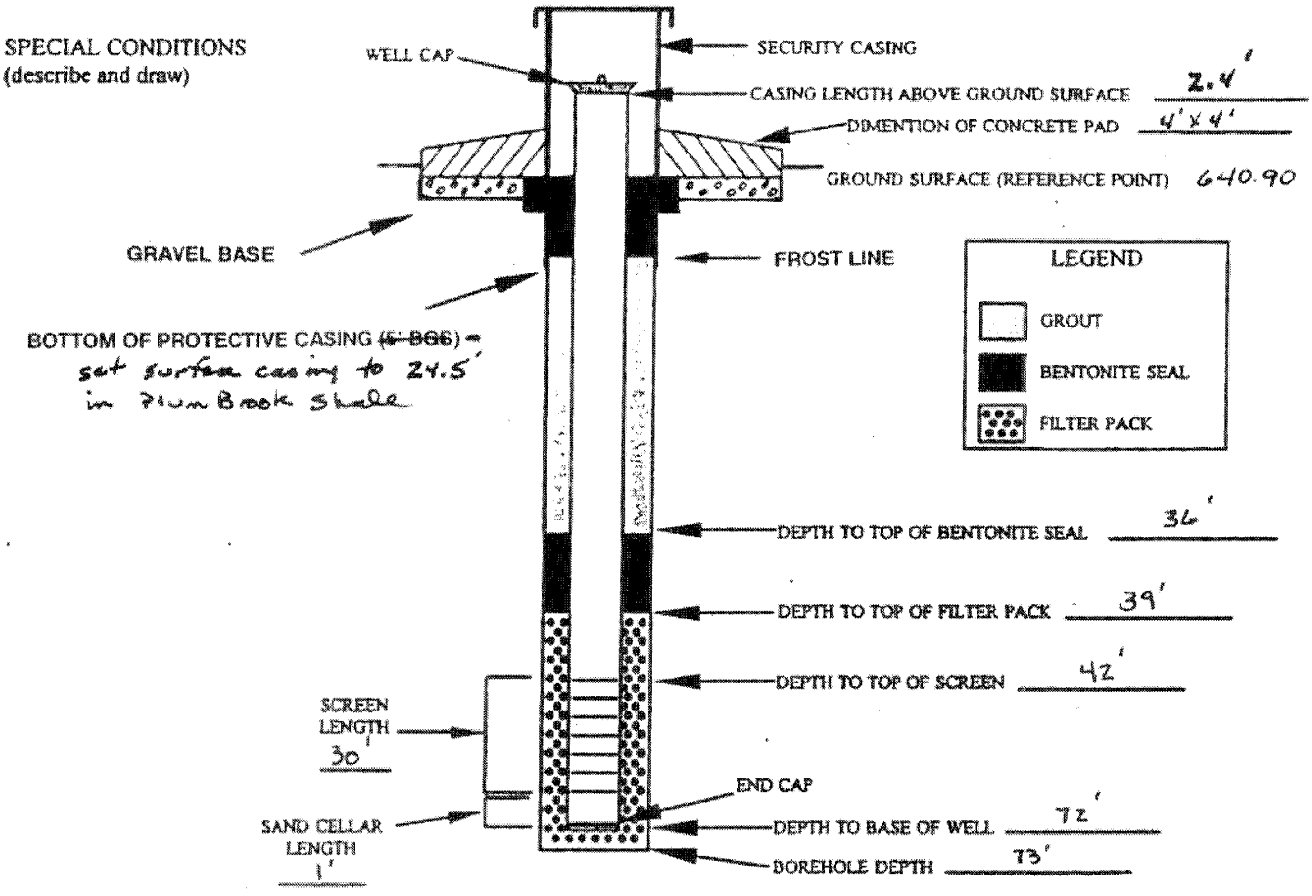
TYPE OF CEMENT: Portland
AMOUNT CEMENT USED: 50 gallons
GROUT MATERIALS USED: Portland cement

DIMENSIONS OF SECURITY CASING: 6" steel casing

TYPE OF WELL CAP: J-plug
TYPE OF END CAP: 3" pointed

COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Don Bond - Prosonic, Al Hardesty - Jacobs
INSTALLATION OBSERVED BY: Jim Beaujon - USACE - Nashville

DISCREPANCIES:

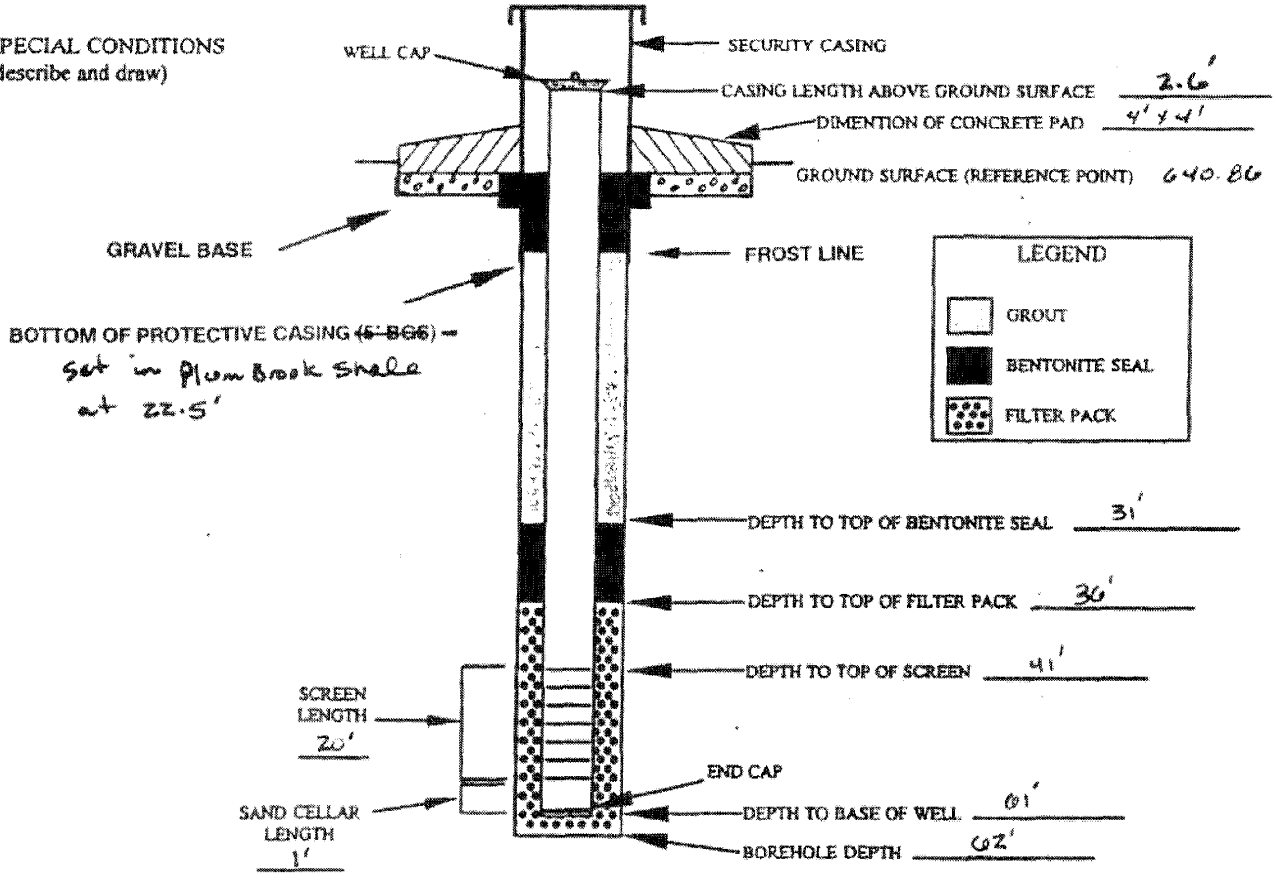
Figure 5-2

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Al Hardesty
DRILLING CONTRACTOR: Prosonic
DRILLING TECHNIQUE: Rotary - water
AUGER SIZE AND TYPE: 94 mm core - 5 7/8" ream
BOREHOLE IDENTIFICATION: ZBG-BGD-mw-003
BOREHOLE DIAMETER: 5 7/8"
WELL IDENTIFICATION: ZBG-BGD-mw-003
WELL CONSTRUCTION START DATE: 6/17/04
WELL CONSTRUCTION COMPLETE DATE: 6/23/04
SCREEN MATERIAL: PVC schedule 40
SCREEN DIAMETER: 2" ID
STRATUM-SCREENED INTERVAL (FT): 41'-61'
CASING MATERIAL: PVC schedule 40
CASING DIAMETER: 2" ID

TYPE OF FILTER PACK: sand
GRADIATION: 20/40
AMOUNT OF FILTER PACK USED: 400 lbs
TYPE OF BENTONITE: 3/8" well plug
AMOUNT BENTONITE USED: 75 lbs
TYPE OF CEMENT: portland
AMOUNT CEMENT USED: 50 gallons
GROUT MATERIALS USED: portland cement
DIMENSIONS OF SECURITY CASING: 6" steel
TYPE OF WELL CAP: J-plug
TYPE OF END CAP: 3" pointed
COMMENTS:

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Don Bond - Prosonic INSTALLATION OBSERVED BY: Jim Beaujon - USACE Nashville

DISCREPANCIES:

Figure 5-2

Appendix E
Well Development Records.

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID ZBG-BED MW-001
SHEET 1 of 1

PROJECT NAME: PBOW - ZBG PROJECT NO.: 358H9301 DATE: 6/22/04

LOCATION: ZBG - North DATE INSTALLED: 6/21/04

TOTAL DEPTH (FTOC): 51.35' CASING DIAMETER: 2" PVC

METHODS OF DEVELOPMENT

☑ Swabbing ☑ Bailing ☑ Pumping ☐ Describe

Equipment decontaminated prior to development: ☑ Yes ☐ NO

Describe: Decon'ed bladder pump and electric pump prior to use

EQUIPMENT NUMBERS:

pH Meter: N/A EC Meter: N/A Turbidity Meter: N/A Thermometer: N/A

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

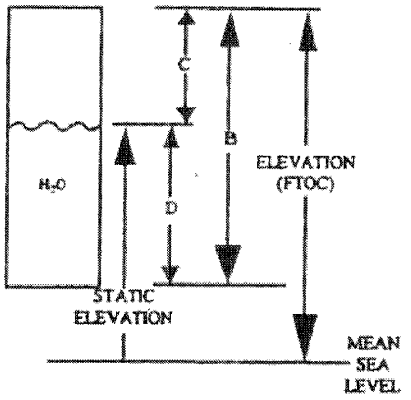
Measured Well Depth (B) 51.35 ft.

Measured Water Level Depth (C) _____ ft.

Length of Static Water Column (D) _____ - _____ = _____ ft.
(B) (C)

Casing Water Volume (E) = _____ x _____ = _____ gal
(A) (D)

Total Purge Volume = _____ (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turb. (NTU) Sand (ppm)	Comments
6/22	1730		20	N/A	N/A	N/A	N/A	initial removal of drilling fluids - no measurements
		lowered	WL to 48.02'					used down hole electric pump.
6/23	1140	46.81'	1					continued initial development removal of all drilling fluid
		lowered	WL to below top of pump					and further evaluation well yield - used bladder pump
		pump set at 50'						
7/21	1048	48.67'	0.75					further development using disposable bailer
		lowered	WL to 50.73'					no measurements recorded.
11/1	1053	48.45'	1.25					further development using disposable bailer
		lowered	WL to 50.81					no measurement recorded

Figure 5-4

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID ZBG-BEDMW-002
SHEET 1 of 1

PROJECT NAME: PBOW-ZBG PROJECT NO.: 35BH9301 DATE 6-21-04

LOCATION: ZBG - center DATE INSTALLED: 6/18/04

TOTAL DEPTH (FTOC) 74.95' CASING DIAMETER 2" PVC

METHODS OF DEVELOPMENT

☑ Swabbing ☑ Bailing ☑ Pumping ☐ Describe

Equipment decontaminated prior to development ☑ Yes ☐ NO

Describe Decontamd bladder pump and electric pump prior to use

EQUIPMENT NUMBERS:

pH Meter N/A EC Meter N/A Turbidity Meter N/A Thermometer N/A

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

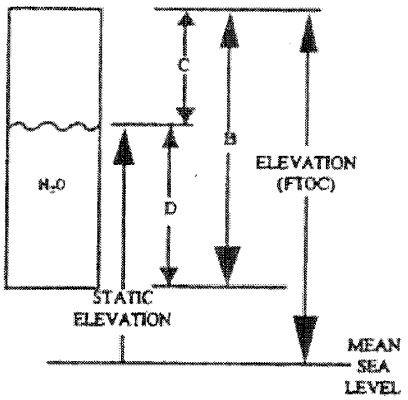
Measured Well Depth (B) 74.95' ft.

Measured Water Level Depth (C) _____ ft.

Length of Static Water Column (D) _____ - _____ = _____ ft.
(B) (C)

Casing Water Volume (E) = _____ x _____ = _____ gal
(A) (D)

Total Purge Volume = _____ (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turb. (NTU) Sand (ppm)	Comments
6/21	1700	N/A	20	N/A	N/A	N/A	N/A	initial removal of drilling water - no measurements
		lowered	WL to	62.45'				Used down hole electric pump
6/22	0807	59.9	4	N/A	N/A			continued initial removal of drilling water and further evaluation of well field. used bladder pump
		lowered	WL to	67.32				
6/23	0915	N/A	1					continued initial removal of drilling fluids and further evaluation of well field used bladder pump
		lowered	WL to	below to of pump				
		pump set at		73'				
7/21	0854	67.3	2.5					from development and sampling using disposable bailer. No measurements recorded
		lowered	WL to	74.05'				
11/1	0959	68.09	2.5	lowered	WL to	74.19'	using	disposable bailer. No measurements recorded

Figure 5-4

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID: 286-BEDMW-003
SHEET 1 of 1

PROJECT NAME: PBOW-286 PROJECT NO: 35BH9301 DATE: 6/24/04

LOCATION: 286-South DATE INSTALLED: 6/23/04

TOTAL DEPTH (FTOC): 65.10' CASING DIAMETER: 2" PVC

METHODS OF DEVELOPMENT

☑ Swabbing ☑ Bailing ☑ Pumping ☐ Describe

Equipment decontaminated prior to development ☑ Yes ☐ NO

Describe: Decon'ed bladder pump prior to use

EQUIPMENT NUMBERS:

pH Meter: N/A EC Meter: N/A Turbidity Meter: N/A Thermometer: N/A

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

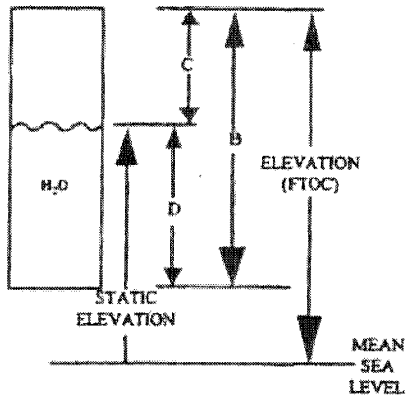
Measured Well Depth (B) 65.10' ft.

Measured Water Level Depth (C) _____ ft.

Length of Static Water Column (D) _____ (B) - _____ (C) = _____ ft.

Casing Water Volume (E) = _____ (A) x _____ (D) = _____ gal

Total Purge Volume = _____ (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turb. (NTU) Sand (ppm)	Comments
6/24	0930	N/A	19	N/A	N/A	N/A	N/A	Initial removal of drilling water - no measurements.
		lowered WL below top of pump						used bladder pump and surged well approx 3ft w/ bladder
		pump set at	64'					
7/21	1001	56.84'	3.25					continued removal of drilling water and evaluation of
		lowered WL to	64.79'					well yield. Used disposable bailer.
8/1	0843	57.45'	3.0					
		lowered WL to	64.49'	using disposable bailer. No measurements recorded.				

Figure 5-4

Appendix F
Land Survey Documentation

NASA CONTROL POINTS - JACOBS ENGINEERING

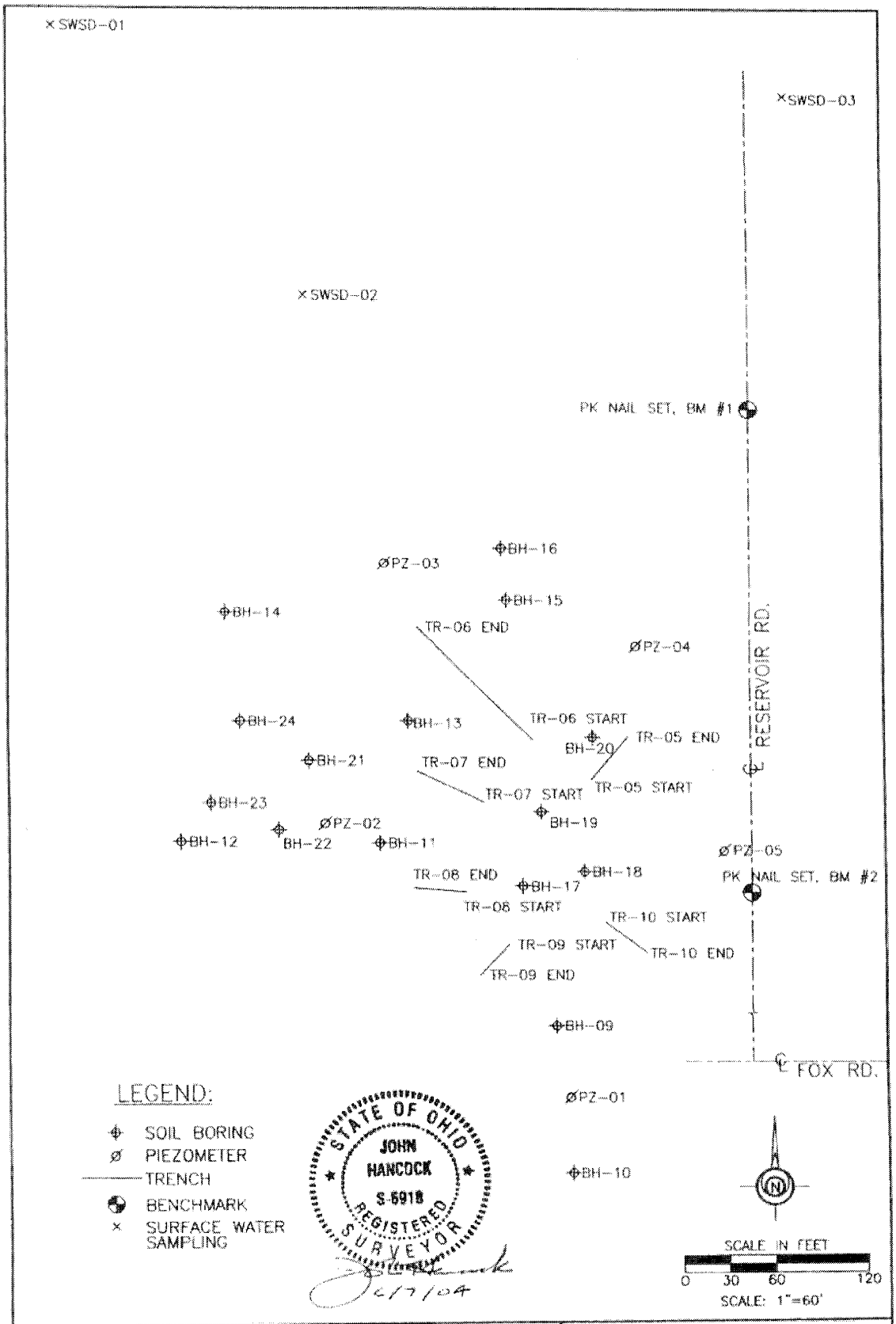
Ohio State Plane North Zone
Coordinate System

NORTHING (feet)	EASTING (feet)	ELEVATION (ft amsl)	DESCRIPTION
623767.2013	1914904.1247	636.19	RANSOM & MAINTENANCE MON 5/8" PIN
621619.5406	1914969.7567	-	RANSOM & FOX MON 1" PIN
622136.8341	1913266.6066	-	RESERVOIR RD. PK NAIL SET, 3RD N OF FOX
622390.6334	1913272.9933	639.75	RESERVOIR RD. PK NAIL SET, 2ND N OF FOX, BM #1
622568.4213	1913276.4187	640.94	RESERVOIR RD. PK NAIL SET, 1ST N OF FOX, BM #2
622267.4635	1913209.7151	640.33	PZ-04 (TOP OF PIPE ELEV. = 643.81)
622320.8665	1913140.4706	640.05	BH-16
622293.4870	1913142.4411	639.99	BH-15
622314.3168	1913078.6762	639.57	PZ-03 (TOP OF PIPE ELEV. = 642.15)
622219.2351	1913154.1789	640.42	TR-06 START
622280.2893	1913094.8881	640.12	TR-06 END
622290.3121	1912993.4699	638.93	BH-14
622232.6438	1913000.0322	639.30	BH-24
622190.4539	1912982.8360	639.15	BH-23
622170.6145	1912966.4068	639.06	BH-12
622175.6099	1913018.5377	639.80	BH-22
622211.5151	1913035.9524	639.80	BH-21
622178.4120	1913043.2230	640.17	PZ-02 (TOP OF PIPE ELEV. = 642.39)
622167.4717	1913071.9514	639.94	BH-11
622230.6980	1913088.9864	640.19	BH-13
622204.6262	1913092.9360	640.38	TR-07 END
622187.4807	1913127.5937	640.46	TR-07 START
622140.6740	1913116.9190	640.30	TR-08 START
622143.2821	1913089.2534	640.03	TR-08 END
622096.2874	1913122.7998	640.15	TR-09 END
622111.9949	1913138.2532	640.06	TR-09 START
621989.9925	1913167.3244	639.80	BH-10
622029.9985	1913167.4904	640.08	PZ-01 (TOP OF PIPE ELEV. = 642.70)
622068.5996	1913161.6648	640.14	BH-09
622143.1015	1913146.4772	640.24	BH-17
622105.8770	1913210.3759	640.63	TR-10 END
622122.8314	1913189.2625	640.20	TR-10 START
622149.8615	1913179.0526	640.15	BH-18
622181.8101	1913157.3061	640.34	BH-19
622198.1579	1913184.2556	640.35	TR-05 START
622219.8757	1913204.2263	640.39	TR-05 END
622219.8661	1913185.7441	640.38	BH-20
622159.1042	1913252.8021	640.60	PZ-05 (TOP OF PIPE ELEV. = 643.10)
622455.1701	1913039.8632	633.89	SWSD-02
622554.1068	1913295.7502	635.09	SWSD-03
622599.2530	1912910.1332	632.93	SWSD-01

Locations are state plane coordinates, NAD 1983 and based on a horizontal and vertical control survey furnished by PBOW.

Level circuit: Elevation at point #97 ("O" in Open - 1st hydrant Ransom North Fox) of 642.46 was

File: JHA6/dwg/145504/docs/control points



JOB NO.:	145504
DRN BY:	ABE
FILE NO.:	1455-control
DATE:	6/04/04
SCALE:	1"=60'
SHEET NO.:	1

NASA CONTROL SURVEY

JACOBS ENGINEERING
NASA PLUM BROOK STATION
PERKINS TOWNSHIP, ERIE COUNTY, OHIO

John Hancock & Associates
INCORPORATED
ENGINEERS - SURVEYORS
326 E. MARKET ST. SANDUSKY, OHIO 44870
(419) 625-7838

NASA MONITORING WELLS - JACOBS ENGINEERING

Ohio State Plane North Zone NORTHING (feet)	EASTING (feet)	ELEVATION TOC (ft amsl)	ELEVATION Ground (ft amsl)	DESCRIPTION
622390.6334	1913272.9933	N/A	639.75	RESERVOIR RD. PK NAIL SET, 2ND N OF FOX, BM #1
622568.4213	1913276.4187	N/A	640.94	RESERVOIR RD. PK NAIL SET, 1ST N OF FOX, BM #2
622295.9447	1913066.3070	642.62	639.69	2BG-BEDGW-001
622163.5934	1913149.9751	643.32	640.90	2BG-BEDGW-002
622002.7403	1913246.2375	643.44	640.86	2BG-BEDGW-003

Locations are state plane coordinates, NAD 1983 and based on a horizontal and vertical control survey furnished by PBOW.

Level circuit: Elevation at point #97 ("O" in Open - 1st hydrant Ransom North Fox) of 642.46 was checked with point #94 (RRS - 3rd pole Ransom North Fox) of 641.94, these two points were used to establish elevation at the site. Site benchmarks are pk nails on Reservoir Rd. listed above and shown on attached drawing as BM #1 & BM #2.

File: JHA6/dwg/145504/docs/wells

NASA CONTROL POINTS & SAMPLING LOCATIONS

JACOBS ENGINEERING

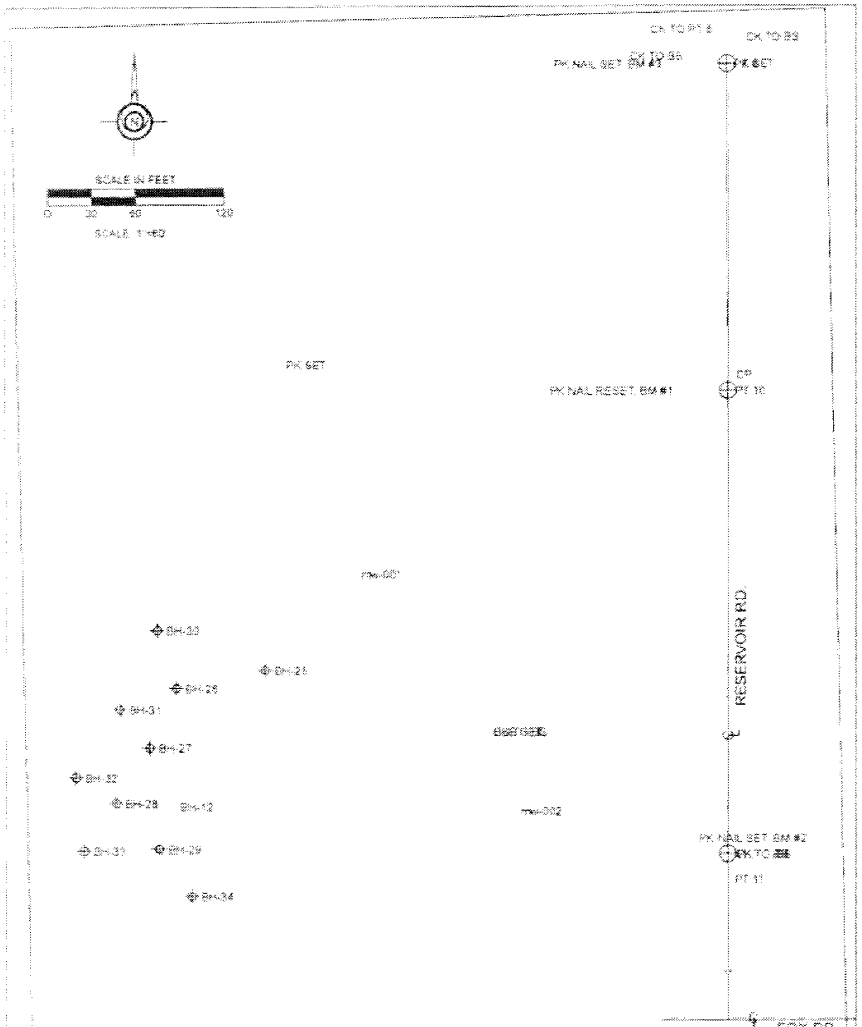
4/28/2005
145504
ABE

NORTHING	EASTING	ELEVATION	DESCRIPTION
31802.6853	18996.4357	636.19	RANSOM & MAINTENANCE MON 5/8" PIN
29657.0567	19113.6781	-	RANSOM & FOX MON 1" PIN
30565.0331	17397.8898	639.08	RESERVOIR RD. PK NAIL SET, 3RD N OF FOX, BM #3
30395.9578	17398.1121	639.72	RESERVOIR RD. PK NAIL SET, 2ND N OF FOX, BM #1 RESET
30133.3013	17398.4541	640.94	RESERVOIR RD. PK NAIL SET, 1ST N OF FOX, BM #2
30235.0650	17147.7302	639.23	BH-25
30257.4471	17089.3130	638.76	BH-30
30225.3655	17099.5991	638.44	BH-26
30213.5348	17068.9510	638.55	BH-31
30192.1070	17085.0889	638.54	BH-27
30175.7472	17044.8308	638.58	BH-32
30161.7452	17066.8103	638.63	BH-28
30134.8808	17049.4042	639.88	BH-33
30135.9680	17090.3821	639.04	BH-29
30110.2058	17108.0148	639.52	BH-34

Level circuit: Elevation at point #97 ("O" in Open - 1st hydrant Ransom North Fox) of 642.46 was checked with point #94 (RRS - 3rd pole Ransom North Fox) of 641.94, these two points were used to establish elevation at the site. Site benchmarks are pk nails on Reservoir Rd. listed above and shown on attached drawing as BM #1, BM #2, and BM #3

Locations are state plane coordinates, NAD 1983 and based on a horizontal and vertical control survey furnished by Jacobs Engineering.

File: server/dwg/145504/docs/bore holes



JOB NO.	145504
DRN BY	ASE
F.B. NO.	1455-BH
DATE	4/29/05
SCALE	1"=60'
SHEET NO.	1

RESERVOIR #2 BURNING GROUNDS

JACOBS ENGINEERING

NASA PLUM BROOK STATION

PERKINS TOWNSHIP, ERIE COUNTY, OHIO

John Hancock & Associates
INCORPORATED
ENGINEERS - SURVEYORS
309 E. MARKET ST. SANDUSKY, OHIO 44870
(419) 625-1334

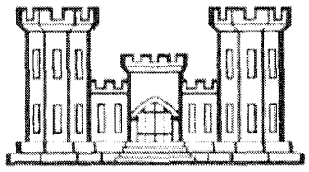
Appendix G
Chemical Data Quality Report
(evaluation of the primary analytical laboratory data).

CHEMICAL DATA QUALITY REPORT

SOIL AND SEDIMENT DATA FOR THE REMEDIAL INVESTIGATION, PART 1, RESERVOIR NUMBER 2 BURNING GROUND (2BG)

FORMER PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO

Prepared for:



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0002

Prepared by:

JACOBS ENGINEERING GROUP, INC.
125 BROADWAY
OAK RIDGE, TN 37830

September 2004

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ATTACHMENT 1 SAMPLE INFORMATION TABLES

ATTACHMENT 2 TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Abbreviations and Acronyms

C	Celsius
CDQR	Chemical Data Quality Report
CLP	USEPA Contract Laboratory Program
COC	Chain of Custody
CQAR	Chemical Quality Assurance Report
CRQL	Contract Required Quantitation Limit
%D	Percent Difference
DQA	Data Quality Assessment
DQO	Data Quality Objectives
GC	Gas Chromatograph or Gas Chromatography
HTRW-CX	Hazardous, Toxic, and Radioactive Waste - Center of Expertise
HTW	Hazardous and Toxic Waste
IS	Internal Standard
Jacobs	Jacobs Engineering Group Inc
LCG	Louisville Chemistry Guidance
LCS	Laboratory Control Sample
LDP	Laboratory Data Package
LRL	USACE - Louisville District
MD	Matrix Duplicate
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not Detected
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl Compounds
PNA	Polynuclear Aromatic Hydrocarbon Compounds
PQL	Practical Quantitation Limit
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QC/MRL	Method Reporting Limit QC sample
QAPP	Quality Assurance Project Plan
%R	Percent Recovery
RL	Reporting Level
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SD	Serial Dilution QC sample
SDG	Sample Delivery Group
SM	Standard Methods
SPLP	Synthetic Precipitation Leaching Procedure
SUR	Surrogate Spike
SVOC	Semi-volatile Organic Compound
SW-846	Solid Waste Analytical Protocols
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TB	Trip Blank
TCL	Target Compound List
TOC	Total Organic Carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This Chemical Data Quality Report (CDQR) presents an evaluation of the quality and usability of the analytical data generated in support of the soil and sediment remedial investigation at Reservoir Number 2 Burning Ground (2BG) at the former Plum Brook Ordnance Works (PBOW). Jacobs Engineering (Jacobs) performed this remedial investigation for the United States Army Corps of Engineers (USACE) Nashville District under contract number DACW62-03-D-0004, task order 0002.

Both primary and quality assurance (QA) environmental samples were collected by Jacobs and were submitted to approved laboratories for chemical analyses. Jacobs provided data quality evaluation services for the primary data, and Stratum Engineering, Inc. was subcontracted to evaluate the QA data and prepare the subsequent Chemical Quality Assurance report (CQAR). This CDQR covers Jacobs' evaluation of the primary data.

This evaluation meets and completes the requirement of Step 2 "data verification" of the project data quality assessment (DQA) process. Completion of this step completes Jacob's portion of the requirement in the DQA process. A description of the DQA process is included in Section 8.2.2 of the approved Quality Assurance Project Plan (QAPP). As specified in the QAPP, the findings of this evaluation were discussed in terms of data precision, accuracy, representativeness, sensitivity and completeness.

1.1 REPORT ORGANIZATION

The CDQR has been organized into four sections and two attachments:

- Section 1 - Report organization and data quality program including: analytical laboratory used, analytical samples included in the evaluation, analytical protocols/methods employed, data evaluation procedures followed, and summary of data reporting formats.
- Section 2 - Definitions of qualifiers that may be assigned to data based on this evaluation.
- Section 3 - Statement of the project overall data quality and summary of qualifiers applied to the data as a result of this evaluation.
- Section 4 - Data quality narratives.
- Attachment 1 - Sample information tables including field and laboratory ID cross-reference.
- Attachment 2 - Test result tables with review qualifiers applied.

1.2 DATA QUALITY ASSURANCE PROGRAM

In order to verify compliance with project objects, it was required that certain measurements of chemical constituents in environmental samples be made that met definitive data quality standards. This CDQR is applicable to those data.

Definitive data standards are specified by the USEPA in *"Data Quality Objectives Process for Superfund,"* EPA540-R-93-071, USEPA Office of Emergency and Remedial Response, September 1993. Definitive data are defined as follows:

> "Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may

be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined."

Specific project data quality objectives (DQOs) and procedures to achieve the DQOs are documented in the approved project Sampling and Analysis Plan Addendum (SAP). Key elements of the quality program relating to this evaluation include:

- Use of approved, USACE-validated laboratories.
- Use of a sampling program designed to meet the project objectives.
- Use of appropriate analytical methods and measurement parameters.
- Evaluation of reported QA/QC to verify compliance with DQOs.
- Use of appropriate analytical data reporting formats.

These elements are discussed in the following paragraphs.

1.2.1 Project Analytical Laboratories

The analytical laboratories employed on this project were evaluated by the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise (HTRW-CX) and hold a current letters of validation from HTRW-CX to perform sample analyses in support of the USACE HTRW Program. This validation confirms their ability to produce reliable and defensible data. The primary analytical laboratories used were:

General Engineering Laboratories (GEL)(Primary VOCs, explosives, and metals analyses)
Contact: Jake Crook, Project Manager (PM)
2040 Savage Road
Charleston, SC 29414
Phone: 843-556-8171 Fax: 843- 766-1178

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1.2.2 Sampling Program Design/Project Samples

The sampling program was designed to collect samples representative of site conditions at the time of sampling and to generate data of sufficient quality and quantity to make the intended decisions. Project analytical samples were collected using standardized, USACE approved procedures documented in the sampling and analysis plan (SAP). The SAP was approved by the USACE prior to collection of the associated project samples and included the basis for selecting the sampling locations, sample collection procedures, frequency and type of samples collected, and the analytical parameters for each sample. There were no known deviations to the sample collection procedures presented in the SAP.

Definitive data measurements were required for the samples collected in support of this investigation. The investigation utilized the EPA Target Analyte List/Target Compound List (TAL/TCL) of analytes as the constituents of concern. The rationale for required analytical measurements and resulting data use is specified in the project QAPP.

Project samples included in this evaluation consist of primary surface and subsurface soils, sediments, and associated field QC samples collected in May of 2004. The laboratories reported the soil, sediment, and field QC analyses in several sample delivery groups (SDGs). The SDGs included in this evaluation are:

1. GEL SDG # 113353
2. GEL SDG # 113472
3. GEL SDG # 113513
4. GEL SDG # 113514
5. GEL SDG # 113517
6. GEL SDG # 113518
7. GEL SDG # 113552
8. GEL SDG # 113558
9. GEL SDG # 113562
10. GEL SDG # 113575
11. GEL SDG # 113697
12. GEL SDG # 113700
13. GEL SDG # 113753
14. GEL SDG # 113757
15. E&E SDG # 0405288
16. E&E SDG # 0405289
17. E&E SDG # 0405290
18. E&E SDG # 0405318
19. E&E SDG # 0405342
20. Paradigm SDG # G341-177
21. Paradigm SDG # G341-179

A listing of specific project samples contained in each SDG, along with a cross reference of sample field ID numbers to laboratory ID numbers, is included in the Sample Information Table at the beginning of each SDG. The respective Sample Information tables have been compiled into a single table listing the samples evaluated from each SDG, and are included with this report as Attachment 1.

1.2.3 Project Analytical Methods and Measurement Parameters

In order to obtain definitive data and promote data comparability, the laboratory was required to perform testing within the guidelines of standardized, USEPA and USACE approved methods and procedures included in the following protocols:

- *"Test Methods for Evaluating Solid Waste,"* SW-846, 3rd Edition, Update III, U.S. EPA, November 1986, (SW-846).
- "*Shell for Analytical Chemistry Requirements*," Appendix I, from EM 200-1-3 "*Requirements for the Preparation of Sampling and Analysis Plans*" USACE HTRW-CX, February 2001.

The project included collection of definitive data for all soil and sediment samples for all measurement parameters. Specific analytical methods used in the analysis of each project sample were included in the laboratory case narratives included in each SDG and are summarized below for each primary sample type.

Surface and Subsurface Soil Samples

- TCL Volatile organic compounds (VOCs) by 5035/8260B
- Polynuclear aromatic hydrocarbons (PAHs) by 3540C/8310
- Polychlorinated biphenyls (PCBs) by 3540C/8082 (not collected at down gradient locations)
- Nitroaromatics by SW-846 8330
- TAL Metals by 3050B/6010B/7471A
- Dioxin/Furans by 8290 (only collected at interior burn pit and trenching locations)

Sediment Samples

- TCL Volatile organic compounds (VOCs) by 5035/8260B
- Polynuclear aromatic hydrocarbons (PAHs) by 3540C/8310
- Polychlorinated biphenyls (PCBs) by 3540C/8082
- Nitroaromatics by SW-846 8330
- TAL Metals by 3050B/6010B/7471A
- Dioxin/Furans by 8290

1.2.3.1 Deviations from Planned Analytical Procedures

The QAPP assumed that the PAH confirmation analyses would be accomplished by 8310 HPLC utilizing a dissimilar column. However, the primary lab performing the PAH analyses, E&E, was directed by USACE HTRW-CX in a recent audit to discontinue using the 8310 HPLC confirmation column, and report PAH data as not confirmed and flagged with an "N" qualifier. USACE HTRW-CX was not satisfied that the primary and confirmation columns for 8310 HPLC were dissimilar enough to constitute an actual confirmation. Unfortunately, another PAH HPLC confirmation column is not currently available. Several laboratories not involved with this project were contacted, and confirmed that they were experiencing the same problem. Jacobs also learned that the EPA is working with several chromatography vendors to develop a new confirmation column for the PAH analyses.

This leaves GC/MS SIM as the only acceptable confirmation for the 8310 PAH HPLC analyses. The SIM analysis is a GC/MS analysis and is considerably more costly then the HPLC analysis, and

since it was not specifically requested it was not performed. This information was not communicated to Jacobs by the laboratories until the data evaluator questioned why there were not PAH confirmation analyses present in the data packages. By the time the data were evaluated, the holding times for the sample analyses had expired. Thus, eliminating the possibility of requesting the confirmation analyses be performed by GC/MS.

To complicate matters even more, there were significant matrix problems with the GC/HPLC analyses of many of the project samples. The matrix affects and/or interferences are likely due to the fact the samples were collected from a burn layer of the soil. Significant dilutions were required for the PCB, nitroaromatic, and PAH analyses to quantitate target analytes and handle the matrix artifacts from the burn layer.

The resulting PAH data from the primary laboratory, E&E, was evaluated as reported, and qualified as estimated and not confirmed "JN". The PAH data should be treated as screening data since it is not confirmed, and there were a large number of matrix artifacts in the samples. The resulting PAH data is likely biased high with false positive detects. The PAH results should be evaluated as estimated quantities that are likely biased high. The PAH results should not be used to drive a remedial action since they are potentially false positives and high biased. It is recommended that if locations have only PAH exceedances to risk criteria that might drive future decisions, that PAH samples be resampled and re-analyzed using the GC/MS SIM method to confirm the PAH results.

1.2.4 Data Evaluation Procedure

The quality of this data has been evaluated following the "data verification" procedure included in the QAPP as Step 2 of the five-step USACE DQA process. The procedure was derived from the USACE "*Shell for Analytical Chemistry Requirements*" and considers the project DQOs, QC requirements of the analytical methods, and informed professional judgment of the evaluator. Qualified Jacobs personnel, experienced in the evaluation of analytical data quality, performed data evaluation.

A brief description of the procedure followed in this evaluation is presented below.

Data Verification Procedure

At a minimum, the following data quality issues were addressed in this evaluation with respect to 100% of the sample data.

- Review of chain-of-custody and sample receipt forms to evaluate sample receipt data, damaged sample containers, etc.
- Review of laboratory testing methods, detection limits, holding times, data qualifiers, etc.
- Review of field QC blank data to detect contamination from outside sources.
- Review of field QC duplicates to evaluate data reproducibility.
- Review of laboratory QC including laboratory blanks, spike recoveries, and duplicates.
- Verification of calibrations as summarized by the laboratory on the CLP-like reporting forms and within their case narratives.
- Qualification of unusable data as rejected and attachment of appropriate qualifiers to usable data.
- Presentation of data evaluation findings in terms of the data quality parameters precision, accuracy, representativeness, sensitivity and completeness.

Data quality parameters were evaluated as follows:

- Precision - by evaluation of Matrix Spike/Matrix Spike Duplicate (MS/MSD), laboratory duplicate, and field duplicate relative percent differences (RPD).
- Accuracy - by evaluation of surrogate (SUR), Laboratory Control Sample (LCS), and MS/MSD percent recoveries (%R).
- Representativeness - by evaluation of sample receipt records, technical holding times, and blank sample results (field and laboratory).
- Sensitivity - by evaluation of laboratory detection limits, reporting units, and the overall performance of the chosen methods.
- Completeness - by comparing the number of valid measurements obtained to the number of measurements planned for these samples.

1.2.5 Data Reporting Formats

1.2.5.1 Laboratory Data Packages and Analytical Results

The laboratory reported field sample and supporting QC data in a format consistent with the USEPA Contract Laboratory Program (CLP) data reporting requirements. This "CLP-like" format included most applicable report summary forms and was sufficient to complete Step 2 of the DQA process. In a few cases the raw quantitation reports had to be reviewed to evaluate dilutions, manual integrations, and to check for proper quantitation.

The supplied reports did include chromatograms and other raw data that are necessary to complete a third party validation of the DQA process for all parameters of interest. However, third party validation is not currently planned for 2BG. Jacobs has supplied copies of the complete QA data packages and the associated primary sample data to Stratum Engineering to complete their assessment of the QA data and CQAR report.

The complete analytical data packages received from the project laboratories and evaluated in this review are available from Jacobs upon request from the **CELRN (acronym).**

1.2.5.2 Data Quality Non-Conformances

Data quality non-conformances identified as a result of this review are presented in Section 4.0, Data Quality Narratives. The data quality narratives are detailed explanations of the findings of this evaluation in terms of precision, accuracy, representativeness, sensitivity and completeness. They are intended to present a compilation of laboratory QC results found outside project acceptance criteria and provide an assessment of the potential impact those results had on the analytical data. Typically, the bulk of the project analytical protocol requirements are fulfilled and, therefore, are not summarized in the narratives.

Tabular presentations of the analytical sample results were included in each SDG. The respective laboratory test results tables were compiled into Data Summary Tables from the Electronic Data Deliverable (EDD) and were included with this report as Attachment 2. In addition, the validation qualifiers were applied to sample data to indicate data use limitations based on the findings of this evaluation.

2.0 DATA QUALIFIER DEFINITIONS

The following definitions provide explanations of the data qualifiers that may be assigned to results based on this evaluation. The data qualifier definitions are consistent with those used within the USEPA NFG referenced in Section 1.2.3 of this report.

U- The analyte was analyzed for but not detected (ND). The value preceding the U is the Contract Required Quantitation Limit (CRQL).

J- The identification of the analyte is acceptable, but the quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision (i.e. the quantitative value is considered estimated).

UJ- This flag is a combination of the U and J qualifiers. This indicates that the analyte is not present and the reported value is considered to be an estimated CRQL.

R- Data are considered to be rejected and shall not be used. This flag denotes the failure of quality control criteria such that it cannot be determined if the analyte is present or absent from the sample.

B- The B flag is to be used for both organic and inorganic analyses when the analyte is found in the associated blank as well as the in the sample. The result is considered ND, and the reported value is considered to be an estimated CRQL.

N- There is presumptive evidence that the analyte is present, but it has not been confirmed. The analyte is tentatively identified. There is an indication that the reported analyte is present, however, all quality control requirements necessary for confirmation were not met.

3.0 DATA EVALUATION SUMMARY

3.1 OVERALL ASSESSMENT OF PROJECT DATA QUALITY

In general, QA/QC results associated with this data indicated that the data met "definitive data" standards and were of known quality with the exception of the PAH limitations discussed in Section 1.2.3.1. QC data demonstrated that the QA mechanisms were effective in ensuring measurement data reliability within expected limits of sampling and analytical error and were considered, as qualified, representative of actual site conditions at the time sampled.

Data reported are acceptable for the uses as intended with the required qualifications and limitations. The data users are urged to review the Data Quality Narratives and associated data qualifications before utilizing this data for decision-making.

Summary Of Required Data Qualifications

This section provides a summary of qualifiers applied to the data as a result of this evaluation. Attachment 2 includes tabular presentations of the analytical sample results with data qualifiers applied based on the findings of this evaluation. The data qualifier definitions applied during this review are presented in Section 2.0. Section 4.0, Data Quality Narratives, contains discussion of the evaluation findings along with an assessment of the impact on project data. Data qualified as estimated due to detection at a level below the laboratory quantitation limit but above the method detection limit were not included in this summary since they were not qualified due to QC non-conformance.

SDG GEL 113353

1. For the VOC (method 8260) analysis of sample PBOW-04-SO-2BG-TR05-1-A, two target analytes were qualified as estimated detects ("J") and one target analyte was qualified as an estimated non-detect ("UJ") due to marginal CCV and ICV outliers.
2. For the VOC (method 8260) analysis of sample PBOW-04-SO-2BG-TR05-1-D, two target analytes were qualified as an estimated detect ("J") and eleven target analytes were qualified as estimated non-detects ("UJ") due to marginal CCV and ICV outliers, a marginally low internal standard recovery, and a field duplicate precision outlier.
3. For the VOC (method 8260) analysis of sample PBOW-04-SO-2BG-TR06-1-A, one target analyte was qualified as an estimated detect ("J") and seventeen target analytes were qualified as estimated non-detects ("UJ") due to marginal CCV and ICV outliers and marginally low internal standard recoveries.
4. For the VOC (method 8260) analysis of sample PBOW-04-SO-2BG-TR07-1-A, one target analyte was qualified as an estimated detect ("J") and one target analyte was qualified as an estimated non-detect ("UJ") due to marginal CCV and ICV outliers.
5. For the VOC (method 8260) analyses of samples PBOW-04-SO-2BG-TR08-1-A and PBOW-04-SO-2BG-TR09-1-A, two target analytes were qualified as estimated non-detect ("UJ") due to marginal CCV and ICV outliers.
6. For the nitroaromatic (method 8330) analysis of samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D, five target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
7. For the nitroaromatic (method 8330) analysis of samples PBOW-04-SO-2BG-TR06-1-A and PBOW-04-SO-2BG-TR07-1-A, four target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
8. For the nitroaromatic (method 8330) analysis of samples PBOW-04-SO-2BG-TR08-1-A and

PBOW-04-SO-2BG-TR09-1-A, one target analyte was qualified as an estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.

9. For the metals (method 6010B/7471A) analysis of all six samples in this SDG, fourteen target analytes were qualified as estimated detects ("J") due to exceedances to the MS recovery, duplicate precision, and serial dilution precision.

SDG GEL 113472

1. Two VOC (method 8260) target analytes were qualified as estimated non-detects in all four samples in this SDG due to an ICV and a CCV exceedance.
2. For the VOC (method 8260) analysis of sample PBOW-04-SO-2BG-BH17A (0-1), seven target analytes were qualified as rejected due to a low biased internal standard recovery. The remaining compounds in the sample were qualified as estimated ("J" for detects and "UJ" for non-detects) due to marginally low MS/MSD recoveries and an ICV and a CCV exceedance.
3. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH10A (0-1), two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
4. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH09A (0-1), one target analyte was qualified as an estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
5. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH17A (0-1), four target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results and high biased recoveries in the MS/MSD.
6. For the metals (method 6010B/7471A) analysis of all four samples in this SDG, eight target analytes were qualified as estimated detects ("J") due to high biased exceedances to the LCS and MS recovery criteria, and exceedances to duplicate precision, and serial dilution precision criteria.
7. For the metals (method 6010B/7471A) analysis of all four samples in this SDG, one target analytes was qualified as estimated non-detect ("UJ") due to low biased exceedances to the LCS and MS recovery criteria.

SDG GEL 113513

1. Two VOC (method 8260B) target analytes were qualified as rejected "R" in seven of the nine samples in this SDG due to a low biased CCV associated with the samples [all samples except PBOW-04-SO-2BG-BH15A (0-1) and PBOW-04-SO-2BG-BH15D (0-1)].
2. Eleven VOC (method 8260B) target analytes were qualified as estimated non-detect ("UJ") in samples PBOW-04-SO-2BG-BH18A (0-1) and PBOW-04-SO-2BG-BH20A (0-1) due to a marginally low biased internal standard recovery in each sample.
3. Two VOC (method 8260B) target analytes were qualified as estimated non-detect ("UJ") in samples PBOW-04-SO-2BG-BH19A (0-1) and PBOW-04-SO-2BG-BH21A (0-1) due to CCV outliers.
4. Three VOC (method 8260B) target analytes were qualified as estimated non-detect ("UJ") in sample PBOW-04-SO-2BG-BH13A (0-1) due to a marginally low biased CCV and a marginally low biased MS/MSD recovery.
5. One VOC (method 8260B) target analyte was qualified as estimated non-detect ("UJ") in samples PBOW-04-SO-2BG-BH14A (0-1) and PBOW-04-SO-2BG-BH21D (0-1) due to CCV outliers.
6. Eleven VOC (method 8260B) target analytes were qualified as estimated non-detect ("UJ")

in sample PBOW-04-SO-2BG-BH15A (0-1) due to CCV outliers.

7. Thirteen VOC (method 8260B) target analytes were qualified as estimated non-detect ("UJ") in sample PBOW-04-SO-2BG-BH15D (0-1) due to CCV outliers.
8. For the nitroaromatic (method 8330) analysis of samples PBOW-04-SO-2BG-BH18A (0-1), PBOW-04-SO-2BG-BH19A (0-1), PBOW-04-SO-2BG-BH20A (0-1), PBOW-04-SO-2BG-BH13A (0-1), PBOW-04-SO-2BG-BH15A (0-1), and PBOW-04-SO-2BG-BH15D (0-1), two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
9. Antimony from the total metals analysis (method 6010B) was qualified as estimated ("J" for detects and "UJ" for non-detects) in all samples in this SDG due to marginally low biased LCS/MS/MSD recoveries.
10. Mercury results for all samples in this SDG were qualified as estimated ("J") for detects due to a serial dilution outlier.
11. Thirteen additional metals analytes were qualified as estimated ("J") for detects in all samples in this SDG due to MS/MSD recovery outliers and duplicate precision outliers.

SDG GEL 113517

1. Thirteen VOC (method 8260) target analytes were qualified as estimated "UJ" for non-detects in samples PBOW-04-SO-2BG-BH22A (0-1) and PBOW-04-SO-2BG-BH23A (0-1) due an LCS outlier and multiple CCV outliers.
2. Twelve VOC (method 8260) target analytes were qualified as estimated "UJ" for non-detects in sample PBOW-04-SO-2BG-BH16A (0-1) due an LCS outlier and multiple CCV outliers.
3. Twenty VOC (method 8260) target analytes were qualified as estimated ("J" for detects and "UJ" for non-detects) in samples PBOW-04-SO-2BG-BH12A (0-1) and PBOW-04-SO-2BG-BH24A (0-1) due an LCS outlier and a marginal internal standard outlier.
4. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH23A (0-1), one target analyte was qualified as an estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
5. For the nitroaromatic (method 8330) analysis of samples PBOW-04-SO-2BG-BH24A (0-1) and PBOW-04-SO-2BG-BH12A (0-1), two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
6. Antimony from the total metals analysis (method 6010B) was qualified as estimated ("J" for detects and "UJ" for non-detects) in all samples in this SDG due to marginally low biased LCS/MS/MSD recoveries.
7. Mercury results for all samples in this SDG were qualified as estimated ("J") for detects due to a serial dilution outlier.
8. Arsenic, magnesium, and selenium failed the precision criteria in the duplicate analysis, and the detects in all five samples for these analytes were qualified as estimated ("J").
9. Lead, manganese, and potassium failed the MS/MSD recovery criteria and were qualified as estimated for detects in all five samples in the SDG.

SDG GEL 113558

1. One VOC (method 8260) target analyte (dichlorodifluoromethane) was qualified as rejected "R" for non-detects and twelve VOC target analytes were qualified as estimated non-detect ("UJ") in samples PBOW-04-SO-2BG-BH12A (3-5), PBOW-04-SO-2BG-BH13A (3-5), PBOW-04-SO-2BG-BH13D (3-5), PBOW-04-SO-2BG-BH14A (3-5), PBOW-04-SO-2BG-BH11A (3-5),and PBOW-04-SO-2BG-BH13A (8-10) due to CCV outliers.
2. One VOC (method 8260) target analyte (dichlorodifluoromethane) was qualified as rejected

"R" for non-detects and five VOC target analytes were qualified as estimated ("J" for detects and "UJ" for non-detects in samples PBOW-04-SO-2BG-BH12A (8-10), PBOW-04-SO-2BG-BH11A (8-10), and PBOW-04-SO-2BG-BH12A (8-10) due to CCV outliers.

3. Two VOC (method 8260) target analytes were qualified as rejected "R" for non-detects and one VOC target analyte was qualified as estimated ("UJ") for the non-detect result in sample PBOW-04-SD-2BG-SD01-A due to CCV outliers.
4. Eleven VOC (method 8260) target analytes were qualified as rejected "R" for non-detects and two VOC target analytes were qualified as estimated ("UJ") for non-detect results in samples PBOW-04-SD-2BG-SD02-A, PBOW-04-SD-2BG-SD02-D, and PBOW-04-SD-2BG-SD03-A due to internal standard failures and CCV outliers.
5. Antimony from the total metals analysis (method 6010B) was qualified as estimated ("J" for detects and "UJ" for non-detects) in all samples in this SDG due to marginally low biased LCS recoveries.

SDG GEL 113697

1. One VOC (method 8260) target analyte (dichlorodifluoromethane) was qualified as rejected "R" and five VOC target analytes were qualified as estimated ("J" for detects and "UJ" for non-detects) in all eight samples in this SDG due to CCV outliers.
2. All VOC compounds (except the analyte rejected due to the CCV outlier) were qualified as estimated ("J" for detects and "UJ" for non-detects) in samples PBOW-04-SO-2BG-BH15A (3-5) and PBOW-04-SO-2BG-BH15D (3-5) due to marginally low MS/MSD failures.
3. Ten VOC (method 8260) target analytes were qualified as rejected "R" in samples PBOW-04-SO-2BG-BH20A (8-10) and PBOW-04-SO-2BG-BH16A (8-10) due to internal standard failures.
4. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH16A (3-5), one target analyte was qualified as an estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
5. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH15A (3-5), two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
6. Sixteen metals analytes were qualified as estimated detects in all eight samples in this SDG due to LCS/MS/MSD recovery outliers and serial dilution and duplicate RPD outliers.

SDG GEL 113753

1. One VOC (method 8260) target analyte (dichlorodifluoromethane) was qualified as estimated ("J" for detects and "UJ" for non-detects) in all ten samples in this SDG due to marginal ICV and CCV outliers for the analyte.
2. Four VOC compounds were qualified as estimated ("J" for detects and "UJ" for non-detects) in samples PBOW-04-SO-2BG-BH10A (3-5), PBOW-04-SO-2BG-BH17A (3-5), PBOW-04-SO-2BG-BH17A (8-10), PBOW-04-SO-2BG-BH18A (3-5), PBOW-04-SO-2BG-BH18A (8-10), PBOW-04-SO-2BG-BH19A (3-5), and PBOW-04-SO-2BG-BH19A (8-10) due to CCV outliers.
3. For the nitroaromatic (method 8330) analysis of sample PBOW-04-SO-2BG-BH18A (3-5), four target analytes were qualified as an estimated detects ("J") due to a high biased surrogate recovery and exceedances to the precision criteria between the original and confirmation results.
4. Antimony from the total metals analysis (method 6010B) was qualified as estimated ("J" for detects and "UJ" for non-detects) in all samples in this SDG due to marginally low biased LCS/MS/MSD recoveries.
5. Iron, manganese, and nickel failed the serial dilution criteria, and the detects in all five

samples for these analytes were qualified as estimated ("J").

6. Eight metals analytes failed the MS/MSD criteria and associated results were qualified as estimated ("J) for detects in all five samples in this SDG.
7. Eight metals analytes failed the duplicate RPD criteria and associated results were qualified as estimated ("J) for detects in all five samples in this SDG.

SDG E&E 0405288

1. All PAH analytes detected in all six samples were qualified as estimated unconfirmed ("JN"). The PAH detects were not confirmed and should be considered tentatively identified with estimated values. With the difficult sample matrix and unconfirmed PAH analyses, there is a potential for false positives and high biased results in the PAH data.
2. One PAH analyte, benzo(a)pyrene, was qualified as estimated ("J" for detects and "UJ" for non-detects) in all six samples in this SDG due to CCV outliers.
3. Two PAH analytes, acenaphthylene and anthracene, were qualified as estimated ("J" for detects and "UJ" for non-detects) in all six samples in this SDG due to marginal LCS outliers.
4. Naphthalene was qualified as estimated ("J" for detects and "UJ" for non-detects) in the parent and field duplicate samples (PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D). A large naphthalene detect was reported in the parent sample and the field duplicate was non-detect for the compound.

SDG E&E 0405289

1. All PAH analytes detected in all four samples were qualified as estimated unconfirmed ("JN"). The PAH detects were not confirmed and should be considered tentatively identified with estimated values. With the difficult sample matrix and unconfirmed PAH analyses, there is a potential for false positives and high biased results in the PAH data.
2. One PAH analyte, benzo(a)pyrene, was qualified as estimated ("J" for detects and "UJ" for non-detects) in all four samples in this SDG due to CCV outliers.
3. Two PAH analytes, acenaphthylene and anthracene, were qualified as estimated ("J" for detects and "UJ" for non-detects) in all four samples in this SDG due to marginal LCS outliers.

SDG E&E 0405290

1. All PAH analytes detected in all fourteen samples were qualified as estimated unconfirmed ("JN"). The PAH detects were not confirmed and should be considered tentatively identified with estimated values. With the difficult sample matrix and unconfirmed PAH analyses, there is a potential for false positives and high biased results in the PAH data.
2. All PAH analytes detected in six of the fourteen samples were qualified as estimated ("J") due to high biased surrogate recoveries (already "JN").
3. All PAH analytes in sample PBOW-04-SO-2BG-BH16-A (0-1) were qualified as estimated ("J" for detects and "UJ" for non-detects) due to a low biased surrogate recoveries (detects already "JN")
4. Two PAH analytes, anthracene and benzo(a)pyrene, were qualified as estimated ("J" for detects and "UJ" for non-detects) in samples PBOW-04-SO-2BG-BH19-A (0-1) and PBOW-04-SO-2BG-BH15-A (0-1) due to CCV outliers.
5. The PCB detect for aroclor 1260 in sample PBOW-04-SO-2BG-BH24A (0-1) was qualified as estimated "J" due to a high biased LCS.

SDG E&E 0405318

1. All PAH analytes detected in all twenty samples were qualified as estimated unconfirmed ("JN"). The PAH detects were not confirmed and should be considered tentatively identified with estimated values. With the difficult sample matrix and unconfirmed PAH analyses, there is a potential for false positives and high biased results in the PAH data.
2. All PAH analytes detected in seven of the twenty samples were qualified as estimated ("J") due to high biased surrogate recoveries (already "JN").
3. All PAH analytes in sample PBOW-04-SO-2BG-BH16A (3-5) were qualified as estimated ("J" for detects and "UJ" for non-detects) due to a low biased surrogate recovery (detects already "JN").
4. Fifteen of the twenty samples were qualified as estimated ("J" for detects and "UJ" for non-detects) for acenaphthylene and anthracene due to marginally low biased LCS recoveries (detects already "JN").
5. Two of the twenty samples were qualified as estimated ("J" for detects and "UJ" for non-detects) for acenaphthylene, anthracene, and benzo(a)pyrene due to marginally low biased LCS recoveries (detects already "JN").
6. CCV outliers for anthracene, benzo(a)anthracene, and benzo(a)pyrene affected all samples in the SDG causing estimated detects ("J") and estimated non-detects ("UJ") if the bias was negative.
7. The positive detects for phenanthrene in PBOW-04-SD-2BG-SD02-A and PBOW-04-SD-2BG-SD02-D were qualified as estimated ("J") due to a precision exceedance in the field duplicate and parent sample.

SDG E&E 0405342

1. All PAH analytes detected in all nine samples were qualified as estimated unconfirmed ("JN"). The PAH detects were not confirmed and should be considered tentatively identified with estimated values. With the difficult sample matrix and unconfirmed PAH analyses, there is a potential for false positives and high biased results in the PAH data.
2. All PAH analytes detected in three of the nine samples were qualified as estimated ("J") due to high biased surrogate recoveries (already "JN").
3. All PAH analytes in sample PBOW-04-SO-2BG-BH19-A (8-10) were qualified as estimated ("J" for detects and "UJ" for non-detects) due to a low biased surrogate recoveries (detects already "JN")
4. Three PAH analytes, acenaphthylene, anthracene, and benzo(a)pyrene, were qualified as estimated ("J" for detects and "UJ" for non-detects) in all nine samples due to marginally low biased LCS outliers.
5. Benzo(a)anthracene was qualified as estimated ("J") for detects in all nine samples due to high biased CCVs.
6. Benzo(a)pyene was qualified as estimated ("J" for detects and "UJ" for non-detects) in five of the nine samples due to a marginally low biased CCV.
7. An MS/MSD was performed on sample PBOW-04-SO-2BG-BH19A (8-10) from this SDG. All of the MS compounds recovered acceptable, and MSD compounds were 0%. The lab noted the MSD was probably not spiked. All PAH analytes in the parent sample were qualified as estimated ("J" for detects and "UJ" for non-detects) due to the potential low bias.

SDGs Paradigm G341-177 & G341-179

1. All positive results reported as estimated maximum possible concentrations (EMPC) were qualified as undetected ("U") at the level reported as an EMPC.

2. All positive results reported below the MDL were qualified as undetected ("U") at the reporting limit.
3. All detects in samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D (parent sample and field duplicate) were qualified as estimated due to duplicate RPD exceedances.
4. The positive detects for OCDD and 1,2,3,4,6,7,8-HpCDD in samples PBOW-04-SD-2BG-SD02-A and PBOW-04-SD-2BG-SD02-D (parent sample and field duplicate) were qualified as estimated due to duplicate RPD exceedances.
5. Diphenyl ether interference was noted for 1,2,3,7,8-PeCDF in sample PBOW-04-SO-2BG-TR06-1-A and qualified as estimated ("J").
6. Diphenyl ether interference was noted for 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, and 2,3,4,6,7,8-HxCDF in sample PBOW-04-SO-2BG-TR10-2-A and qualified as estimated ("J").

4.0 DATA QUALITY NARRATIVES

The findings of this data quality evaluation are presented below in terms of precision, accuracy, representativeness, sensitivity and completeness.

4.1 DATA PRECISION

4.1.1 Field QC Duplicate Precision Review

Project field duplicate precision indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Findings:

1. The VOC field duplicate performed on samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D had a marginal RPD outlier as detailed in the table below. The RPD exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
Benzene	55%	J

2. The metals field duplicate performed on samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D had several RPD outliers as detailed in the table below. The RPDs exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
Cadmium	52%	J
Chromium	80%	J
Lead	90%	J

3. The nitroaromatics field duplicate performed on samples PBOW-04-SO-2BG-BH15-A and PBOW-04-SO-2BG-BH15-D had twol RPD outliers as detailed in the table below. The RPDs exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
2,4,6-TNT	111%	J
2,4-DNT	92%	J

4. The metals field duplicate performed on samples PBOW-04-SO-2BG-BH13A (3-5) and PBOW-04-SO-2BG-BH13D (3-5) had several RPD outliers as detailed in the table below. The RPDs exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
Cobalt	89%	J
Manganese	113%	J

5. The PAH field duplicate performed on samples PBOW-04-SD-2BG-SD02-A and PBOW-04-SD-2BG-SD02-D had a RPD outlier as detailed in the table below. The RPD exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
Phenanthrene	143%	J

6. The dioxin/furan field duplicate performed on samples PBOW-04-SD-2BG-SD02-A and PBOW-04-SD-2BG-SD02-D had two RPD outliers as detailed in the table below. The RPDs exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
OCDD	86%	J
1,2,3,4,6,7,8-HpCDD	73%	J

7. The dioxin/furan field duplicate performed on samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D had several RPD outliers as detailed in the table below. The RPDs exceeded the project criteria (<50% RPD) for soil samples. The positive results in both the parent sample and the field duplicate were qualified as estimated "J".

Analyte	RPD	Qualifier
OCDD	65.9%	J
1,2,3,4,6,7,8-HpCDD	55%	J
2,3,7,8-TCDF	57%	J
1,2,3,7,8-PeCDF	54%	J
2,3,4,7,8-PeCDF	58%	J
1,2,3,4,7,8-HxCDF	58%	J
1,2,3,6,7,8-HxCDF	71%	J
2,3,4,6,7,8-HxCDF	70%	J
1,2,3,4,6,7,8-HpCDF	63%	J

4.1.2 Laboratory Duplicate Precision Review

Project laboratory duplicate precision indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Findings:

1. The second column confirmation of the nitroaromatic results for several samples in SDG GEL 113353 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-TR05-1-A	1,3,5-TNB	66%	J
	2,4-DNT	144%	J
	2-NT	119%	J
	3-NT	184%	J
	4-NT	129%	J
PBOW-04-SO-2BG-TR05-1-D	1,3,5-TNB	67%	J
	1,3-DNB	41%	J
	2,4-DNT	159%	J
	2-NT	130%	J
	3-NT	179%	J
	4-NT	143%	J
PBOW-04-SO-2BG-TR06-1-A	4-AM-2,6-DNT	76%	J
	2,4-DNT	95%	J
	2-NT	147%	J
	4-NT	179%	J
PBOW-04-SO-2BG-TR07-1-A	1,3,5-TNB	69%	J
	2,4-DNT	164%	J
	2-NT	139%	J
	4-NT	137%	J
PBOW-04-SO-2BG-TR08-1-A	1,3,5-TNB	64%	J
	2,4-DNT	101%	J
PBOW-04-SO-2BG-TR08-1-A	2,4-DNT	110%	J

2. The metals serial dilution performed on sample PBOW-04-SO-2BG-TR08-1-A for SDG GEL 113353 had three %D outliers as detailed in the table below. The compounds were qualified as estimated "J" in the associated samples in the SDG to indicate the potential imprecise measurement. The table below details the outliers for PBOW-04-SO-2BG-TR08-1-A and the qualifiers applied to the associated samples.

Analyte	RPD	Qualifier
Aluminum	14.5%	J
Calcium	18%	J
Mercury	14.1%	J

3. The total metals matrix duplicate in SDG GEL 113353 performed on sample PBOW-04-SO-2BG-TR08-1-A was found to have several RPD exceedances (>20%). The exceedances and resulting qualification for all samples in the SDG are detailed below in the table. The detects for the failing compounds were qualified as "J" in all associated samples in the SDG to indicate this precision outlier.

Analyte	RPD	Qualifier
Arsenic	83.7%	J
Cobalt	24%	J
Iron	41.3%	J
Selenium	45%	J
Sodium	30%	J
Zinc	37%	J
Mercury	94%	J

4. The second column confirmation of the nitroaromatic results for several samples in SDG GEL 113353 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-BH10A (0-1)	2,4,6-TNT	47%	J
PBOW-04-SO-2BG-BH09A (0-1)	2,4-DNT	132%	J
PBOW-04-SO-2BG-BH17A (0-1)	1,3,5-TNB	67%	J
	2,4,6-TNT	44%	J
	4-AM-2,6-DNT	41%	J
	2,4-DNT	83%	J

5. The nitroaromatic MS/MSD performed on sample PBOW-04-SO-2BG-BH17A (0-1) for SDG GEL 113472 had one RPD outlier as detailed in the table below. The compound was detected in the parent sample, and was already qualified due to a second column confirmation precision outlier.

Analyte	RPD	Qualifier
2,4,6-TNT	102%	J

6. The metals serial dilution performed on sample PBOW-04-SO-2BG-BH11A (0-1) for SDG GEL 113472 had two %D outliers as detailed in the table below. The compounds were qualified as estimated "J" in the associated samples in the SDG to indicate the potential imprecise measurement. The table below details the outliers for PBOW-04-SO-2BG-BH11A (0-1) and the qualifiers applied to the associated samples in the SDG.

Analyte	RPD	Qualifier
Arsenic	23.8%	J
Mercury	18.6%	J

7. The second column confirmation of the nitroaromatic results for several samples in SDG GEL 113513 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-BH15D (0-1)	1,3,5-TNB	63%	J
	2,4-DNT	189%	J
PBOW-04-SO-2BG-BH19A (0-1)	1,3,5-TNB	57%	J
	2,4-DNT	198%	J
PBOW-04-SO-2BG-BH21D (0-1)	2,4,6-TNT	60%	J
	4-AM-2,6-DNT	41%	J
PBOW-04-SO-2BG-BH13A (0-1)	2,4,6-TNT	58%	J
	2,4-DNT	72%	J
PBOW-04-SO-2BG-BH15A (0-1)	2,4-DNT	186%	J
PBOW-04-SO-2BG-BH18A (0-1)	4-AM-2,6-DNT	48%	J
	2,4-DNT	190%	J
PBOW-04-SO-2BG-BH20A (0-1)	4-AM-2,6-DNT	70%	J
	2,4-DNT	99%	J

8. The nitroaromatic MS/MSD performed on sample PBOW-04-SO-2BG-BH15D (0-1) for SDG GEL 113513 had one RPD outlier as detailed in the table below. The compound was detected in the parent sample, and was already qualified due to a second column confirmation precision outlier.

Analyte	RPD	Qualifier
2,4,6-TNT	96%	J

9. The metals serial dilution performed on sample PBOW-04-SO-2BG-BH15D (0-1) for SDG GEL 113513 had one %D outlier as detailed in the table below. The positive detects for the compound were qualified as estimated "J" in the associated samples in the SDG to indicate the potential imprecise measurement. The table below details the outliers for PBOW-04-SO-2BG-BH15D (0-1) and the qualifiers applied to the associated samples in the SDG.

Analyte	RPD	Qualifier
Mercury	11.2%	J

10. The total metals matrix duplicate in SDG GEL 113513 performed on sample PBOW-04-SO-2BG-BH15A (0-1) was found to have several RPD exceedances (>20%). The exceedances and resulting qualification for all samples in the SDG are detailed below in the table. The detects for the failing compounds were qualified as "J" in all associated samples in the SDG to indicate this precision outlier.

Analyte	RPD	Qualifier
Arsenic	56%	J
Barium	26%	J
Cobalt	41%	J
Iron	39%	J
Magnesium	27%	J
Manganese	63%	J
Selenium	200%	J
Sodium	40%	J
Zinc	66%	J

11. The second column confirmation of the nitroaromatic results for several samples in SDG GEL 113517 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-BH23A (0-1)	2,4-DNT	199%	J
PBOW-04-SO-2BG-BH12A (0-1)	4-AM-2,6-DNT	48%	J
	2,4-DNT	120%	J
PBOW-04-SO-2BG-BH24A (0-1)	2,4,6-TNT	48%	J
	2,4-DNT	92%	J

12. The total metals lab duplicate in SDG GEL 113517 performed on sample PBOW-04-SO-2BG-BH22A (0-1) was found to have several RPD exceedances (>20%). The exceedances and resulting qualification for all samples in the SDG are detailed below in the table. The detects for the failing compounds were qualified as "J" in all associated samples in the SDG

to indicate this precision outlier.

Analyte	RPD	Qualifier
Arsenic	21%	J
Magnesium	24%	J
Selenium	43%	J

13. The second column confirmation of the nitroaromatic results for several samples in SDG GEL 113697 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-BH15A (3-5)	2,4,6-TNT	59%	J
	2,4-DNT	56%	J
PBOW-04-SO-2BG-BH16A (3-5)	2,4-DNT	59%	J

14. The metals serial dilution performed on sample PBOW-04-SO-2BG-BH16A (3-5) for SDG GEL 113697 had several %D outliers as detailed in the table below. The positive detects for the compounds were qualified as estimated "J" in the associated samples in the SDG to indicate the potential imprecise measurement. The table below details the outliers for PBOW-04-SO-2BG-BH16A (3-5) and the qualifiers applied to the associated samples in the SDG.

Analyte	RPD	Qualifier
Aluminum	23%	J
Barium	20%	J
Calcium	18%	J
Chromium	19%	J
Cobalt	17%	J
Copper	27%	J
Iron	16%	J
Magnesium	20%	J
Manganese	19%	J
Nickel	23%	J
Potassium	24%	J
Sodium	34%	J
Vanadium	21%	J

15. The second column confirmation of the nitroaromatic results for one sample in SDG GEL 113753 and several analytes were found to exceed the RPD criteria of 40%. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-04-SO-2BG-BH18A (3-5)	2,4,6-TNT	80%	J
	2,4-DNT	46%	J

16. The metals serial dilution performed on sample PBOW-04-SO-2BG-BH09A (3-5) for SDG GEL 113753 had several %D outliers as detailed in the table below. The positive detects for the compounds were qualified as estimated "J" in the associated samples in the SDG to indicate the potential imprecise measurement. The table below details the outliers for PBOW-04-SO-2BG-BH09A (3-5) and the qualifiers applied to the associated samples in the SDG.

Analyte	RPD	Qualifier
Iron	12%	J
Manganese	22%	J
Nickel	11%	J

17. The total metals matrix duplicate in SDG GEL 113753 performed on sample PBOW-04-SO-2BG-BH09A (3-5) was found to have several RPD exceedances (>20%). The exceedances and resulting qualification for all samples in the SDG are detailed below in the table. The detects for the failing compounds were qualified as "J" in all associated samples in the SDG to indicate this precision outlier.

Analyte	RPD	Qualifier
Arsenic	28%	J
Barium	69%	J
Cadmium	155%	J
Cobalt	43%	J
Copper	64%	J
Lead	32%	J
Manganese	131%	J
Nickel	90%	J

18. The PAH MS/MSD performed on sample PBOW-04-SO-2BG-BH19A (8-10) for SDG E&E 0405342 had RPD outliers for all PAH analytes due to no recovery in the MSD. The lab noted in the case narrative that they suspect the MSD was inadvertently not spiked. All PAH analytes were already qualified as estimated ("J/UJ") in the parent sample due to the recovery outliers in the MSD.

19. The dioxin/furan MS/MSD performed on sample PBOW-04-SO-2BG-BH17A (0-1) for SDG Paradigm G341-177 had several RPD outliers. The outliers and resulting qualification applied to the affected samples of the same matrix (DPT borehole samples) are detailed in the table below.

Analyte	RPD	Qualifier
2,3,7,8-TCDF	342%	J
1,2,3,7,8-PeCDF	29%	J
2,3,4,7,8-PeCDF	85%	J
1,2,3,4,7,8-HxCDF	50%	J
1,2,3,6,7,8-HxCDF	28%	J
2,3,4,6,7,8-HxCDF	22%	J
1,2,3,4,6,7,8-HpCDF	25%	J

20. The dioxin/furan MS/MSD performed on sample PBOW-04-SO-2BG-TR08-1-A for SDG Paradigm G341-177 had several RPD outliers. The outliers are detailed in the table below. All of the compounds were already qualified as estimated ("J/UJ") due to low biased

MS/MSD recoveries.

Analyte	RPD	Qualifier
2,3,7,8-TCDF	23%	J
2,3,4,7,8-PeCDF	71%	J
2,3,4,6,7,8-HxCDF	26%	J
OCDD	68%	J
1,2,3,4,6,7,8-HpCDD	26%	J

4.2 DATA ACCURACY

4.2.1 Data Accuracy Indicators Review

Project accuracy indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification. Instances were dilutions caused surrogate or spike recoveries to be diluted out (dilutions greater than 4X) are not discussed as findings if qualification was not deemed necessary.

Specific Findings: SDG GEL 113353

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113353 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (31%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all six soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verifications (CCVs) associated with SDG GEL 113353 failed the percent drift criteria marginally for cyclohexane (23%) with a negative bias. The finding indicated a potential low bias for the analyte, thus the results were qualified as estimated ("J" for detects and "UJ" for non-detects) for the results in all six associated soil samples.
3. The VOC Continuing Calibration Verifications (CCVs) associated with SDG GEL 113353 failed the percent drift criteria for trichlorofluoromethane (41%), methyl acetate (22%), 1,1,1-trichloroethane (23%), carbon tetrachloride (36%), and 1,2,4-trichlorobenzene (23%) with a positive bias. The finding indicated a potential high bias for the analytes, thus the results were qualified as estimated ("J" for detects only) for the analytes in all six associated soil samples.
4. VOC sample PBOW-04-SO-2BG-TR05-1-D had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-TR05-1-D.
5. VOC sample PBOW-04-SO-2BG-TR06-1-A had marginally low biased internal standard recoveries for IS#2 (chlorobenzene-d5) and IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standards per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-TR06-1-A.
6. For the metals analysis of the six soils associated with SDG GEL 113353, the LCS recovered marginally below the lower control limit for antimony (65%). The analyte was qualified as estimated ("J" for detects and "UJ" for non-detects) for the results in all six samples in SDG GEL 113353 to indicate the marginally low bias for the analyte.
7. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-TR08-1-A

associated with SDG GEL 113353 recovered marginally low for one compound and high for several compounds. The outliers and resulting qualification is detailed below in the table for all six associated soils in SDG GEL 113353.

Analyte	% Recovery	Qualifier
Antimony	55% in MS, 54% in MSD	J/UJ
Barium	126 in MS	J/none
Copper	385% in MS, 472 in MSD	J/none
Manganese	336% in MS, 290% in MSD	J/none
Potassium	136% in MS, 204% in MSD	J/none
Zinc	1355% in MS, 748% in MSD	J/none

Specific Findings: SDG GEL 113472

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113472 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (31%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all four soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verifications (CCVs) associated with SDG GEL 113472 failed the percent drift criteria for cyclohexane (62%) with a positive bias. The finding indicated a potential high bias for the analytes, thus the results were qualified as estimated ("J" for detects only) for the analyte in all four associated soil samples.
3. VOC sample PBOW-04-SO-2BG-BH17A (0-1) had a low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as rejected ("R") in sample PBOW-04-SO-2BG-BH17A (0-1).
4. The VOC MS/MSD performed on sample PBOW-04-SO-2BG-BH17A (0-1) had marginally low recoveries for four of the five compounds spiked in the MS and two of the five compounds spiked in the MSD (not a full analyte spike). The table below details the outliers and resulting qualification applied to all analytes (not already rejected due to the IS failure) in sample PBOW-04-SO-2BG-BH17A (0-1). All analytes were qualified since a full analyte spike was not used and most of the compounds spiked recovered with a low bias.

Analyte	% Recovery	Qualifier
Benzene	56% in MS	J/UJ all analytes in sample PBOW-04-SO-2BG-BH17A (0-1)
TCE	47% in MS, 46% in MSD	
Toluene	46% in MS	
Chlorobenzene	25% in MS, 28% in MSD	

5. The nitroaromatics MS/MSD performed on sample PBOW-04-SO-2BG-BH17A (0-1) had high recoveries for the compounds listed below in the table. Detects in the parent sample, PBOW-04-SO-2BG-BH17A (0-1), were qualified as estimated ("J") to indicate the potential high bias.

Analyte	% Recovery	Qualifier
2,4,6-TNT	336% in MS	J/none
4-AM-2,6-DNT	152% in MS	J/none
2-AM-4,6-DNT	158% in MSD	J/none

6. The metals LCS associated with the four soil samples in SDG GEL 113472 recovered marginally low for one compound and high for two compounds. The outliers and resulting qualification is detailed below in the table for all four associated soils in SDG GEL 113472.

Analyte	% Recovery	Qualifier
Aluminum	122%	J/none
Antimony	73%	J/UJ
Silver	126%	J/none

7. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH11A (0-1) associated with SDG GEL 113472 recovered marginally low for one compound and high for several compounds. The outliers and resulting qualification is detailed below in the table for all four associated soils in SDG GEL 113472.

Analyte	% Recovery	Qualifier
Antimony	55% in MS, 60% in MSD	J/UJ
Barium	133% in MS	J/none
Calcium	176% in MS, 129% in MSD	J/none
Magnesium	200% in MS, 167% in MSD	J/none
Manganese	168% in MS	J/none
Potassium	267% in MS, 216% in MSD	J/none

Specific Findings: SDG GEL 113513

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113513 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (31%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all nine soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verifications (CCVs) associated with the following samples in SDG GEL 113472:

PBOW-04-SO-2BG-BH18A (0-1)
PBOW-04-SO-2BG-BH19A (0-1)
PBOW-04-SO-2BG-BH20A (0-1)
PBOW-04-SO-2BG-BH13A (0-1)
PBOW-04-SO-2BG-BH14A (0-1)
PBOW-04-SO-2BG-BH15A (0-1)
PBOW-04-SO-2BG-BH21A (0-1)
PBOW-04-SO-2BG-BH21D (0-1)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	-46%	J/R
Methylcyclohexane	-33%	J/R
Cyclohexane	-28%	J/UJ
Methyl acetate	+51%	J/none

3. The VOC Continuing Calibration Verification (CCV) associated with sample PBOW-04-SO-2BG-BH15A (0-1) in SDG GEL 113472 failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	+35%	J/UJ
Bromomethane	+31%	J/UJ
Trichlorofluoromethane	+66%	J/UJ
Methyl acetate	-22%	J/UJ
2-Butanone	-25%	J/UJ
1,1,1-Trichloroethane	+44%	J/UJ
Carbon tetrachloride	+57%	J/UJ
Bromodichloromethane	+22%	J/UJ
4-Methyl-2-pentanone	-24%	J/UJ
2-Hexanone	-29%	J/UJ
Tetrachloroethylene	+40%	J/UJ
Dibromochloromethane	+24%	J/UJ
1,1,2,2-Tetrachloroethane	-25%	J/UJ
1,2,4-Trichlorobenzene	+23%	J/UJ

4. VOC sample PBOW-04-SO-2BG-BH18A (0-1) had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-BH18A (0-1).
5. VOC sample PBOW-04-SO-2BG-BH20A (0-1) had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-BH20A (0-1).
6. The VOC MS/MSD performed on sample PBOW-04-SO-2BG-BH13A (0-1) had marginally low recoveries for one of the five compounds spiked in the MS/MSD (not a full analyte spike). The table below details the outlier and resulting qualification applied to sample PBOW-04-SO-2BG-BH13A (0-1) to only the failing analyte (chlorobenzene) to indicate the potential low bias.

Analyte	% Recovery	Qualifier
Chlorobenzene	52% in MS, 55% in MSD	J/UJ

7. The nitroaromatics MS/MSD performed on sample PBOW-04-SO-2BG-BH15A (0-1) had both high and low recoveries for some of the target analytes listed below in the table. Sample PBOW-04-SO-2BG-BH15A (0-1) was qualified as detailed in the table to indicate the potential low and high biases due the MS/MSD outliers.

Analyte	% Recovery	Qualifier
2,4,6-TNT	26% in MSD	J/UJ
4-AM-2,6-DNT	157% in MS, 152% in MSD	J/none
2-AM-4,6-DNT	151% in MS, 144% in MSD	J/none

8. The metals LCS associated with the nine soil samples in SDG GEL 113513 recovered marginally low for one compound. The outlier and resulting qualification is detailed below in

the table for all nine associated soils in SDG GEL 113513.

Analyte	% Recovery	Qualifier
Antimony	67%	J/UJ

9. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH15D (0-1) associated with SDG GEL 113513 recovered marginally low for one compound, very low for one compound, and high for several compounds. The outliers and resulting qualification is detailed below in the table for all nine associated soils in SDG GEL 113513.

Analyte	% Recovery	Qualifier
Antimony	36% in MS, 39% in MSD	J/UJ
Barium	131% in MS	J/none
Copper	218% in MS	J/none
Lead	204% in MS	J/none
Magnesium	361% in MS, 200% in MSD	J/none
Potassium	322% in MS, 253% in MSD	J/none
Zinc	16% in MS, -61% in MSD	J/R

Specific Findings: SDG GEL 113517

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113517 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (32%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all five soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verifications (CCVs) associated with all five samples in SDG GEL 113517 failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	+35%	J/UJ
Bromomethane	+31%	J/UJ
Trichlorofluoromethane	+66%	J/UJ
Methyl acetate	-22%	J/UJ
2-Butanone	-25%	J/UJ
1,1,1-Trichloroethane	+44%	J/UJ
Carbon tetrachloride	+57%	J/UJ
Bromodichloromethane	+22%	J/UJ
4-Methyl-2-pentanone	-24%	J/UJ
2-Hexanone	-29%	J/UJ
Tetrachloroethylene	+40%	J/UJ
Dibromochloromethane	+24%	J/UJ
1,1,2,2-Tetrachloroethane	-25%	J/UJ
1,2,4-Trichlorobenzene	+23%	J/UJ

3. VOC sample PBOW-04-SO-2BG-BH12A (0-1) had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for

non-detects) in sample PBOW-04-SO-2BG-BH12A (0-1).

4. VOC sample PBOW-04-SO-2BG-BH24A (0-1) had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-BH24A (0-1).
5. The metals LCS associated with the five soil samples in SDG GEL 113517 recovered marginally low for one compound. The outlier and resulting qualification is detailed below in the table for all five associated soils in SDG GEL 113517.

Analyte	% Recovery	Qualifier
Antimony	67%	J/UJ

6. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH22A (0-1) associated with SDG GEL 113517 recovered marginally low for several compounds, and high for one compound. The outliers and resulting qualification is detailed below in the table for all five associated soils in SDG GEL 113517.

Analyte	% Recovery	Qualifier
Antimony	43% in MS, 43% in MSD	J/UJ
Lead	63% in MS	J/UJ
Manganese	69% in MS, 29% in MSD	J/UJ
Potassium	259% in MS, 251% in MSD	J/none

Specific Findings: SDG GEL 113558

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113558 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (32%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all 13 soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verifications (CCVs) associated with four samples in SDG GEL 113558:

PBOW-04-SD-2BG-SD01-A
PBOW-04-SD-2BG-SD02-A
PBOW-04-SD-2BG-SD02-D
PBOW-04-SD-2BG-SD03-A

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	-46%	J/R
Methyl acetate	+51%	J/UJ
Cyclohexane	-29%	J/UJ
Methylcyclohexane	-33%	J/R

3. The VOC Continuing Calibration Verifications (CCVs) associated with six samples in SDG GEL 113558:

PBOW-04-SO-2BG-BH12A (3-5)
PBOW-04-SO-2BG-BH13A (3-5)
PBOW-04-SO-2BG-BH13D (3-5)
PBOW-04-SO-2BG-BH11A (3-5)
PBOW-04-SO-2BG-BH14A (3-5)
PBOW-04-SO-2BG-BH13A (8-10)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	-35%	J/R
Bromomethane	+31%	J/UJ
Trichlorofluoromethane	+67%	J/UJ
Methyl acetate	-22%	J/UJ
2-Butanone	-25%	J/UJ
1,1,1-Trichloroethane	+44%	J/UJ
Carbon tetrachloride	+57%	J/UJ
Bromodichloromethane	+22%	J/UJ
4-Methyl-2-pentanone	-24%	J/UJ
2-Hexanone	-29%	J/UJ
Tetrachloroethylene	+40%	J/UJ
Dibromochloromethane	+24%	J/UJ
1,1,2,2-Tetrachloroethane	-25%	J/UJ
1,2,4-Trichlorobenzene	+23%	J/UJ

4. The VOC Continuing Calibration Verifications (CCVs) associated with three samples in SDG GEL 113558:

PBOW-04-SO-2BG-BH14A (8-10)
PBOW-04-SO-2BG-BH11A (8-10)
PBOW-04-SO-2BG-BH12A (8-10)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	-44%	J/R
Acetone	-22%	J/UJ
Cyclohexane	-25%	J/UJ
Methylcyclohexane	-24%	J/UJ
Isopropylbenzene	-26%	J/UJ
1,1,2,2-Tetrachloroethane	-23%	J/UJ

5. VOC sample PBOW-04-SD-2BG-SD02A had a low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as rejected ("R") in sample PBOW-04-SD-2BG-SD02A.
6. VOC sample PBOW-04-SD-2BG-SD02D had a low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal

standard per the EPA NFG were qualified as rejected ("R") in sample PBOW-04-SD-2BG-SD02D.

7. VOC sample PBOW-04-SD-2BG-SD03A had a low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as rejected ("R") in sample PBOW-04-SD-2BG-SD03A.
8. The metals LCS associated with the 13 soil samples in SDG GEL 113558 recovered marginally low for one compound. The outlier and resulting qualification is detailed below in the table for all 13 associated soils in SDG GEL 113558.

Analyte	% Recovery	Qualifier
Antimony	67%	J/UJ

Specific Findings: SDG GEL 113697

1. The VOC Continuing Calibration Verifications (CCVs) associated with all eight samples in SDG GEL 113697:

PBOW-04-SO-2BG-BH16A (3-5)
PBOW-04-SO-2BG-BH15A (3-5)
PBOW-04-SO-2BG-BH15D (3-5)
PBOW-04-SO-2BG-BH20A (3-5)
PBOW-04-SO-2BG-BH20D (3-5)
PBOW-04-SO-2BG-BH16A (8-10)
PBOW-04-SO-2BG-BH15A (8-10)
PBOW-04-SO-2BG-BH20A (8-10)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Dichlorodifluoromethane	-45%	J/R
Methyl acetate	+27%	J/UJ
Cyclohexane	-24%	J/UJ
Methylcyclohexane	-23%	J/UJ
Isopropylbenzene	-25%	J/UJ
1,1,2,2-Tetrachloroethane	-22%	J/UJ

2. VOC sample PBOW-04-SO-2BG-BH20A (8-10) had a low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as rejected ("R") in sample PBOW-04-SO-2BG-BH20A (8-10).
3. VOC sample PBOW-04-SO-2BG-BH16A (8-10) had a marginally low biased internal standard recovery for IS#3 (1,4-dichlorobenzene-d4). The appropriate compounds associated with the internal standard per the EPA NFG were qualified as estimated ("J" for detects and "UJ" for non-detects) in sample PBOW-04-SO-2BG-BH16A (8-10).
4. The VOC MS/MSD performed on sample PBOW-04-SO-2BG-BH15A (3-5) had marginally low recoveries for all five compounds spiked in the MS/MSD (not a full analyte spike). The table below details the outliers and resulting qualification applied to all analytes in sample PBOW-04-SO-2BG-BH15A (3-5). All analytes were qualified since a full analyte spike was not used and all of the spiked compounds recovered with a low bias.

Analyte	% Recovery	Qualifier
Benzene	57% in MS, 56% in MSD	J/UJ all analytes in sample PBOW-04-SO-2BG-BH15A (3-5)
TCE	55% in MS, 55% in MSD	
Toluene	47% in MS, 48 in MSD	
Chlorobenzene	37% in MS, 38% in MSD	
1,1-Dichloroethylene	56% in MS, 61% in MSD	

5. The metals LCS associated with the eight soil samples in SDG GEL 113697 recovered high for one compound. The outlier and resulting qualification is detailed below in the table for all eight associated soils in SDG GEL 113697.

Analyte	% Recovery	Qualifier
Aluminum	127%	J/none

6. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH16A (3-5) associated with SDG GEL 113697 recovered marginally low for one compound and high for two compounds. The outliers and resulting qualification is detailed below in the table for all eight associated soils in SDG GEL 113697.

Analyte	% Recovery	Qualifier
Antimony	43% in MS, 41% in MSD	J/UJ
Barium	127% in MS, 138% in MSD	J/none
Potassium	22% in MS, 290% in MSD	J/none

Specific Findings: SDG GEL 113753

1. The VOC Initial Calibration Verification (ICV) associated with all of the samples in SDG GEL 113753 failed the criteria (80-120% R or 20%D) marginally low for dichlorodifluoromethane (32%D). The finding indicated a potential low bias for dichlorodifluoromethane, thus the results for dichlorodifluoromethane in all ten soil samples were qualified estimated ("J" for detects and "UJ" for non-detects).
2. The VOC Continuing Calibration Verification (CCV) associated with seven samples in SDG GEL 113753:

PBOW-04-SO-2BG-BH10A (3-5)
PBOW-04-SO-2BG-BH17A (3-5)
PBOW-04-SO-2BG-BH17A (8-10)
PBOW-04-SO-2BG-BH18A (3-5)
PBOW-04-SO-2BG-BH18A (8-10)
PBOW-04-SO-2BG-BH19A (3-5)
PBOW-04-SO-2BG-BH17A (8-10)
PBOW-04-SO-2BG-BH09A (8-10)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Methyl acetate	+27%	J/UJ
Cyclohexane	-24%	J/UJ
Methylcyclohexane	-23%	J/UJ
Isopropylbenzene	-25%	J/UJ
1,1,2,2-Tetrachloroethane	-22%	J/UJ

3. The VOC Continuing Calibration Verifications (CCVs) associated with three samples in SDG GEL 113753:

PBOW-04-SO-2BG-BH09A (3-5)
PBOW-04-SO-2BG-BH19A (8-10)
PBOW-04-SO-2BG-BH10D (8-10)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential low bias for some analytes and a high bias for other analytes.

Analyte	Bias/% Difference	Qualifier
Trichlorofluoromethane	+38%	J/UJ
Methyl acetate	+59%%	J/UJ
Methylcyclohexane	+25%	J/UJ
Tetrachloroethylene	+28%	J/UJ
1,2,4-Trichlorobenzene	+23%	J/UJ
Chloroethane	+32%%	J/UJ
Carbon tetrachloride	+25%	J/UJ

4. Nitroaromatics sample PBOW-04-SO-2BG-BH18A (3-5) had a high biased surrogate recovery of 3,4-Nitrotoluene. All nitroaromatic compounds detected in sample PBOW-04-SO-2BG-BH18A (3-5) were qualified as estimated ("J").
5. The metals LCS associated with the ten soil samples in SDG GEL 113753 recovered marginally low for one compound. The outlier and resulting qualification is detailed below in the table for all ten associated soils in SDG GEL 113753.

Analyte	% Recovery	Qualifier
Antimony	66%	J/UJ

6. The metals MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH09D (3-5) associated with SDG GEL 113753 recovered marginally low for several compounds and high for one compound. The outliers and resulting qualification is detailed below in the table for all ten associated soils in SDG GEL 113753.

Analyte	% Recovery	Qualifier
Antimony	31% in MSD	J/UJ
Arsenic	73% in MSD	J/UJ
Cobalt	52% in MS, 63% in MSD	J/UJ
Copper	29% in MS, 48% in MSD	J/R
Lead	73% in MS	J/UJ
Nickel	27% in MS, 4% in MSD	J/R
Potassium	328% in MS, 365% in MSD	J/none
Zinc	65% in MS	J/UJ

Specific Findings: SDG E&E 0405288

1. The PAH CCV associated with three samples in SDG E&E 0405288:

   PBOW-04-SO-2BG-TR05-1-A
   PBOW-04-SO-2BG-TR05-1-D
   PBOW-04-SO-2BG-TR06-1-A

   failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential low bias for the analyte. The analyte was qualified as estimated since the %D was less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-16%	J/UJ

2. The PAH CCVs associated with three samples in SDG E&E 0405288:

   PBOW-04-SO-2BG-TR07-1-A
   PBOW-04-SO-2BG-TR08-1-A
   PBOW-04-SO-2BG-TR09-1-A

   failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential low bias for the analyte. The analyte was qualified as estimated since the %D was less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-23%, -25%%	J/UJ

3. The PAH LCS associated with all six soil samples in SDG E&E 0405288 had low marginally recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	56%	J/UJ
Anthracene	54%%	J/UJ

Specific Findings: SDG E&E 0405289

1. The PAH CCV associated with all four samples in SDG E&E 0405289:

   PBOW-04-SO-2BG-BH11A (0-1)
   PBOW-04-SO-2BG-BH10A (0-1)
   PBOW-04-SO-2BG-BH09A (0-1)
   PBOW-04-SO-2BG-BH17A (0-1)

   failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential low bias for the analyte. The analyte was qualified as estimated since the %D was less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-21%	J/UJ

2. The PAH LCS associated with all four soil samples in SDG E&E 0405289 had marginally low recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	56%	J/UJ
Anthracene	54%%	J/UJ

Specific Findings: SDG E&E 0405290

1. The PAH CCVs associated with two of the 14 samples in SDG E&E 0405290:

PBOW-04-SO-2BG-BH19A (0-1)
PBOW-04-SO-2BG-BH15A (0-1)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential negative bias for two analytes and a positive bias for one analyte. The analytes were qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-20%, -22%	J/UJ
Anthracene	-17%, -17%	J/UJ
Benzo(a)anthracene	+17%, +17%	J/none

2. The PAH CCVs associated with two of the 14 samples in SDG E&E 0405290:

PBOW-04-SO-2BG-BH12A (0-1)
PBOW-04-SO-2BG-BH16A (0-1)

failed the percent drift criteria for the compounds detailed in the table below. The finding indicates a potential negative bias for one analyte and a positive bias for one analyte. The analytes were qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-17%	J/UJ
Benzo(a)anthracene	+21%	J/none

3. The PAH LCS associated with all two of the 14 soil samples in SDG E&E 0405290:

PBOW-04-SO-2BG-BH12A (0-1)
PBOW-04-SO-2BG-BH16A (0-1)

had marginally low recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	57%	J/UJ
Anthracene	54%%	J/UJ

4. The PAH surrogate (Terphenyl-d14) had high recoveries in the samples detailed below in the table. The finding indicates a potential high bias for all PAH analytes in the samples, thus all PAH analytes detected in the samples were qualified as estimated ("J").

Sample	% Recovery	Qualifier
PBOW-04-SO-2BG-BH20A (0-1)	170%	J/none
PBOW-04-SO-2BG-BH13A (0-1)	155%	J/none
PBOW-04-SO-2BG-BH14A (0-1)	186%	J/none
PBOW-04-SO-2BG-BH21D (0-1)	132%	J/none
PBOW-04-SO-2BG-BH24A (0-1)	225%	J/none
PBOW-04-SO-2BG-BH12A (0-1)	172%	J/none

5. The PAH surrogate (Terphenyl-d14) had a marginally low recovery in the sample detailed below in the table. The finding indicates a potential low bias for all PAH analytes in the sample, thus all PAH analytes in the samples were qualified as estimated ("J" for detects and "UJ" for non-detects).

Sample	% Recovery	Qualifier
PBOW-04-SO-2BG-BH16A (0-1)	33%	J/UJ

Specific Findings: SDG E&E 0405318

1. The PAH CCVs associated with four of the 20 samples in SDG E&E 0405318:

PBOW-04-SD-2BG-SD01-A
PBOW-04-SD-2BG-SD02-A
PBOW-04-SD-2BG-SD02-D
PBOW-04-SO-2BG-BH16-A (3-5)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential negative bias for the analyte. The analyte was qualified as estimated since the %D was all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Anthracene	-16%	J/UJ

2. The PAH CCV associated with three of the 20 samples in SDG E&E 0405318:

PBOW-04-SO-2BG-BH12A (3-5)
PBOW-04-SO-2BG-BH13D (3-5)
PBOW-04-SO-2BG-BH14A (3-5)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential positive bias for the analyte. The detects for the analyte were qualified

as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)anthracene	+21%	J/none

3. The PAH CCV associated with 12 of the 20 samples in SDG E&E 0405318:

PBOW-04-SO-2BG-BH12A (3-5)
PBOW-04-SO-2BG-BH13D (3-5)
PBOW-04-SO-2BG-BH14A (3-5)
PBOW-04-SO-2BG-BH11A (3-5)
PBOW-04-SO-2BG-BH13A (3-5)
PBOW-04-SO-2BG-BH15A (3-5)
PBOW-04-SO-2BG-BH15D (3-5)
PBOW-04-SO-2BG-BH20A (3-5)
PBOW-04-SO-2BG-BH20A (8-10)
PBOW-04-SO-2BG-BH12A (8-10)
PBOW-04-SO-2BG-BH13A (8-10)
PBOW-04-SO-2BG-BH14A (8-10)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential negative bias for the analyte. The analyte was qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-17%	J/UJ

4. The PAH CCV associated with 10 of the 20 samples in SDG E&E 0405318:

PBOW-04-SO-2BG-BH11A (3-5)
PBOW-04-SO-2BG-BH13A (3-5)
PBOW-04-SO-2BG-BH15A (3-5)
PBOW-04-SO-2BG-BH15D (3-5)
PBOW-04-SO-2BG-BH20A (3-5)
PBOW-04-SO-2BG-BH20A (8-10)
PBOW-04-SO-2BG-BH12A (8-10)
PBOW-04-SO-2BG-BH13A (8-10)
PBOW-04-SO-2BG-BH14A (8-10)
PBOW-04-SO-2BG-BH15A (8-10)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential positive bias for the analyte. The detects for the analyte were qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)anthracene	+19%	J/none

5. The PAH CCV associated with three of the 20 samples in SDG E&E 0405318:

PBOW-04-SD-2BG-SD03-A
PBOW-04-SO-2BG-BH11A (8-10)
PBOW-04-SO-2BG-BH16A (8-10)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential negative bias for the analyte. The analyte was qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)anthracene	-18%	J/none

6. The PAH LCS associated with all 15 of the 20 soil samples in SDG E&E 0405318:

PBOW-04-SD-2BG-SD03-A
PBOW-04-SO-2BG-BH12A (3-5)
PBOW-04-SO-2BG-BH13D (3-5)
PBOW-04-SO-2BG-BH14A (3-5)
PBOW-04-SO-2BG-BH11A (3-5)
PBOW-04-SO-2BG-BH13A (3-5)
PBOW-04-SO-2BG-BH15A (3-5)
PBOW-04-SO-2BG-BH15D (3-5)
PBOW-04-SO-2BG-BH20A (3-5)
PBOW-04-SO-2BG-BH20A (8-10)
PBOW-04-SO-2BG-BH12A (8-10)
PBOW-04-SO-2BG-BH13A (8-10)
PBOW-04-SO-2BG-BH14A (8-10)

had marginally low recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	57%	J/UJ
Anthracene	54%%	J/UJ

7. The PAH LCS associated with all 2 of the 20 soil samples in SDG E&E 0405318:

PBOW-04-SO-2BG-BH11A (8-10)
PBOW-04-SO-2BG-BH16A (8-10)

had marginally low recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	49%	J/UJ
Anthracene	45%	J/UJ
Benzo(a)pyrene	58%	J/UJ

8. The PAH surrogate (Terphenyl-d14) had high recoveries in the samples detailed below in the table. The finding indicates a potential high bias for all PAH analytes in the samples, thus all PAH analytes detected in the samples were qualified as estimated ("J").

Sample	% Recovery	Qualifier
PBOW-04-SD-2BG-SD01-A	141%	J/none
PBOW-04-SD-2BG-SD02-A	134%	J/none
PBOW-04-SD-2BG-SD03-A	262%	J/none
PBOW-04-SO-2BG-BH12A (8-10)	219%	J/none
PBOW-04-SO-2BG-BH13A (8-10)	180%	J/none
PBOW-04-SO-2BG-BH14A (8-10)	156%	J/none
PBOW-04-SO-2BG-BH11A (8-10)	196	J/none

9. The PAH surrogate (Terphenyl-d14) had a low recovery in the sample detailed below in the table. The finding indicates a potential low bias for all PAH analytes in the sample, thus all PAH analytes in the sample was qualified as estimated ("J" for detects and "UJ" for non-detects).

Sample	% Recovery	Qualifier
PBOW-04-SO-2BG-BH16A (3-5)	16%	J/UJ

Specific Findings: SDG E&E 0405342

1. The PAH CCVs associated with all nine of the samples in SDG E&E 0405342:

PBOW-04-SO-2BG-BH09-A (3-5)
PBOW-04-SO-2BG-BH10-A (3-5)
PBOW-04-SO-2BG-BH10-A (8-10)
PBOW-04-SO-2BG-BH17-A (3-5)
PBOW-04-SO-2BG-BH17-A (8-10)
PBOW-04-SO-2BG-BH18-A (3-5)
PBOW-04-SO-2BG-BH18-A (8-10)
PBOW-04-SO-2BG-BH19-A (3-5)
PBOW-04-SO-2BG-BH19-A (8-10)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential positive bias for the analyte. The detects for the analyte were qualified as estimated since the %D was all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)anthracene	+17%, +18%, +21%	J/none

2. The PAH CCV associated with five of the nine samples in SDG E&E 0405342:

PBOW-04-SO-2BG-BH09-A (3-5)
PBOW-04-SO-2BG-BH10-A (3-5)
PBOW-04-SO-2BG-BH10-A (8-10)
PBOW-04-SO-2BG-BH17-A (3-5)
PBOW-04-SO-2BG-BH17-A (8-10)

failed the percent drift criteria for the compound detailed in the table below. The finding indicates a potential negative bias for the analyte. The analyte was qualified as estimated since the %Ds were all less than 30% and the mean %D for all PAH analytes was less than 15%.

Analyte	Bias/% Difference	Qualifier
Benzo(a)pyrene	-18%	J/UJ

3. The PAH LCS associated with all nine samples in SDG E&E 0405318 had marginally low recoveries for the compounds detailed in the table below. The finding indicates a potential low bias for the analytes.

Analyte	% Recovery	Qualifier
Acenaphthylene	46%	J/UJ
Anthracene	45%	J/UJ
Benzo(a)pyrene	58%	J/UJ

4. The PAH surrogate (Terphenyl-d14) had high recoveries in the samples detailed below in the table. The finding indicates a potential high bias for all PAH analytes in the samples, thus all PAH analytes detected in the samples were qualified as estimated ("J").

Sample	% Recovery	Qualifier
PBOW-04-SO-2BG-BH10A (8-10)	170%	J/none
PBOW-04-SO-2BG-BH17A (8-10)	159%	J/none

5. The PAH surrogate (Terphenyl-d14) had a low recovery in the sample detailed below in the table. The finding indicates a potential low bias for all PAH analytes in the sample, thus all PAH analytes in the sample was qualified as estimated ("J" for detects and "UJ" for non-detects).

Sample	% Recovery	Qualifier
PBOW-04-SO-2BG-BH19A (8-10)	20%	J/UJ

6. The PAH MS/MSD performed on sample PBOW-04-SO-2BG-BH19A (8-10) had acceptable recoveries for all PAH compounds in the MS, but had 0% recovery for all MSD PAH compounds. The lab stated in the case narrative that the MSD was inadvertently not spiked. This finding indicates a potential low bias for all PAH analytes in the parent sample, PBOW-04-SO-2BG-BH19A (8-10), thus all PAH analytes in the sample were qualified as estimated ("J" for detects and "UJ" for non-detects).

Specific Findings: SDG Paradigm G341-177

1. The dioxin/furan MS/MSD analysis performed on sample PBOW-04-SO-2BG-BH17A (0-1) associated with SDG Paradigm G341-177 recovered marginally low for several compounds and high for one compound. The outliers and resulting qualification is detailed below in the table for four of the 21 soils in SDG Paradigm G341-177 (this MS/MSD applies to the four DPT borehole soil samples).

Analyte	% Recovery	Qualifier
2,3,7,8-TCDF	36% in MS, 138% in MSD	J/UJ
1,2,3,7,8-PeCDF	63% in MS	J/UJ
2,3,4,7,8-PeCDF	30% in MS	J/UJ
1,2,3,4,7,8-HxCDF	47% in MS	J/UJ

2. The dioxin/furan MS/MSD analysis performed on sample PBOW-04-SO-2BG-TR08-1-A associated with SDG Paradigm G341-177 recovered marginally low for several compounds and high for one compound. The outliers and resulting qualification is detailed below in the table for 17 of the 21 soils in SDG Paradigm G341-177 (this MS/MSD applies to the 17 trench soil samples).

Analyte	% Recovery	Qualifier
2,3,7,8-TCDF	-193% in MS, -153% in MSD	J/UJ
2,3,4,7,8-PeCDF	16% in MS, 33% in MSD	J/UJ
1,2,3,7,8,9-HxCDF	134% in MS, 135% in MSD	J/UJ
2,3,4,6,7,8-HxCDF	59% in MS	J/UJ
OCDD	59% in MS	J/UJ

4.3 DATA REPRESENTATIVENESS

4.3.1 Sample Custody/Handling Documentation Review

The project samples were received at the laboratory adequately preserved, chilled within the required range of 4 ± 2 degrees Celsius, in good condition, and with required custody documentation in order with the following exception noted below as a Specific Finding.

Specific Findings: SDG Paradigm G341-179

1. The cooler containing the three sediment samples and the field duplicate for SDG Paradigm G341-179 was received at Paradigm at 9.9 degrees Celsius. The samples were shipped from the field to GEL and received within the acceptable range of 4 degrees Celsius +/- 2 degrees. The exceedance occurred in the shipment between GEL and Paradigm, the dioxin/furan analytical subcontractor. The four samples affected were analyzed for dioxins/furans, which are not volatile compounds likely to degrade due to the marginal temperature exceedance. The results for the dioxin/furan sample analyses for all four samples affected by the temperature exceedance were qualified as estimated ("J" for detects and "UJ" for non-detects) to indicate that an occurrence existed that potentially could introduce a low bias to the sample results.

4.3.2 Sample Holding Time Review

QC data indicated requirements for holding times were met for each sample analysis.

4.3.3 Blank Sample Results Review

QC data indicated requirements for blank sample results were met for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Finding:

1. The VOC trip blank associated with the six soil samples in SDG GEL 113353 contained a trace level detect of Acetone at 4.5 ug/L. One of the six associated soil samples in SDG GEL 113472, sample PBOW-04-SO-2BG-TR07-1-A, also contained a trace level detect of Acetone less than the reporting limit and <10 times the blank level. Since the detect in the sample was less than the reporting limit but greater than the MDL, the acetone result was qualified as undetected ("U") at the level the trace detect was reported.
2. The metals method blank and calibration blanks associated with SDG GEL 113353 had trace level (less than the reporting limit, but greater than the MDL) detects of Aluminum, Antimony, Calcium, Iron, Magnesium, and Zinc. All of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples.
3. The VOC trip blank associated with the four soil samples in SDG GEL 113472 contained a trace level detect of Acetone at 3.2 ug/L. Three of the four associated soil samples in SDG GEL 113472 also contained low level detects of Acetone above the reporting limit and <10 times the blank level and were qualified as "B" to indicate the presence of the blank contamination.
4. The metals method blank and calibration blanks associated with SDG GEL 113472 had trace level (less than the reporting limit, but greater than the MDL) detects of Aluminum, Antimony, Arsenic, Selenium, Magnesium, Mercury, and Zinc. All of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples.
5. The metals method blank and calibration blanks associated with SDG GEL 113513 had trace level (less than the reporting limit, but greater than the MDL) detects of Aluminum, Arsenic, Calcium, Selenium, Magnesium, and Mercury. All of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples.
6. The metals method blank and calibration blanks associated with SDG GEL 113517 had trace level (less than the reporting limit, but greater than the MDL) detects of Antimony, Arsenic, Calcium, Selenium, Magnesium, Sodium, Potassium, and Zinc. With the exception of Antimony, all of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples. The trace level detects of Antimony in samples PBOW-04-SO-2BG-BH23A (0-1) and PBOW-04-SO-2BG-BH24A (0-1) were qualified as "B" to indicate the potential for blank contamination contributing to the sample result.

7. The metals method blank and calibration blanks associated with SDG GEL 113558 had trace level (less than the reporting limit, but greater than the MDL) detects of Antimony, Arsenic, Calcium, Selenium, Magnesium, Sodium, Potassium, and Zinc. With the exception of Antimony, all of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples. The trace level detect of Antimony in sample PBOW-04-SO-2BG-BH12A (8-10) was qualified as "B" to indicate the potential for blank contamination contributing to the sample result.
8. The metals method blank and calibration blanks associated with SDG GEL 113697 had trace level (less than the reporting limit, but greater than the MDL) detects of Antimony, Arsenic, Calcium, Iron, Lead, Selenium, Magnesium, Sodium, and Zinc. All of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples or non-detects in the case of Antimony.
9. The metals method blank and calibration blanks associated with SDG GEL 113753 had trace level (less than the reporting limit, but greater than the MDL) detects of Aluminum, Arsenic, Calcium, Iron, Lead, Selenium, Magnesium, Mercury, Sodium, and Zinc. All of the blank detections were less than ½ the reporting limit and did not affect the sample results due to the magnitude of the detects of the compounds in the samples.

4.4 DATA SENSITIVITY

Several of the samples included in this evaluation had high analyte concentrations and/or interferences forcing initial sample dilutions to be performed for the PAH, nitroaromatic, and PCB analyses. Therefore, non-detect sample data are impacted by a decrease in sensitivity and elevated detection limits that accompany diluted samples. The laboratories reported target analytes to the Method Detection Level (MDL) to achieve maximum sensitivity and to meet as many of the Region IX preliminary remediation goals and data quality objectives detailed in the project QAPP as possible. Analytes detected above the MDL but below the Method Reporting Limit (MRL) are "J" qualified to indicate the result is estimated and does have less certainty than a result greater than the MRL.

There were ten PCB samples and three associated field duplicate samples analyzed at initial dilutions and reported as non-detect for the target analytes. The laboratory did perform the appropriate clean-up steps on the extracts, but analyzed them at dilutions due to the color of the extracts after the clean-ups. While there were detects in many of the samples, ten of the samples were reported as non-detect for target analytes at an elevated sensitivity level. The samples listed below in the table were reported as non-detect for the PCB target analytes with the sensitivity levels elevated above the Region IX screening criteria due to the dilutions. The shaded rows in the table indicate primary samples with corresponding QA sample results. The QA samples were analyzed undiluted by the QA lab with no detects greater than the Region IX PRGs for the samples shaded in the table below.

Sample	Dilution
PBOW-04-SO-2BG-TR05-1-A	100
PBOW-04-SO-2BG-TR05-1-D	10
PBOW-04-SO-2BG-BH11A (0-1)	2
PBOW-04-SO-2BG-BH10A (0-1)	5
PBOW-04-SO-2BG-BH20A (0-1)	5
PBOW-04-SO-2BG-BH13A (0-1)	50
PBOW-04-SO-2BG-BH14A (0-1)	2
PBOW-04-SO-2BG-BH15A (0-1)	5
PBOW-04-SO-2BG-BH15D (0-1)	5
PBOW-04-SD-2BG-SD01-A	5
PBOW-04-SD-2BG-SD02-A	5
PBOW-04-SD-2BG-SD02-D	5
PBOW-04-SD-2BG-SD03-A	5

4.5 DATA COMPLETENESS

Data completeness was found to be 100% for all PAHs, nitroaromatics, PCBs, dioxin/furans, and metals analytes. A few VOC analytes were rejected due to internal standard and continuing calibration outliers in a few samples. The table following summarizes the VOC analytes rejected and the overall completeness of those analytes for the soil and sediment matrices.

Surface and Subsurface Soil Analytes < 100% completeness

Analyte	Completeness
1,1,2,2-Tetrachloroethane	94%
1,2,3-Trichlorobenzene	94%
1,2,4-Trichlorobenzene	94%
1,2-Dibromo-3-chloropropane	94%
1,2-Dichlorobenzene	94%
1,3-Dichlorobenzene	94%
1,4-Dichlorobenzene	94%
Isopropylbenzene	94%
Methyl isobutyl ketone	94%
Dichlorodifluoromethane	47%
Methylcyclohexane	84%

Data completeness was found to be acceptable (>90%) for all but two of the VOC compounds in the surface and subsurface soils. Dichlorodifluoromethane and methylcyclohexane did not meet the project completeness goals due to calibration outliers requiring data rejection.

Sediment Analytes < 100% completeness

Analyte	Completeness
1,1,2,2-Tetrachloroethane	25%
1,2,3-Trichlorobenzene	25%
1,2,4-Trichlorobenzene	25%
1,2-Dibromo-3-chloropropane	25%
1,2-Dichlorobenzene	25%
1,3-Dichlorobenzene	25%
1,4-Dichlorobenzene	25%
Isopropylbenzene	25%
Methyl isobutyl ketone	25%
Dichlorodifluoromethane	0%
Methylcyclohexane	0%

Data completeness was found to be less than the project completeness goal (<90%) in the sediment data for the eleven VOC analytes listed in the table above. The eleven analytes required rejections due to calibration outliers and internal standard failures. Due to the small number of sediment samples (3+ 1 field duplicate), any rejected data point caused failure of the project goal of 90% completeness. The samples were also analyzed in the same batch, and batch related QC failures unfortunately affected all four samples. This was the case with the dichlorodifluoromethane and methylcyclohexane calibration outliers.

Overall the data were found to be complete and acceptable for the intended data usages as qualified. The few VOC rejected data points must be considered when evaluating the data for risk or remedial type decisions.

ATTACHMENT 1

SAMPLE INFORMATION TABLES

Plum Brook Ordnance 2BG Soil and Sediment Cross Reference Table

Sample Date	Matrix	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-A	ECEN	0405288-01A	N1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-A	GEL	113353001	N1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-A	PDMW	G341-177-1B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-D	ECEN	0405288-02A	FD1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-D	GEL	113353002	FD1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR05-1-D	PDMW	G341-177-2B	FD1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR05-2-A	PDMW	G341-177-3B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR06-1-A	ECEN	0405288-03A	N1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR06-1-A	GEL	113353003	N1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR06-1-A	PDMW	G341-177-4B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR06-2-A	PDMW	G341-177-5B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR06-3-A	PDMW	G341-177-6B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR07-1-A	ECEN	0405288-04A	N1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR07-1-A	GEL	113353004	N1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR07-1-A	PDMW	G341-177-7B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR07-2-A	PDMW	G341-177-8B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR07-3-A	PDMW	G341-177-9B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR08-1-A	ECEN	0405288-05A	N1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR08-1-A	GEL	113353005	N1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR08-1-A	GEL	1200629711	LR1	113353-gel	SW7471A
5/19/2004	SO	PBOW-04-SO-2BG-TR08-1-A	GEL	1200632833	LR1	113353-gel	SW6010B
5/19/2004	SO	PBOW-04-SO-2BG-TR08-1-A	PDMW	G341-177-10B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR08-2-A	PDMW	G341-177-13B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR09-1-A	ECEN	0405288-06A	N1	0405288-ecen	D2216, SW8082, SW8310
5/19/2004	SO	PBOW-04-SO-2BG-TR09-1-A	GEL	113353006	N1	113353-gel	SW6010B, SW7471A, SW8260, SW8330
5/19/2004	SO	PBOW-04-SO-2BG-TR09-1-A	PDMW	G341-177-14B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR09-1-D	PDMW	G341-177-15B	FD1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR09-2-A	PDMW	G341-177-16B	N1	g341-177cor-pd	SW8290
5/19/2004	SO	PBOW-04-SO-2BG-TR10-1-A	PDMW	G341-177-17B	N1	g341-177cor-pd	SW8290
5/19/2004	WQ	PBOW-04-TB-051904-1	GEL	113552001	TB1	113552-gel	SW8260
5/20/2004	SO	PBOW-04-SO-2BG-BH09A(0-1)	ECEN	0405289-03A	N1	0405289-ecen	D2216, SW8082, SW8310
5/20/2004	SO	PBOW-04-SO-2BG-BH09A(0-1)	GEL	113472006	N1	113472-gel	SW6010B, SW7471A, SW8260, SW8330
5/20/2004	SO	PBOW-04-SO-2BG-BH09A(0-1)	PDMW	G341-177-22B	N1	g341-177cor-pd	SW8290
5/20/2004	SO	PBOW-04-SO-2BG-BH10A(0-1)	ECEN	0405289-02A	N1	0405289-ecen	D2216, SW8082, SW8310
5/20/2004	SO	PBOW-04-SO-2BG-BH10A(0-1)	GEL	113472005	N1	113472-gel	SW6010B, SW7471A, SW8260, SW8330
5/20/2004	SO	PBOW-04-SO-2BG-BH10A(0-1)	PDMW	G341-177-21B	N1	g341-177cor-pd	SW8290
5/20/2004	SO	PBOW-04-SO-2BG-BH11A(0-1)	ECEN	0405289-01A	N1	0405289-ecen	D2216, SW8082, SW8310
5/20/2004	SO	PBOW-04-SO-2BG-BH11A(0-1)	GEL	113472004	N1	113472-gel	SW6010B, SW7471A, SW8260, SW8330
5/20/2004	SO	PBOW-04-SO-2BG-BH11A(0-1)	GEL	1200632851	LR1	113472-gel	SW6010B
5/20/2004	SO	PBOW-04-SO-2BG-BH11A(0-1)	PDMW	G341-177-20B	N1	g341-177cor-pd	SW8290
5/20/2004	SO	PBOW-04-SO-2BG-BH17A(0-1)	ECEN	0405289-04A	LR1	0405289-ecen	D2216

Plum Brook Ordnance 2BG Soil and Sediment Cross Reference Table

Sample Date	Matrix	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
5/20/2004	SO	PBOW-04-SO-2BG-BH17A(0-1)	ECEN	0405289-04A	N1	0405289-ecen	D2216, SW8082, SW8310
5/20/2004	SO	PBOW-04-SO-2BG-BH17A(0-1)	GEL	113472007	N1	113472-gel	SW6010B, SW7471A, SW8260, SW8330
5/20/2004	SO	PBOW-04-SO-2BG-BH17A(0-1)	GEL	1200637207	LR1	113472-gel	SW7471A
5/20/2004	SO	PBOW-04-SO-2BG-BH17A(0-1)	PDMW	G341-177-23B	N1	g341-177cor-pd	SW8290
5/20/2004	SO	PBOW-04-SO-2BG-TR10-2-A	PDMW	G341-177-19B	N1	g341-177cor-pd	SW8290
5/20/2004	SO	PBOW-04-SO-2BG-TR10-3-A	PDMW	G341-177-18B	N1	g341-177cor-pd	SW8290
5/20/2004	WQ	PBOW-04-TB-05-20-04-1	GEL	113575001	TB1	113575-gel	SW8260
5/21/2004	SO	PBOW-04-SO-2BG-BH13A(0-1)	ECEN	0405290-04A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH13A(0-1)	GEL	113513004	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH14A(0-1)	ECEN	0405290-05A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH14A(0-1)	GEL	113513005	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH15A(0-1)	ECEN	0405290-06A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH15A(0-1)	GEL	113513006	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH15D(0-1)	ECEN	0405290-07A	FD1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH15D(0-1)	GEL	113513007	FD1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH15D(0-1)	GEL	1200631049	LR1	113513-gel	SW7471A
5/21/2004	SO	PBOW-04-SO-2BG-BH15D(0-1)	GEL	1200633956	LR1	113513-gel	SW6010B
5/21/2004	SO	PBOW-04-SO-2BG-BH15D(0-1)	GEL	1200633956	LR2	113513-gel	SW6010B
5/21/2004	SO	PBOW-04-SO-2BG-BH18A(0-1)	ECEN	0405290-01A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH18A(0-1)	GEL	113513001	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH19A(0-1)	ECEN	0405290-02A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH19A(0-1)	GEL	113513002	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH20A(0-1)	ECEN	0405290-03A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH20A(0-1)	GEL	113513003	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH21A(0-1)	ECEN	0405290-08A	N1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH21A(0-1)	GEL	113513008	N1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	SO	PBOW-04-SO-2BG-BH21D(0-1)	ECEN	0405290-09A	FD1	0405290-ecen	D2216, SW8082, SW8310
5/21/2004	SO	PBOW-04-SO-2BG-BH21D(0-1)	GEL	113513009	FD1	113513-gel	SW6010B, SW7471A, SW8260, SW8330
5/21/2004	WQ	PBOW-4-TB-052104-1	GEL	113514001	TB1	113514-gel	SW8260
5/22/2004	SO	PBOW-04-SO-2BG-BH12A(0-1)	ECEN	0405290-13A	N1	0405290-ecen	D2216, SW8082, SW8310
5/22/2004	SO	PBOW-04-SO-2BG-BH12A(0-1)	GEL	113517004	N1	113517-gel	SW6010B, SW7471A, SW8260, SW8330
5/22/2004	SO	PBOW-04-SO-2BG-BH16A(0-1)	ECEN	0405290-14A	N1	0405290-ecen	D2216, SW8082, SW8310
5/22/2004	SO	PBOW-04-SO-2BG-BH16A(0-1)	GEL	113517005	N1	113517-gel	SW6010B, SW7471A, SW8260, SW8330
5/22/2004	SO	PBOW-04-SO-2BG-BH22A(0-1)	ECEN	0405290-10ALR	LR1	0405290-ecen	D2216
5/22/2004	SO	PBOW-04-SO-2BG-BH22A(0-1)	ECEN	0405290-10A	N1	0405290-ecen	D2216, SW8082, SW8310
5/22/2004	SO	PBOW-04-SO-2BG-BH22A(0-1)	GEL	113517001	N1	113517-gel	SW6010B, SW7471A, SW8260, SW8330
5/22/2004	SO	PBOW-04-SO-2BG-BH22A(0-1)	GEL	1200634002	LR1	113558-gel	SW6010B
5/22/2004	SO	PBOW-04-SO-2BG-BH23A(0-1)	ECEN	0405290-11A	N1	0405290-ecen	D2216, SW8082, SW8310
5/22/2004	SO	PBOW-04-SO-2BG-BH23A(0-1)	GEL	113517002	N1	113517-gel	SW6010B, SW7471A, SW8260, SW8330
5/22/2004	SO	PBOW-04-SO-2BG-BH24A(0-1)	ECEN	0405290-12A	N1	0405290-ecen	D2216, SW8082, SW8310
5/22/2004	SO	PBOW-04-SO-2BG-BH24A(0-1)	GEL	113517003	N1	113517-gel	SW6010B, SW7471A, SW8260, SW8330

Plum Brook Ordnance 2BG Soil and Sediment Cross Reference Table

Sample Date	Matrix	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
5/22/2004	WQ	PBOW-04-TB-052204-1	GEL	113518001	TB1	113518-gel	SW8260
5/23/2004	SE	PBOW-04-SD-2BG-SD01-A	ECEN	0405318-01A	N1	0405318-ecen	D2216, SW8082, SW8310
5/23/2004	SE	PBOW-04-SD-2BG-SD01-A	GEL	113558010	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/23/2004	SE	PBOW-04-SD-2BG-SD01-A	PDMW	G341-179-1C	N1	g341-179cor-pd	SW8290
5/23/2004	SE	PBOW-04-SD-2BG-SD02-A	ECEN	0405318-02A	N1	0405318-ecen	D2216, SW8082, SW8310
5/23/2004	SE	PBOW-04-SD-2BG-SD02-A	ECEN	0405318-03A	FD1	0405318-ecen	D2216, SW8082, SW8310
5/23/2004	SE	PBOW-04-SD-2BG-SD02-A	GEL	113558011	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/23/2004	SE	PBOW-04-SD-2BG-SD02-A	PDMW	G341-179-4B	N1	g341-179cor-pd	SW8290
5/23/2004	SE	PBOW-04-SD-2BG-SD02-A	PDMW	G341-179-5B	FD1	g341-179cor-pd	SW8290
5/23/2004	SE	PBOW-04-SD-2BG-SD02-D	GEL	113558012	FD1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/23/2004	SE	PBOW-04-SD-2BG-SD03-A	ECEN	0405318-04A	N1	0405318-ecen	D2216, SW8082, SW8310
5/23/2004	SE	PBOW-04-SD-2BG-SD03-A	GEL	113558013	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/23/2004	SE	PBOW-04-SD-2BG-SD03-A	PDMW	G341-179-6B	N1	g341-179cor-pd	SW8290
5/23/2004	WQ	PBOW-04-TB-052304-1	GEL	113562001	TB1	113562-gel	SW8260
5/24/2004	SO	PBOW-04-SO-2BG-BH11A(3-5)	ECEN	0405318-08A	N1	0405318-ecen	D2216, SW8082, SW8310
5/24/2004	SO	PBOW-04-SO-2BG-BH11A(3-5)	GEL	113558004	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BG-BH12A(3-5)	ECEN	0405318-05A	N1	0405318-ecen	D2216, SW8082, SW8310
5/24/2004	SO	PBOW-04-SO-2BG-BH12A(3-5)	GEL	113558001	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BG-BH12A(3-5)	GEL	1200632326	LR1	113558-gel	SW7471A
5/24/2004	SO	PBOW-04-SO-2BG-BH13A(3-5)	ECEN	0405318-09A	N1	0405318-ecen	D2216, SW8082, SW8310
5/24/2004	SO	PBOW-04-SO-2BG-BH13A(3-5)	GEL	113558005	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BG-BH13D(3-5)	ECEN	0405318-06A	FD1	0405318-ecen	D2216, SW8082, SW8310
5/24/2004	SO	PBOW-04-SO-2BG-BH13D(3-5)	GEL	113558002	FD1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BG-BH14A(3-5)	ECEN	0405318-07A	N1	0405318-ecen	D2216, SW8082, SW8310
5/24/2004	SO	PBOW-04-SO-2BG-BH14A(3-5)	GEL	113558003	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BGBH11A(8-10)	ECEN	0405318-18A	N1	0405318-ecen	D2216, SW8310
5/24/2004	SO	PBOW-04-SO-2BGBH11A(8-10)	GEL	113558009	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BGBH12A(8-10)	ECEN	0405318-15A	N1	0405318-ecen	D2216, SW8310
5/24/2004	SO	PBOW-04-SO-2BGBH12A(8-10)	GEL	113558006	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BGBH13A(8-10)	ECEN	0405318-16A	N1	0405318-ecen	D2216, SW8310
5/24/2004	SO	PBOW-04-SO-2BGBH13A(8-10)	GEL	113558007	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	SO	PBOW-04-SO-2BGBH14A(8-10)	ECEN	0405318-17A	N1	0405318-ecen	D2216, SW8310
5/24/2004	SO	PBOW-04-SO-2BGBH14A(8-10)	GEL	113558008	N1	113558-gel	SW6010B, SW7471A, SW8260, SW8330
5/24/2004	WQ	PBOW-04-TB-052404-1	GEL	113562002	TB1	113562-gel	SW8260
5/24/2004	WQ	PBOW-04-TB-052404-2	GEL	113562003	TB2	113562-gel	SW8260
5/25/2004	SO	PBOW-04-SO-2BG-BH15A(3-5)	ECEN	0405318-11A	N1	0405318-ecen	D2216, SW8082, SW8310
5/25/2004	SO	PBOW-04-SO-2BG-BH15A(3-5)	GEL	113697002	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BG-BH15D(3-5	GEL	113697003	FD1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BG-BH15D(3-5)	ECEN	0405318-12A	FD1	0405318-ecen	D2216, SW8082, SW8310
5/25/2004	SO	PBOW-04-SO-2BG-BH16A(3-5)	ECEN	0405318-10ALR	LR1	0405318-ecen	D2216
5/25/2004	SO	PBOW-04-SO-2BG-BH16A(3-5)	ECEN	0405318-10A	N1	0405318-ecen	D2216, SW8082, SW8310

Plum Brook Ordnance 2BG Soil and Sediment Cross Reference Table

Sample Date	Matrix	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
5/25/2004	SO	PBOW-04-SO-2BG-BH16A(3-5)	GEL	113697001	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BG-BH16A(3-5)	GEL	1200633515	LR1	113697-gel	SW7471A
5/25/2004	SO	PBOW-04-SO-2BG-BH16A(3-5)	GEL	1200634008	LR1	113697-gel	SW6010B
5/25/2004	SO	PBOW-04-SO-2BG-BH20A(3-5)	ECEN	0405318-13A	N1	0405318-ecen	D2216, SW8082, SW8310
5/25/2004	SO	PBOW-04-SO-2BG-BH20A(3-5)	GEL	113697004	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BG-BH20D(3-5)	GEL	113697005	FD1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BGBH15A(8-10)	ECEN	0405318-20ALR	LR1	0405318-ecen	D2216
5/25/2004	SO	PBOW-04-SO-2BGBH15A(8-10)	ECEN	0405318-20A	N1	0405318-ecen	D2216, SW8310
5/25/2004	SO	PBOW-04-SO-2BGBH15A(8-10)	GEL	113697008	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BGBH15A(8-10)	GEL	1200633516	LR1	113697-gel	SW7471A
5/25/2004	SO	PBOW-04-SO-2BGBH15A(8-10)	GEL	1200634009	LR1	113697-gel	SW6010B
5/25/2004	SO	PBOW-04-SO-2BGBH16A(8-10)	ECEN	0405318-19A	N1	0405318-ecen	D2216, SW8310
5/25/2004	SO	PBOW-04-SO-2BGBH16A(8-10)	GEL	113697007	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	SO	PBOW-04-SO-2BGBH20A(8-10)	ECEN	0405318-14A	N1	0405318-ecen	D2216, SW8082, SW8310
5/25/2004	SO	PBOW-04-SO-2BGBH20A(8-10)	GEL	113697006	N1	113697-gel	SW6010B, SW7471A, SW8260, SW8330
5/25/2004	WQ	PBOW-04-TB-052504-1	GEL	113700001	TB1	113700-gel	SW8260
5/25/2004	WQ	PBOW-04-TB-052504-3	GEL	113700002	TB2	113700-gel	SW8260
5/26/2004	SO	PBOW-04-SO-2BG-BH09A(3-5)	ECEN	0405342-01A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BG-BH09A(3-5)	GEL	113753001	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BG-BH09A(3-5)	GEL	1200634018	LR1	113753-gel	SW6010B
5/26/2004	SO	PBOW-04-SO-2BG-BH10A(3-5)	ECEN	0405342-02A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BG-BH10A(3-5)	GEL	113753002	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BG-BH17A(3-5)	ECEN	0405342-04A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BG-BH17A(3-5)	GEL	113753003	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BG-BH18A(3-5)	ECEN	0405342-06A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BG-BH18A(3-5)	GEL	113753005	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BG-BH19A(3-5)	ECEN	0405342-08A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BG-BH19A(3-5)	GEL	113753007	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BGBH09A(8-10)	GEL	113753009	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BGBH10A(8-10)	ECEN	0405342-03A	N1	0405342-ecen	D2216, SW8310
5/26/2004	SO	PBOW-04-SO-2BGBH10A(8-10)	GEL	113753010	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BGBH17A(8-10)	ECEN	0405342-05A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BGBH17A(8-10)	GEL	113753004	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BGBH18A(8-10)	ECEN	0405342-07A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BGBH18A(8-10)	GEL	113753006	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	SO	PBOW-04-SO-2BGBH19A(8-10)	ECEN	0405342-09A	N1	0405342-ecen	D2216, SW8082, SW8310
5/26/2004	SO	PBOW-04-SO-2BGBH19A(8-10)	GEL	113753008	N1	113753-gel	SW6010B, SW7471A, SW8260, SW8330
5/26/2004	WQ	PBOW-04-TB-052604-1	GEL	113757001	TB1	113757-gel	SW8260

ATTACHMENT 2

TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Plum Brook
2004 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(0-1) BH09 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(0-1) BH10 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg	8.29		22.7	
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg	5.68	J	7.49	J
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg	0.593	J	0.715	J
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg	1.29	J	4.52	
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg	7.35	J	8.35	J
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg	1.64	J	4.89	
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg	4.49	J	4.11	J
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg	1.32	J	3.56	
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg	0.375	J	0.54	J
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg	2.67		8.88	
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg	3.7	J	4.41	J
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg	3.79	J	4.98	J
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg	8.25	J	11.8	J
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg	1.79		**4.3**	
2,3,7,8-TCDF	SW8290	165			ng/Kg	7.14	J	12.2	J
OCDD	SW8290	119			ng/Kg	35.8		86.4	
OCDF	SW8290	85.4			ng/Kg	5.29		5.31	
Total HpCDD	SW8290	51.4			ng/Kg	15.7		40.8	
Total HpCDF	SW8290	117			ng/Kg	8.78		11.3	
Total HxCDD	SW8290	43.8			ng/Kg	13.6		36.1	
Total HxCDF	SW8290	678			ng/Kg	34		40.8	
Total PeCDD	SW8290	36.1			ng/Kg	7.51		17.5	
Total PeCDF	SW8290	1090			ng/Kg	51.6		68.2	
Total TCDD	SW8290	20.5			ng/Kg	3.49		10.5	
Total TCDF	SW8290	909			ng/Kg	40.8		65	
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	24.56		32.46	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	2450		928	J
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	429	J	125	U
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	487	J
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

Plum Brook
2004 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(0-1) BH09 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(0-1) BH10 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	10910	J	10910	J
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.424	UJ	0.428	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	8.68	J	7.15	J
Barium (total)	SW6010B	314	826	540	mg/Kg	76.3	J	82.5	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.644		0.805	
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.276	J	0.284	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	4480	J	4170	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	16.6		16.9	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	5.79		7.52	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	23.4		24.5	
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	17630		16220	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**182**		**71.9**	
Magnesium (total)	SW6010B	6600	10400		mg/Kg	2830	J	1840	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	245	J	252	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.518	J	0.503	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	17.2		24.1	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1290	J	1280	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	1.02		0.202	U
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.111	U	0.112	U
Sodium (total)	SW6010B	250			mg/Kg	90.3		54.1	
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.23	U	**1.39**	**J**
Tin (total)	SW6010B	5310		4700000	ug/Kg				
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	30.1		31.3	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	89.4		71.7	
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	376	NJ	153	NJ
Acenaphthylene	SW8310	4140			ug/Kg	1150	NJ	708	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	17	J	17.2	NJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	80.5	NJ	46.2	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	**103**	**NJ**	**73**	**NJ**
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	95.7	NJ	76.4	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	84.6	J	30.3	NJ
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	98.9	NJ	35.4	NJ
Chrysene	SW8310	297		62000	ug/Kg	97.6	J	57.6	NJ

Plum Brook
2004 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(0-1) BH09 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(0-1) BH10 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	16.9	U	3.81	U
Fluoranthene	SW8310	350		230000	ug/Kg	151	J	121	NJ
Fluorene	SW8310	91.3		270000	ug/Kg	48.5	U	16.7	J
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	49.7	NJ	42.4	NJ
Naphthalene	SW8310	9930		5600	ug/Kg	81.8	J	150	NJ
Phenanthrene	SW8310	404			ug/Kg	86.4	J	80.1	NJ
Pyrene	SW8310	295		230000	ug/Kg	107	J	59.3	NJ
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	340	U	383	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	2020	U	2270	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	237	U	266	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	276	U	311	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	403	U	454	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	745	U	838	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	**840**	J	509	U
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.549	U	0.616	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.943	U	1.06	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.59	U	2.91	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.56	U	0.628	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.487	U	0.546	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.518	U	0.581	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.363	U	0.407	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.373	U	0.418	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.777	U	0.872	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.435	U	0.488	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.466	U	0.523	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.446	U	0.5	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.497	U	0.558	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.321	U	0.36	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.383	U	0.43	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	3.88	U	4.35	U
2-Hexanone	SW8260				ug/Kg	3.91	U	4.38	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.18	U	4.68	U
Acetone	SW8260	17.8		1400000	ug/Kg	3.65	U	15.5	B
Benzene	SW8260	20.6		640	ug/Kg	0.466	U	0.523	U
Bromochloromethane	SW8260				mg/Kg	0.000518	U	0.000581	U
Bromodichloromethane	SW8260			820	ug/Kg	0.508	U	0.57	U
Bromoform	SW8260			62000	ug/Kg	0.508	U	0.57	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(0-1) BH09 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(0-1) BH10 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.518	U	0.581	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.45	U	2.74	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.508	U	0.57	U
Chlorobenzene	SW8260			15000	ug/Kg	0.425	U	0.477	U
Chloroethane	SW8260			3000	ug/Kg	0.839	U	0.942	U
Chloroform	SW8260	2		220	ug/Kg	0.539	U	0.604	U
Chloromethane	SW8260			4700	ug/Kg	0.383	U	0.43	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.497	UJ	0.558	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.518	U	0.581	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.86	UJ	0.965	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.394	U	0.442	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.466	U	0.523	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.42	U	3.84	U
Methylcyclohexane	SW8260	1.9		260000	ug/Kg	0.529	U	0.593	U
Methylene Chloride	SW8260			9100	ug/Kg	1.4	U	1.57	U
Styrene	SW8260			440000	ug/Kg	0.404	U	0.453	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.549	U	0.616	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.394	U	0.442	U
Toluene	SW8260	1570		66000	ug/Kg	0.352	U	0.395	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.466	U	0.523	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.518	U	0.581	U
Vinyl chloride	SW8260			79	ug/Kg	0.58	U	0.651	U
Xylenes, Total	SW8260			27000	ug/Kg	0.404	U	0.453	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.487	U	0.546	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.446	U	0.5	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.549	U	0.616	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.259	U	0.291	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH11A(0-1) BH11 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(0-1) BH12 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg	9.98			
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg	4.51	J		
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg	0.239	U		
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg	1.89	J		
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg	3.85	J		
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg	2.16	J		
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg	1.97	J		
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg	1.73	J		
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg	0.475	U		
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg	3.76			
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg	1.83	J		
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg	2.46	J		
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg	5	J		
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg	2			
2,3,7,8-TCDF	SW8290	165			ng/Kg	5.74	J		
OCDD	SW8290	119			ng/Kg	43.4			
OCDF	SW8290	85.4			ng/Kg	7.3			
Total HpCDD	SW8290	51.4			ng/Kg	18.6			
Total HpCDF	SW8290	117			ng/Kg	6.76			
Total HxCDD	SW8290	43.8			ng/Kg	17.5			
Total HxCDF	SW8290	678			ng/Kg	18.9			
Total PeCDD	SW8290	36.1			ng/Kg	10.6			
Total PeCDF	SW8290	1090			ng/Kg	27.3			
Total TCDD	SW8290	20.5			ng/Kg	4.35			
Total TCDF	SW8290	909			ng/Kg	23.4			
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	35.66		25.24	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	125	U	4640	
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	125	U	1040	J
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	152	J
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	125	U	2040	J
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH11A(0-1) BH11 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(0-1) BH12 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	8840	J	11330	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.427	UJ	0.459	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	5.13	J	7.73	J
Barium (total)	SW6010B	314	826	540	mg/Kg	47.1	J	142	
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.515	J	0.59	J
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.168	J	0.704	
Calcium (total)	SW6010B	25090	52300		mg/Kg	2430	J	25090	
Chromium (total)	SW6010B	26.7	29		mg/Kg	11.5		26.7	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	4.02		6.06	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	13		61.5	
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	11660		29960	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	31.9		**295**	**J**
Magnesium (total)	SW6010B	6600	10400		mg/Kg	1560	J	5910	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	147	J	317	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.0308	J	0.121	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	11.6		25.8	
Potassium (total)	SW6010B	1950	3390		mg/Kg	938	J	1870	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	0.202	U	1.8	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.112	U	0.121	U
Sodium (total)	SW6010B	250			mg/Kg	47.8		99.3	
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.24	U	1.34	U
Tin (total)	SW6010B	5310		4700000	ug/Kg				
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	21.3		28.6	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	38.8		221	
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	32.1	U	697	NJ
Acenaphthylene	SW8310	4140			ug/Kg	26.8	J	1960	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	6.73	NJ	38.8	NJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	4.14	J	186	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	19.2	NJ	**229**	**NJ**
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	29.6	NJ	286	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	14	J	220	NJ
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	30.9	NJ	283	NJ
Chrysene	SW8310	297		62000	ug/Kg	18.8	J	297	NJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH11A(0-1) BH11 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(0-1) BH12 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	3.77	U	**124**	NJ
Fluoranthene	SW8310	350		230000	ug/Kg	44.5	J	350	NJ
Fluorene	SW8310	91.3		270000	ug/Kg	13.2	J	91.3	J
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	14.5	NJ	152	NJ
Naphthalene	SW8310	9930		5600	ug/Kg	25.4	J	136	NJ
Phenanthrene	SW8310	404			ug/Kg	21.3	J	171	NJ
Pyrene	SW8310	295		230000	ug/Kg	20.5	J	295	NJ
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	160	U	988	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	948	U	5860	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	111	U	687	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	130	U	803	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	189	U	1170	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	350	U	2160	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	212	U	**5330**	
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.536	U	0.587	UJ
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.921	U	1.01	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.53	U	2.77	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.546	U	0.599	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.476	U	0.521	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.506	U	0.66	J
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.354	U	0.388	UJ
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.364	U	0.399	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.759	U	0.831	UJ
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.425	U	0.466	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.455	U	0.499	UJ
1,2-Dichloroethane	SW8260			280	ug/Kg	0.435	U	0.477	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.486	U	0.532	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.314	U	0.344	UJ
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.374	U	0.41	UJ
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	3.78	U	4.15	UJ
2-Hexanone	SW8260				ug/Kg	3.81	U	4.18	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.08	U	4.47	UJ
Acetone	SW8260	17.8		1400000	ug/Kg	8.1	B	3.9	U
Benzene	SW8260	20.6		640	ug/Kg	0.455	U	0.499	U
Bromochloromethane	SW8260				mg/Kg	0.000506	U	0.000554	U
Bromodichloromethane	SW8260			820	ug/Kg	0.496	U	0.543	UJ
Bromoform	SW8260			62000	ug/Kg	0.496	U	0.543	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH11A(0-1) BH11 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(0-1) BH12 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.506	U	0.554	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	2.39	U	2.62	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.496	U	0.543	UJ
Chlorobenzene	SW8260			15000	ug/Kg	0.415	U	0.454	U
Chloroethane	SW8260			3000	ug/Kg	0.82	U	0.898	U
Chloroform	SW8260	2		220	ug/Kg	0.526	U	0.576	U
Chloromethane	SW8260			4700	ug/Kg	0.374	U	0.41	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.486	UJ	0.532	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.506	U	0.554	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.84	UJ	0.92	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.385	U	0.421	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.455	U	0.499	UJ
Methyl Acetate	SW8260			2200000	ug/Kg	3.34	U	3.66	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg	0.516	U	0.565	U
Methylene Chloride	SW8260			9100	ug/Kg	1.37	U	1.5	U
Styrene	SW8260			440000	ug/Kg	0.395	U	0.432	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.536	U	0.587	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.385	U	0.421	UJ
Toluene	SW8260	1570		66000	ug/Kg	0.344	U	0.377	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.455	U	0.499	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.506	U	0.554	UJ
Vinyl chloride	SW8260			79	ug/Kg	0.567	U	0.621	U
Xylenes, Total	SW8260			27000	ug/Kg	0.395	U	0.432	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.476	U	0.521	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.435	U	0.477	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.536	U	0.587	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.253	U	0.277	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH13A(0-1) BH13 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(0-1) BH14 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	21.95		24.73	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	2230	J	364	J
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	1370	J	125	U
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH13A(0-1) BH13 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(0-1) BH14 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	10500		11310	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.438	UJ	0.427	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	5.72	J	6.13	J
Barium (total)	SW6010B	314	826	540	mg/Kg	98.6	J	69.1	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.596	J	0.555	J
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.269	J	0.163	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	4400	J	4400	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	15.5		15.5	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	5.22	J	5.25	J
Copper (total)	SW6010B	151	56.2	310	mg/Kg	27.4	J	19.1	J
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	15080	J	15660	J
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**148**	J	41.9	J
Magnesium (total)	SW6010B	6600	10400		mg/Kg	2610	J	3080	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	244	J	206	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.0565	J	0.0468	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	17.3		14.2	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1500	J	1240	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	0.586	J	1.32	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.153	J	0.152	J
Sodium (total)	SW6010B	250			mg/Kg	62.5	J	60.5	J
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.28	U	1.24	U
Tin (total)	SW6010B	5310		4700000	ug/Kg	486	U	474	U
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	24.6		25.6	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	81.7	J	53.9	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	251	NJ	78.8	NJ
Acenaphthylene	SW8310	4140			ug/Kg	605	NJ	97.7	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	11.8	NJ	10.6	NJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	8.86	NJ	21.7	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	23.5	NJ	38.1	NJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	36.3	NJ	34.1	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	13.7	J	20	J
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	112	NJ	137	NJ
Chrysene	SW8310	297		62000	ug/Kg	26	NJ	43.6	NJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH13A(0-1) BH13 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(0-1) BH14 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	3.33	U	3.45	U
Fluoranthene	SW8310	350		230000	ug/Kg	78.8	NJ	117	NJ
Fluorene	SW8310	91.3		270000	ug/Kg	40.4	J	13.3	J
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	23.5	NJ	13.1	NJ
Naphthalene	SW8310	9930		5600	ug/Kg	606	NJ	183	NJ
Phenanthrene	SW8310	404			ug/Kg	55.2	NJ	76.2	NJ
Pyrene	SW8310	295		230000	ug/Kg	24.9	J	36.8	J
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	10000	U	404	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	59400	U	2400	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	6950	U	281	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	8130	U	328	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	11900	U	478	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	21900	U	884	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	13300	U	536	U
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.5	U	0.588	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.858	U	1.01	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.36	U	2.78	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.509	U	0.599	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.443	U	0.522	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.472	U	0.555	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.33	U	0.389	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.339	U	0.4	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.707	U	0.833	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.396	U	0.466	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.424	U	0.5	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.405	U	0.477	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.453	U	0.533	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.292	U	0.344	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.349	U	0.411	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	3.53	U	4.15	U
2-Hexanone	SW8260				ug/Kg	3.56	U	4.18	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.8	U	4.47	U
Acetone	SW8260	17.8		1400000	ug/Kg	3.32	U	3.91	U
Benzene	SW8260	20.6		640	ug/Kg	0.424	U	0.5	U
Bromochloromethane	SW8260				mg/Kg	0.000472	U	0.000555	U
Bromodichloromethane	SW8260			820	ug/Kg	0.462	U	0.544	U
Bromoform	SW8260			62000	ug/Kg	0.462	U	0.544	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH13A(0-1) BH13 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(0-1) BH14 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.472	U	0.555	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.23	U	2.62	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.462	U	0.544	U
Chlorobenzene	SW8260			15000	ug/Kg	0.387	UJ	0.455	U
Chloroethane	SW8260			3000	ug/Kg	0.764	U	0.899	U
Chloroform	SW8260	2		220	ug/Kg	0.49	U	0.577	U
Chloromethane	SW8260			4700	ug/Kg	0.349	U	0.411	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.453	UJ	0.72	J
Dibromochloromethane	SW8260			1100	ug/Kg	0.472	U	0.555	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	0.358	U	0.422	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.424	U	0.5	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.11	UJ	3.66	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg		UR		UR
Methylene Chloride	SW8260			9100	ug/Kg	1.27	U	1.5	U
Styrene	SW8260			440000	ug/Kg	0.368	U	0.433	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.5	U	0.588	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.6	J	0.422	U
Toluene	SW8260	1570		66000	ug/Kg	0.321	U	0.377	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.424	U	0.5	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.472	U	0.555	U
Vinyl chloride	SW8260			79	ug/Kg	0.528	U	0.622	U
Xylenes, Total	SW8260			27000	ug/Kg	0.368	U	0.433	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.443	U	0.522	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.405	U	0.477	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.5	U	0.588	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.236	U	0.278	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH15A(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	24.2		20.44	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	441	
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	13600	J	**47700**	**J**
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	341	J	920	J
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	1920	J	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH15A(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	12320		10550	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.429	UJ	0.534	J
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	14.2	J	8.04	J
Barium (total)	SW6010B	314	826	540	mg/Kg	128	J	96	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.989		0.712	
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.191	J	0.166	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	3090	J	4400	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	15.2		14.3	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	13.1	J	6.84	J
Copper (total)	SW6010B	151	56.2	310	mg/Kg	38.9	J	31.7	J
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	24280	J	15070	J
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**89.6**	J	**116**	J
Magnesium (total)	SW6010B	6600	10400		mg/Kg	2190	J	2210	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	611	J	261	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.0555		0.0617	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	27.5		18.3	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1580	J	1140	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	0.638	J	0.194	U
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.185	J	0.191	J
Sodium (total)	SW6010B	250			mg/Kg	59.7	J	106	J
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.25	U	1.2	U
Tin (total)	SW6010B	5310		4700000	ug/Kg	476	U	3780	
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	27.9		24.3	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	70.3	J	161	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	213	J	1070	NJ
Acenaphthylene	SW8310	4140			ug/Kg	724	NJ	1630	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	8.99	UJ	23.3	NJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	15.9	U	61.9	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	32.3	J	**62.7**	NJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	29.2	J	62.2	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	28.2	U	60.3	J
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	44.1	NJ	127	NJ
Chrysene	SW8310	297		62000	ug/Kg	35.2	J	69.9	J

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH15A(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	17	U	16.3	U
Fluoranthene	SW8310	350		230000	ug/Kg	50.5	J	108	J
Fluorene	SW8310	91.3		270000	ug/Kg	48.9	U	64.2	J
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	9.62	J	27	J
Naphthalene	SW8310	9930		5600	ug/Kg	2680	NJ	795	NJ
Phenanthrene	SW8310	404			ug/Kg	39.5	J	78.2	J
Pyrene	SW8310	295		230000	ug/Kg	54.1	U	62.8	J
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	1020	U	929	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	6060	U	5510	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	710	U	645	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	830	U	754	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	1210	U	1100	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	2240	U	2030	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	1360	U	1230	U
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.524	UJ	0.536	UJ
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.899	UJ	0.921	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.47	U	2.53	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.534	U	0.546	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.464	U	0.476	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.62	J	0.506	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.346	U	0.354	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.356	UJ	0.364	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.741	U	0.759	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.415	U	0.425	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.445	U	0.455	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.425	U	0.435	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.474	U	0.486	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.306	U	0.314	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.366	U	0.374	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	3.7	UJ	3.78	UJ
2-Hexanone	SW8260				ug/Kg	3.72	UJ	3.81	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.98	UJ	4.08	UJ
Acetone	SW8260	17.8		1400000	ug/Kg	3.48	U	3.56	U
Benzene	SW8260	20.6		640	ug/Kg	0.445	U	0.455	U
Bromochloromethane	SW8260				mg/Kg	0.000494	U	0.000506	U
Bromodichloromethane	SW8260			820	ug/Kg	0.484	UJ	0.496	UJ
Bromoform	SW8260			62000	ug/Kg	0.484	U	0.496	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH15A(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(0-1) BH15 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.494	UJ	0.506	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	2.33	U	2.39	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.484	UJ	0.496	UJ
Chlorobenzene	SW8260			15000	ug/Kg	0.405	U	0.415	U
Chloroethane	SW8260			3000	ug/Kg	0.8	U	0.819	U
Chloroform	SW8260	2		220	ug/Kg	0.514	U	0.526	U
Chloromethane	SW8260			4700	ug/Kg	0.366	U	0.374	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.474	U	0.486	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.494	UJ	0.506	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.82	UJ	0.84	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.375	U	0.384	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.445	U	0.455	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.26	UJ	3.34	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg	0.504	U	0.516	U
Methylene Chloride	SW8260			9100	ug/Kg	1.33	U	1.37	U
Styrene	SW8260			440000	ug/Kg	0.385	U	0.395	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.524	U	0.536	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.375	UJ	0.39	J
Toluene	SW8260	1570		66000	ug/Kg	0.336	U	0.344	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.445	U	0.455	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.494	UJ	0.506	UJ
Vinyl chloride	SW8260			79	ug/Kg	0.553	U	0.567	U
Xylenes, Total	SW8260			27000	ug/Kg	0.385	U	0.395	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.464	U	0.476	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.425	U	0.435	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.524	U	0.536	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.247	U	0.253	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(0-1) BH16 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(0-1) BH17 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg			28.5	
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg			79.1	J
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg			12	
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg			4.34	
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg			152	J
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg			5.55	
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg			87.6	J
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg			4.21	
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg			5.55	
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg			11.4	
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg			84.8	J
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg			72.8	J
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg			187	J
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg			**6.58**	
2,3,7,8-TCDF	SW8290	165			ng/Kg			165	J
OCDD	SW8290	119			ng/Kg			119	
OCDF	SW8290	85.4			ng/Kg			85.4	
Total HpCDD	SW8290	51.4			ng/Kg			51.4	
Total HpCDF	SW8290	117			ng/Kg			117	
Total HxCDD	SW8290	43.8			ng/Kg			43.8	
Total HxCDF	SW8290	678			ng/Kg			678	
Total PeCDD	SW8290	36.1			ng/Kg			36.1	
Total PeCDF	SW8290	1090			ng/Kg			1090	
Total TCDD	SW8290	20.5			ng/Kg			20.5	
Total TCDF	SW8290	909			ng/Kg			909	
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	17.71		29.98	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	686	J
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	125	U	6540	J
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	125	U	3040	J
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	977	
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			860	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	125	U	3260	J
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(0-1) BH16 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(0-1) BH17 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	9250		9210	J
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.421	UJ	0.41	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	6.39	J	6.45	J
Barium (total)	SW6010B	314	826	540	mg/Kg	66.2		314	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.549	J	0.588	J
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.0771	J	0.611	
Calcium (total)	SW6010B	25090	52300		mg/Kg	2550		9540	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	10.7		26.6	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	4.86		7.57	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	14.7		94.9	
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	11550		23170	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	37.4	J	**730**	
Magnesium (total)	SW6010B	6600	10400		mg/Kg	1380	J	5520	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	197	J	290	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.046	J	0.409	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	13.5		56.3	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1060	J	1350	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	0.546	J	1.75	
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.111	U	0.108	U
Sodium (total)	SW6010B	250			mg/Kg	45.9		250	
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.23	U	1.19	U
Tin (total)	SW6010B	5310		4700000	ug/Kg				
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	20.3		25.9	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	38.4		339	
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	127	NJ	772	NJ
Acenaphthylene	SW8310	4140			ug/Kg	166	NJ	614	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	4.93	UJ	21.4	J
Benzo(a)anthracene	SW8310	186		620	ug/Kg	8.72	UJ	31.3	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	**65.1**	**NJ**	**62.7**	**NJ**
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	24.5	NJ	101	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	39.6	J	94.7	J
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	59.7	NJ	75.5	NJ
Chrysene	SW8310	297		62000	ug/Kg	6.33	UJ	38.9	J

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-BH16A(0-1) BH16 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(0-1) BH17 05/20/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	9.33	UJ	18.4	U
Fluoranthene	SW8310	350		230000	ug/Kg	39.4	J	139	J
Fluorene	SW8310	91.3		270000	ug/Kg	26.8	UJ	52.9	U
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	27.8	NJ	33.9	J
Naphthalene	SW8310	9930		5600	ug/Kg	29	UJ	3210	NJ
Phenanthrene	SW8310	404			ug/Kg	58.7	J	68.8	J
Pyrene	SW8310	295		230000	ug/Kg	40.1	J	58.7	U
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	179	U	5520	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1060	U	32700	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	124	U	3840	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	145	U	4480	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	212	U	6540	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	392	U	12100	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	238	U	**11600**	J
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.594	UJ	0.52	UJ
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.02	UJ		UR
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.8	U	2.45	UJ
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.605	U	0.529	UJ
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.526	U	0.461	UJ
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.57	J	0.66	J
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.392	U		UR
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.403	UJ		UR
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.84	U	0.735	UJ
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.47	U	0.412	UJ
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.504	U		UR
1,2-Dichloroethane	SW8260			280	ug/Kg	0.482	U	0.422	UJ
1,2-Dichloropropane	SW8260			340	ug/Kg	0.538	U	0.471	UJ
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.347	U		UR
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.414	U		UR
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	4.19	UJ	3.67	UJ
2-Hexanone	SW8260				ug/Kg	4.22	UJ		UR
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.51	UJ		UR
Acetone	SW8260	17.8		1400000	ug/Kg	3.94	U	8.9	JB
Benzene	SW8260	20.6		640	ug/Kg	0.504	U	1.7	J
Bromochloromethane	SW8260				mg/Kg	0.00056	U	0.00049	UJ
Bromodichloromethane	SW8260			820	ug/Kg	0.549	UJ	0.48	UJ
Bromoform	SW8260			62000	ug/Kg	0.549	U	0.48	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(0-1) BH16 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(0-1) BH17 05/20/2004 0 0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.56	UJ	0.49	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	2.64	U	2.31	UJ
Carbon tetrachloride	SW8260			250	ug/Kg	0.549	UJ	0.48	UJ
Chlorobenzene	SW8260			15000	ug/Kg	0.459	U	0.402	UJ
Chloroethane	SW8260			3000	ug/Kg	0.907	U	0.794	UJ
Chloroform	SW8260	2		220	ug/Kg	0.582	U	2	J
Chloromethane	SW8260			4700	ug/Kg	0.414	U	0.363	UJ
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.538	U	0.471	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.56	UJ	0.49	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.93	UJ	0.814	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.426	U	0.373	UJ
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.504	U		UR
Methyl Acetate	SW8260			2200000	ug/Kg	3.7	UJ	3.24	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg	0.571	U	1.9	J
Methylene Chloride	SW8260			9100	ug/Kg	1.51	U	1.32	UJ
Styrene	SW8260			440000	ug/Kg	0.437	U	0.382	UJ
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.594	U	0.52	UJ
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.43	J	0.373	UJ
Toluene	SW8260	1570		66000	ug/Kg	0.381	U	3.5	J
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.504	U	0.441	UJ
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.56	UJ	0.49	UJ
Vinyl chloride	SW8260			79	ug/Kg	0.627	U	0.549	UJ
Xylenes, Total	SW8260			27000	ug/Kg	0.437	U	0.382	UJ
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.526	U	0.461	UJ
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.482	U	0.422	UJ
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.594	U	0.52	UJ
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.28	U	0.245	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(0-1) BH18 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(0-1) BH19 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	18.38		23.43	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	5640	J
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	625	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	**60300**		**3120000**	
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	993	J	10600	J
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	625	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	28900	
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	625	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	625	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	4170	J	625	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	625	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(0-1) BH18 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(0-1) BH19 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	625	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	625	U
RDX	SW8330			4400	ug/Kg	125	U	625	U
Tetryl	SW8330			61000	ug/Kg	125	U	625	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	9750		8940	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.963	J	0.431	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	4.91	J	6.6	J
Barium (total)	SW6010B	314	826	540	mg/Kg	138	J	290	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.627		0.548	J
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.61	J	0.421	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	9870	J	7390	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	22.1		19.1	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	9.07	J	6.23	J
Copper (total)	SW6010B	151	56.2	310	mg/Kg	49.4	J	66.6	J
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	15820	J	16940	J
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**598**	**J**	**585**	**J**
Magnesium (total)	SW6010B	6600	10400		mg/Kg	6600	J	4930	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	277	J	274	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.39	J	0.282	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	31		27.2	
Potassium (total)	SW6010B	1950	3390		mg/Kg	985	J	1270	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	1.54	J	1.38	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.222	J	0.313	J
Sodium (total)	SW6010B	250			mg/Kg	135	J	212	J
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	**1.52**	**J**	1.26	U
Tin (total)	SW6010B	5310		4700000	ug/Kg	467	U	5310	
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	24		23.8	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	489	J	365	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	783	NJ	11000	NJ
Acenaphthylene	SW8310	4140			ug/Kg	1730	NJ	4140	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	21.8	NJ	35.9	UJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	83.8	NJ	63.5	U
Benzo(a)pyrene	SW8310	229		62	ug/Kg	**108**	**NJ**	78.3	UJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	140	NJ	83.5	J
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	103	NJ	113	U
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	209	NJ	29.4	U
Chrysene	SW8310	297		62000	ug/Kg	56.8	J	193	J

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(0-1) BH18 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(0-1) BH19 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	15.6	U	67.9	U
Fluoranthene	SW8310	350		230000	ug/Kg	164	J	192	J
Fluorene	SW8310	91.3		270000	ug/Kg	44.9	U	195	U
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	58.7	NJ	27.8	U
Naphthalene	SW8310	9930		5600	ug/Kg	2200	NJ	**9930**	**NJ**
Phenanthrene	SW8310	404			ug/Kg	70.5	J	404	J
Pyrene	SW8310	295		230000	ug/Kg	203	NJ	216	U
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	3810	U	4020	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	22600	U	23900	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	2650	U	2800	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	3090	U	3270	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	4510	U	4770	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	8340	U	8810	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	**8940**	**J**	**8140**	**J**
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.667	U	1.7	
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.15	UJ	1.07	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	3.15	U	2.94	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.68	U	0.634	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.592	U	0.552	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.629	U	0.587	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.441	UJ	0.411	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.453	UJ	0.423	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.944	UJ	0.881	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.529	U	0.493	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.566	UJ	0.529	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.541	U	0.505	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.604	U	0.564	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.39	UJ	0.364	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.466	UJ	0.435	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	4.71	U	4.39	U
2-Hexanone	SW8260				ug/Kg	4.75	U	4.43	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	5.07	UJ	4.73	U
Acetone	SW8260	17.8		1400000	ug/Kg	4.43	U	17.8	
Benzene	SW8260	20.6		640	ug/Kg	0.566	U	20.6	
Bromochloromethane	SW8260				mg/Kg	0.000629	U	0.000587	U
Bromodichloromethane	SW8260			820	ug/Kg	0.617	U	0.576	U
Bromoform	SW8260			62000	ug/Kg	0.617	U	0.576	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(0-1) BH18 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(0-1) BH19 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.629	U	0.587	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.97	U	2.77	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.617	U	0.576	U
Chlorobenzene	SW8260			15000	ug/Kg	0.516	U	0.482	U
Chloroethane	SW8260			3000	ug/Kg	1.02	U	0.951	U
Chloroform	SW8260	2		220	ug/Kg	0.655	U	0.611	U
Chloromethane	SW8260			4700	ug/Kg	0.466	U	0.435	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.604	UJ	0.564	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.629	U	0.587	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	0.478	U	0.446	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.566	UJ	0.529	U
Methyl Acetate	SW8260			2200000	ug/Kg	4.15	UJ	3.88	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg		UR		UR
Methylene Chloride	SW8260			9100	ug/Kg	1.7	U	1.59	U
Styrene	SW8260			440000	ug/Kg	0.491	U	0.458	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.667	U	0.622	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.478	U	0.446	U
Toluene	SW8260	1570		66000	ug/Kg	0.428	U	1570	
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.566	U	0.529	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.629	U	0.587	U
Vinyl chloride	SW8260			79	ug/Kg	0.705	U	0.658	U
Xylenes, Total	SW8260			27000	ug/Kg	0.491	U	0.458	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.592	U	0.552	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.541	U	0.505	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.667	U	0.622	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.315	U	0.294	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH20A(0-1) BH20 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH21A(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	20.06		25.85	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	4750		125	U
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	1620	J	125	U
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	352	J	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	2960		125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	2180	J	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-BH20A(0-1) BH20 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH21A(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	9280		13050	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.425	UJ	0.427	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	5.88	J	6.78	
Barium (total)	SW6010B	314	826	540	mg/Kg	79.7	J	79.1	J
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.568	J	0.685	
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.279	J	0.204	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	5830	J	4290	J
Chromium (total)	SW6010B	26.7	29		mg/Kg	14.6		17.6	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	6.36	J	4.72	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	30.5	J	21	J
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	15000	J	17550	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**155**	**J**	41.1	J
Magnesium (total)	SW6010B	6600	10400		mg/Kg	3120	J	3030	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	319	J	164	
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.185	J	0.0588	
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	19.1		16.8	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1280	J	1640	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	1.34	J	1.2	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.132	J	0.112	U
Sodium (total)	SW6010B	250			mg/Kg	64.7	J	61.9	J
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.24	U	**1.44**	**J**
Tin (total)	SW6010B	5310		4700000	ug/Kg	472	U	474	U
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	23.3		29.3	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	75	J	58.8	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	978	NJ	29.8	U
Acenaphthylene	SW8310	4140			ug/Kg	1830	NJ	41.6	J
Anthracene	SW8310	38.8		2200000	ug/Kg	24.6	NJ	3.35	J
Benzo(a)anthracene	SW8310	186		620	ug/Kg	68.7	NJ	18.1	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	61.3	NJ	30.3	NJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	75.9	NJ	23.9	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	47.4	NJ	14.4	J
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	136	NJ	90.4	NJ
Chrysene	SW8310	297		62000	ug/Kg	60.9	NJ	22.2	J

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH20A(0-1) BH20 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH21A(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	3.18	U	3.5	U
Fluoranthene	SW8310	350		230000	ug/Kg	126	NJ	26	J
Fluorene	SW8310	91.3		270000	ug/Kg	66.3	J	10.1	U
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	40.4	NJ	14.9	NJ
Naphthalene	SW8310	9930		5600	ug/Kg	835	NJ	30.1	J
Phenanthrene	SW8310	404			ug/Kg	78.7	NJ	13.1	J
Pyrene	SW8310	295		230000	ug/Kg	68.4	NJ	30.9	J
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	951	U	207	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	5640	U	1230	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	661	U	144	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	772	U	168	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	1130	U	245	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	2080	U	453	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	1260	U	275	U
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.539	U	0.563	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.925	UJ	0.967	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.54	U	2.66	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.549	U	0.574	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.478	U	0.499	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.508	U	0.531	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.356	UJ	0.372	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.366	UJ	0.382	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.762	UJ	0.797	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.427	U	0.446	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.457	UJ	0.478	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.437	U	0.457	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.488	U	0.51	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.315	UJ	0.329	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.376	UJ	0.393	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	3.8	U	3.97	U
2-Hexanone	SW8260				ug/Kg	3.83	U	4	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.1	U	4.28	U
Acetone	SW8260	17.8		1400000	ug/Kg	3.58	U	3.74	U
Benzene	SW8260	20.6		640	ug/Kg	0.457	U	0.478	U
Bromochloromethane	SW8260				mg/Kg	0.000508	U	0.000531	U
Bromodichloromethane	SW8260			820	ug/Kg	0.498	U	0.521	U
Bromoform	SW8260			62000	ug/Kg	0.498	U	0.521	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH20A(0-1) BH20 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH21A(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.508	U	0.531	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.4	U	2.51	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.498	U	0.521	U
Chlorobenzene	SW8260			15000	ug/Kg	0.417	U	0.436	U
Chloroethane	SW8260			3000	ug/Kg	0.823	U	0.86	U
Chloroform	SW8260	2		220	ug/Kg	0.528	U	0.552	U
Chloromethane	SW8260			4700	ug/Kg	0.376	U	0.393	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.488	UJ	0.51	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.508	U	0.531	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	0.386	U	0.404	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.457	UJ	0.478	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.35	UJ	3.51	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg		UR		UR
Methylene Chloride	SW8260			9100	ug/Kg	1.37	U	1.43	U
Styrene	SW8260			440000	ug/Kg	0.396	U	0.414	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.539	U	0.563	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.386	U	0.404	U
Toluene	SW8260	1570		66000	ug/Kg	0.345	U	0.361	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.457	U	0.478	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.508	U	0.531	U
Vinyl chloride	SW8260			79	ug/Kg	0.569	U	0.595	U
Xylenes, Total	SW8260			27000	ug/Kg	0.396	U	0.414	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.478	U	0.499	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.437	U	0.457	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.539	U	0.563	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.254	U	0.266	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-BH21D(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH22A(0-1) BH22 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	20.13		25.12	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	284	J	125	U
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	125	U	125	U
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH21D(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH22A(0-1) BH22 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	11370		12610	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.443	UJ	0.434	UJ
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	6.57		7.85	J
Barium (total)	SW6010B	314	826	540	mg/Kg	77.1	J	84.5	
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.633	J	0.683	
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.277	J	0.222	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	4080	J	5960	
Chromium (total)	SW6010B	26.7	29		mg/Kg	16.2		18.1	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	5.19	J	6.04	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	22.2	J	22.3	
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	16550		19060	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**61.6**	J	**50.5**	J
Magnesium (total)	SW6010B	6600	10400		mg/Kg	2650	J	3960	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	223		245	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.0459	J	0.0437	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	17.4		18.7	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1530	J	1720	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	0.518	J	1.55	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.117	U	0.114	U
Sodium (total)	SW6010B	250			mg/Kg	120	J	66.2	
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.29	U	1.26	U
Tin (total)	SW6010B	5310		4700000	ug/Kg	493	U		
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	26.5		29.7	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	63.9	J	64.8	
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	44.7	NJ	34.2	J
Acenaphthylene	SW8310	4140			ug/Kg	161	NJ	69.9	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	2.4	J	2.74	J
Benzo(a)anthracene	SW8310	186		620	ug/Kg	8.83	NJ	5.61	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	19.4	NJ	12.5	NJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	17.6	NJ	12.1	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	11.7	J	5.65	U
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	133	NJ	87.1	NJ
Chrysene	SW8310	297		62000	ug/Kg	13.2	J	8.3	J

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH21D(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH22A(0-1) BH22 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	14.7	NJ	10.4	NJ
Fluoranthene	SW8310	350		230000	ug/Kg	21.7	J	21.3	J
Fluorene	SW8310	91.3		270000	ug/Kg	10.7	J	9.79	U
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	12.7	J	1.4	U
Naphthalene	SW8310	9930		5600	ug/Kg	63.9	NJ	47.4	NJ
Phenanthrene	SW8310	404			ug/Kg	14.3	J	12.8	J
Pyrene	SW8310	295		230000	ug/Kg	28	J	13	J
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	192	U	195	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1140	U	1160	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	134	U	136	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	156	U	158	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	228	U	231	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	420	U	427	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	255	U	259	U
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.572	U	0.57	UJ
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.982	U	0.978	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.7	U	2.69	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.582	U	0.581	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.507	U	0.505	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.539	U	0.75	J
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.378	U	0.376	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.388	U	0.387	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.809	U	0.806	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.453	U	0.452	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.485	U	0.484	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.464	U	0.462	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.518	U	0.516	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.334	U	0.333	U
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.399	U	0.398	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	4.03	U	4.02	UJ
2-Hexanone	SW8260				ug/Kg	4.07	U	4.05	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.35	U	4.33	UJ
Acetone	SW8260	17.8		1400000	ug/Kg	3.8	U	3.78	U
Benzene	SW8260	20.6		640	ug/Kg	0.485	U	0.484	U
Bromochloromethane	SW8260				mg/Kg	0.000539	U	0.000538	U
Bromodichloromethane	SW8260			820	ug/Kg	0.529	U	0.527	UJ
Bromoform	SW8260			62000	ug/Kg	0.529	U	0.527	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH21D(0-1) BH21 05/21/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH22A(0-1) BH22 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.539	U	0.538	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	2.55	U	2.54	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.529	U	0.527	UJ
Chlorobenzene	SW8260			15000	ug/Kg	0.442	U	0.441	U
Chloroethane	SW8260			3000	ug/Kg	0.874	U	0.871	U
Chloroform	SW8260	2		220	ug/Kg	0.561	U	0.559	U
Chloromethane	SW8260			4700	ug/Kg	0.399	U	0.398	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.518	UJ	0.516	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.539	U	0.538	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR	0.892	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.41	U	0.409	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.485	U	0.484	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.56	UJ	3.55	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg		UR	0.548	U
Methylene Chloride	SW8260			9100	ug/Kg	1.46	U	1.45	U
Styrene	SW8260			440000	ug/Kg	0.421	U	0.419	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.572	U	0.57	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.41	U	0.409	UJ
Toluene	SW8260	1570		66000	ug/Kg	0.367	U	0.366	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.485	U	0.484	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.539	U	0.538	UJ
Vinyl chloride	SW8260			79	ug/Kg	0.604	U	0.602	U
Xylenes, Total	SW8260			27000	ug/Kg	0.421	U	0.419	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.507	U	0.505	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.464	U	0.462	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.572	U	0.57	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.27	U	0.269	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH23A(0-1) BH23 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH24A(0-1) BH24 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	28.5			ng/Kg				
1,2,3,4,6,7,8-HpCDF	SW8290	79.1			ng/Kg				
1,2,3,4,7,8,9-HpCDF	SW8290	12			ng/Kg				
1,2,3,4,7,8-HxCDD	SW8290	4.52			ng/Kg				
1,2,3,4,7,8-HxCDF	SW8290	152			ng/Kg				
1,2,3,6,7,8-HxCDD	SW8290	5.55			ng/Kg				
1,2,3,6,7,8-HxCDF	SW8290	87.6			ng/Kg				
1,2,3,7,8,9-HxCDD	SW8290	4.21			ng/Kg				
1,2,3,7,8,9-HxCDF	SW8290	5.55			ng/Kg				
1,2,3,7,8-PeCDD	SW8290	11.4			ng/Kg				
1,2,3,7,8-PeCDF	SW8290	84.8			ng/Kg				
2,3,4,6,7,8-HxCDF	SW8290	72.8			ng/Kg				
2,3,4,7,8-PeCDF	SW8290	187			ng/Kg				
2,3,7,8-TCDD	SW8290	6.58		3.9	ng/Kg				
2,3,7,8-TCDF	SW8290	165			ng/Kg				
OCDD	SW8290	119			ng/Kg				
OCDF	SW8290	85.4			ng/Kg				
Total HpCDD	SW8290	51.4			ng/Kg				
Total HpCDF	SW8290	117			ng/Kg				
Total HxCDD	SW8290	43.8			ng/Kg				
Total HxCDF	SW8290	678			ng/Kg				
Total PeCDD	SW8290	36.1			ng/Kg				
Total PeCDF	SW8290	1090			ng/Kg				
Total TCDD	SW8290	20.5			ng/Kg				
Total TCDF	SW8290	909			ng/Kg				
Wet Chemistry									
Moisture, Percent	D2216	35.7			PERCENT	28.04		22.43	
Explosives									
1,3,5-Trinitrobenzene	SW8330	5640		180000	ug/Kg	625	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	625	U	125	U
2,4,6-Trinitrotoluene	SW8330	3120000		16000	ug/Kg	**2270000**		1970	J
2,4-Dinitrotoluene	SW8330	10600		12000	ug/Kg	2710	J	850	J
2,6-Dinitrotoluene	SW8330	977		6100	ug/Kg	625	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	28900			ug/Kg	625	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	625	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	625	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330	4170			ug/Kg	625	U	1570	
4-Nitrotoluene	SW8330			12000	ug/Kg	625	U	125	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH23A(0-1) BH23 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH24A(0-1) BH24 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
HMX	SW8330			310000	ug/Kg	625	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	625	U	125	U
RDX	SW8330			4400	ug/Kg	625	U	125	U
Tetryl	SW8330			61000	ug/Kg	625	U	125	U
Metals									
Aluminum (total)	SW6010B	13050	15500	7600	mg/Kg	10160		10990	
Antimony (total)	SW6010B	0.963	9.3	3.1	mg/Kg	0.649	J	0.782	J
Arsenic (total)	SW6010B	14.2	36.5	0.39	mg/Kg	7.54	J	8.44	J
Barium (total)	SW6010B	314	826	540	mg/Kg	154		168	
Beryllium (total)	SW6010B	0.989	1		mg/Kg	0.572	J	0.615	J
Cadmium (total)	SW6010B	0.778		3.7	mg/Kg	0.778		0.629	J
Calcium (total)	SW6010B	25090	52300		mg/Kg	5710		11090	
Chromium (total)	SW6010B	26.7	29		mg/Kg	20		25	
Cobalt (total)	SW6010B	13.1	116	90	mg/Kg	6.86		6.85	
Copper (total)	SW6010B	151	56.2	310	mg/Kg	92.4		151	
Iron (total)	SW6010B	29960	234000	2300	mg/Kg	17770		19040	
Lead (total)	SW6010B	730	48.6	40	mg/Kg	**386**	J	**590**	J
Magnesium (total)	SW6010B	6600	10400		mg/Kg	3380	J	4490	J
Manganese (total)	SW6010B	611	3506.2	180	mg/Kg	320	J	305	J
Mercury (total)	SW7471A	0.518	0.1	2.3	mg/Kg	0.154	J	0.115	J
Nickel (total)	SW6010B	56.3	55.1	160	mg/Kg	24.3		25.3	
Potassium (total)	SW6010B	1950	3390		mg/Kg	1850	J	1950	J
Selenium (total)	SW6010B	2.06	2	39	mg/Kg	2.06	J	0.774	J
Silver (total)	SW6010B	0.471	11.1	39	mg/Kg	0.471	J	0.138	J
Sodium (total)	SW6010B	250			mg/Kg	96.6		137	
Thallium (total)	SW6010B	1.52	1.3	0.52	mg/Kg	1.42	U	1.37	U
Tin (total)	SW6010B	5310		4700000	ug/Kg				
Vanadium (total)	SW6010B	31.3	40.9		mg/Kg	25.6		27.9	
Zinc (total)	SW6010B	489	321.8	2300	mg/Kg	247		299	
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	11000		370000	ug/Kg	57.7	NJ	377	NJ
Acenaphthylene	SW8310	4140			ug/Kg	16.7	U	490	NJ
Anthracene	SW8310	38.8		2200000	ug/Kg	3.8	J	20	NJ
Benzo(a)anthracene	SW8310	186		620	ug/Kg	4.08	J	76.1	NJ
Benzo(a)pyrene	SW8310	229		62	ug/Kg	13.6	NJ	**89.5**	NJ
Benzo(b)fluoranthene	SW8310	286		620	ug/Kg	14.3	NJ	108	NJ
Benzo(g,h,i)perylene	SW8310	220			ug/Kg	5.97	U	75.9	NJ
Benzo(k)fluoranthene	SW8310	283		6200	ug/Kg	100	NJ	95	NJ
Chrysene	SW8310	297		62000	ug/Kg	12.5	J	136	NJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH23A(0-1) BH23 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH24A(0-1) BH24 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Dibenz(a,h)anthracene	SW8310	124		62	ug/Kg	12.3	NJ	43.9	NJ
Fluoranthene	SW8310	350		230000	ug/Kg	23.8	J	193	NJ
Fluorene	SW8310	91.3		270000	ug/Kg	13.6	J	33.3	J
Indeno(1,2,3-cd)pyrene	SW8310	152		620	ug/Kg	8.2	J	50.1	NJ
Naphthalene	SW8310	9930		5600	ug/Kg	23.4	J	190	NJ
Phenanthrene	SW8310	404			ug/Kg	8.03	U	72.3	NJ
Pyrene	SW8310	295		230000	ug/Kg	11.5	U	229	NJ
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	21400	U	876	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	127000	U	5190	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	14900	U	608	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	17400	U	711	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	25400	U	1040	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	46900	U	1920	U
PCB-1260 (Aroclor 1260)	SW8082	44400		220	ug/Kg	**44400**	J	**2630**	J
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	1.7		200000	ug/Kg	0.647	UJ	1.7	J
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.11	UJ	0.972	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	3.05	U	2.67	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.659	U	0.577	U
1,1-Dichloroethane	SW8260			51000	ug/Kg	0.574	U	0.502	U
1,1-Dichloroethene	SW8260	0.75		12000	ug/Kg	0.61	U	0.534	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.427	U	0.374	UJ
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.439	UJ	0.385	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.915	U	0.801	UJ
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.512	U	0.449	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.549	U	0.481	UJ
1,2-Dichloroethane	SW8260			280	ug/Kg	0.525	U	0.459	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.586	U	0.513	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.378	U	0.331	UJ
1,4-Dichlorobenzene	SW8260	0.42		3400	ug/Kg	0.451	U	0.42	J
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	4.56	UJ	4	UJ
2-Hexanone	SW8260				ug/Kg	4.6	UJ	4.03	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.92	UJ	4.3	UJ
Acetone	SW8260	17.8		1400000	ug/Kg	4.3	U	4.6	J
Benzene	SW8260	20.6		640	ug/Kg	0.549	U	0.481	U
Bromochloromethane	SW8260				mg/Kg	0.00061	U	0.000534	U
Bromodichloromethane	SW8260			820	ug/Kg	0.598	UJ	0.523	UJ
Bromoform	SW8260			62000	ug/Kg	0.598	U	0.523	U

Plum Brook
2004 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH23A(0-1) BH23 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH24A(0-1) BH24 05/22/2004 0.0-1.0 ft. SO RESULT / QUAL	VQ
Bromomethane	SW8260			390	ug/Kg	0.61	UJ	0.534	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	2.88	U	2.52	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.598	UJ	0.523	UJ
Chlorobenzene	SW8260			15000	ug/Kg	0.5	U	0.438	U
Chloroethane	SW8260			3000	ug/Kg	0.988	U	0.865	U
Chloroform	SW8260	2		220	ug/Kg	0.635	U	0.555	U
Chloromethane	SW8260			4700	ug/Kg	0.451	U	0.395	U
Cyclohexane	SW8260	0.72		280000	ug/Kg	0.586	U	0.513	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.61	UJ	0.534	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	1.01	UJ	0.887	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.464	U	0.406	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.549	U	0.481	UJ
Methyl Acetate	SW8260			2200000	ug/Kg	4.03	UJ	3.53	UJ
Methylcyclohexane	SW8260	1.9		260000	ug/Kg	0.622	U	0.545	U
Methylene Chloride	SW8260			9100	ug/Kg	1.65	U	1.44	U
Styrene	SW8260			440000	ug/Kg	0.476	U	0.417	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.647	U	0.566	U
Tetrachloroethene (PCE)	SW8260	3.4		480	ug/Kg	0.464	UJ	3.4	J
Toluene	SW8260	1570		66000	ug/Kg	0.415	U	0.363	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.549	U	0.481	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.61	UJ	0.534	UJ
Vinyl chloride	SW8260			79	ug/Kg	0.683	U	0.598	U
Xylenes, Total	SW8260			27000	ug/Kg	0.476	U	0.417	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.574	U	0.502	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.525	U	0.459	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.647	U	0.566	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.305	U	0.267	U

Plum Brook
2004 Subsurface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(3-5) BH09 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH09A(8-10) BH09 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry									
Moisture, Percent	D2216	22.8			PERCENT	16.4			
Explosives									
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U	125	U
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U	125	U
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U
HMX	SW8330			310000	ug/Kg	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U
RDX	SW8330			4400	ug/Kg	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U
Metals									
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	**15750**		12060	
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.406	UJ	0.519	BJ
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	21.7	J	8.92	J
Barium (total)	SW6010B	798	826	540	mg/Kg	263	J	71.1	J
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.946		0.577	J
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	1.74	J	0.335	J
Calcium (total)	SW6010B	1173000	52300		mg/Kg	3330	J	**53990**	J
Chromium (total)	SW6010B	367	29		mg/Kg	23.5		18.7	
Cobalt (total)	SW6010B	166	116	90	mg/Kg	30.1	J	10.7	J
Copper (total)	SW6010B	504	56.2	310	mg/Kg	73	J	48.4	J
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	32720	J	23710	J
Lead (total)	SW6010B	227	48.6	40	mg/Kg	18.7	J	11.6	J
Magnesium (total)	SW6010B	363100	10400		mg/Kg	4270		**16840**	
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	**3870**	J	501	J
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0309		0.0151	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	96.5	J	26.4	J
Potassium (total)	SW6010B	58210	3390		mg/Kg	2310	J	2740	J
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	1.77		2.14	
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.973		0.208	J
Sodium (total)	SW6010B	3690			mg/Kg	82.3		156	
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	23.6	U	1.22	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(3-5) BH09 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH09A(8-10) BH09 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg	**41.4**		28.7	
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	80.3	J	63.2	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	241		370000	ug/Kg	75.9	U		
Acenaphthylene	SW8310	408			ug/Kg	41.4	UJ		
Anthracene	SW8310	22.8		2200000	ug/Kg	4.72	UJ		
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.34	U		
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	10.6	J		
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	4.07	U		
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	14.8	U		
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	191	NJ		
Chrysene	SW8310	63.4		62000	ug/Kg	6.05	U		
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	8.92	U		
Fluoranthene	SW8310	298		230000	ug/Kg	24	U		
Fluorene	SW8310	162		270000	ug/Kg	25.6	U		
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	3.66	U		
Naphthalene	SW8310	256		5600	ug/Kg	27.7	U		
Phenanthrene	SW8310	247			ug/Kg	19.9	U		
Pyrene	SW8310	96.2		230000	ug/Kg	28.4	U		
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	179	U		
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1060	U		
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	125	U		
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	146	U		
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	212	U		
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	392	U		
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	238	U		
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.46	U	0.436	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.79	U	0.749	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.17	U	2.06	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.469	U	0.444	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.408	U	0.387	U
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	1		0.411	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.304	U	0.288	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.313	U	0.296	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.651	U	0.617	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.365	U	0.345	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.391	U	0.37	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH09A(3-5) BH09 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH09A(8-10) BH09 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	0.373	U	0.354	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.417	U	0.395	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.269	U	0.255	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.321	U	0.304	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.25	U	3.08	U
2-Hexanone	SW8260				ug/Kg	3.27	U	3.1	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.5	U	3.31	U
Acetone	SW8260	22.4		1400000	ug/Kg	6.4		2.9	U
Benzene	SW8260			640	ug/Kg	0.391	U	0.37	U
Bromochloromethane	SW8260				mg/Kg	0.000434	U	0.000411	U
Bromodichloromethane	SW8260			820	ug/Kg	0.425	U	0.403	U
Bromoform	SW8260			62000	ug/Kg	0.425	U	0.403	U
Bromomethane	SW8260			390	ug/Kg	0.434	U	0.411	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.05	U	1.94	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.425	U	0.403	U
Chlorobenzene	SW8260			15000	ug/Kg	0.356	U	0.337	U
Chloroethane	SW8260			3000	ug/Kg	0.703	U	0.666	U
Chloroform	SW8260			220	ug/Kg	0.452	U	0.428	U
Chloromethane	SW8260			4700	ug/Kg	0.321	U	0.304	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	3.9		0.395	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.434	U	0.411	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.721	UJ	0.683	UJ
Ethylbenzene	SW8260			190000	ug/Kg	0.33	U	0.313	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.391	U	0.37	U
Methyl Acetate	SW8260			2200000	ug/Kg	2.87	U	2.71	U
Methylcyclohexane	SW8260			260000	ug/Kg	0.443	U	0.419	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.17	U	1.11	U
Styrene	SW8260	1		440000	ug/Kg	1		0.321	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.46	U	0.436	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.33	U	0.313	U
Toluene	SW8260			66000	ug/Kg	0.295	U	0.28	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.391	U	0.37	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.434	U	0.411	U
Vinyl chloride	SW8260			79	ug/Kg	0.486	U	0.461	U
Xylenes, Total	SW8260			27000	ug/Kg	0.339	U	0.321	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.408	U	0.387	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.373	U	0.354	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.46	U	0.436	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.217	U	0.206	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH10A(3-5) BH10 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(8-10) BH10 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH11A(3-5) BH11 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT	20.4		18.9		15.8
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U	125	U	125
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U	125	U	125
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U	125
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U	125
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125
HMX	SW8330			310000	ug/Kg	125	U	125	U	125
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125
RDX	SW8330			4400	ug/Kg	125	U	125	U	125
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	**16450**		**233600**		13370
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.433	UJ	8.35	U	0.401
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	6.1	J	**131**	J	9.59
Barium (total)	SW6010B	798	826	540	mg/Kg	89.7	J	798	J	87.7
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.816		**11.4**	J	0.712
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.145	BJ	**8.64**	J	0.125
Calcium (total)	SW6010B	1173000	52300		mg/Kg	4530		**1173000**	J	3750
Chromium (total)	SW6010B	367	29		mg/Kg	22.3		**367**		20.7
Cobalt (total)	SW6010B	166	116	90	mg/Kg	6.3	J	**166**	J	7.86
Copper (total)	SW6010B	504	56.2	310	mg/Kg	26.3	J	**504**	J	17.6
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	21910	J	**412600**	J	22790
Lead (total)	SW6010B	227	48.6	40	mg/Kg	11.8	J	**227**	J	11.3
Magnesium (total)	SW6010B	363100	10400		mg/Kg	4300		**363100**		3340
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	283	J	**8230**	J	366
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0346		0.0142		0.0286
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	24.3	J	**475**	J	23.4
Potassium (total)	SW6010B	58210	3390		mg/Kg	2170	J	**58210**	J	1770
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	0.527	BJ	**51.8**		1.2
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.37	J	3.21	J	0.105
Sodium (total)	SW6010B	3690			mg/Kg	78		3690		68
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	**1.44**	J	24.3	U	1.17

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-BH10A(3-5) BH10 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(8-10) BH10 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH11A(3-5) BH11 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
Vanadium (total)	SW6010B	536	40.9		mg/Kg	34		**536**		33.6
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	64.3		1140	J	53.1
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	80.1	U	76.7	U	78.5
Acenaphthylene	SW8310	408			ug/Kg	43.6	UJ	68.8	J	42.8
Anthracene	SW8310	22.8		2200000	ug/Kg	4.98	UJ	10.6	J	4.88
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.8	U	8.43	U	8.62
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	10.9	UJ	15.6	J	10.6
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	4.29	U	21.1	J	4.21
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	15.6	U	15	U	15.3
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	173	NJ	84	NJ	70
Chrysene	SW8310	63.4		62000	ug/Kg	6.38	U	16.7	J	6.26
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	9.41	U	9.01	U	9.23
Fluoranthene	SW8310	298		230000	ug/Kg	25.3	U	82.1	J	24.8
Fluorene	SW8310	162		270000	ug/Kg	27	U	25.9	U	26.5
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	3.86	U	15	J	3.78
Naphthalene	SW8310	256		5600	ug/Kg	29.2	U	94.3	J	28.7
Phenanthrene	SW8310	247			ug/Kg	21	U	54.8	J	20.6
Pyrene	SW8310	96.2		230000	ug/Kg	30	U	28.7	U	29.4
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	182	U			172
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1080	U			1020
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	127	U			119
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	148	U			139
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	216	U			203
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	399	U			375
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	242	U			228
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.527	U	0.457	U	0.435
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.905	UJ	0.785	U	0.747
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.49	U	2.16	U	2.05
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.537	U	0.466	U	0.443
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.467	U	0.406	U	0.386
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	0.497	U	0.57	J	0.48
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.348	U	0.302	U	0.287
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.358	U	0.311	U	0.295
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.746	U	0.647	U	0.616
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.418	U	0.362	U	0.345
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.448	U	0.388	U	0.369

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH10A(3-5) BH10 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH10A(8-10) BH10 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH11A(3-5) BH11 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
1,2-Dichloroethane	SW8260			280	ug/Kg	0.428	U	0.371	U	0.353
1,2-Dichloropropane	SW8260			340	ug/Kg	0.477	U	0.414	U	0.394
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.308	U	0.268	U	0.254
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.368	U	0.319	U	0.304
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.72	U	3.23	U	3.07
2-Hexanone	SW8260				ug/Kg	3.75	U	3.25	U	3.09
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	4.01	U	3.48	U	3.31
Acetone	SW8260	22.4		1400000	ug/Kg	3.5	U	9.4		2.89
Benzene	SW8260			640	ug/Kg	0.448	U	0.388	U	0.369
Bromochloromethane	SW8260				mg/Kg	0.000497	U	0.000431	U	0.00041
Bromodichloromethane	SW8260			820	ug/Kg	0.487	U	0.423	U	0.402
Bromoform	SW8260			62000	ug/Kg	0.487	U	0.423	U	0.402
Bromomethane	SW8260			390	ug/Kg	0.497	U	0.431	U	0.41
Carbon Disulfide	SW8260			36000	ug/Kg	2.35	U	2.04	U	1.94
Carbon tetrachloride	SW8260			250	ug/Kg	0.487	U	0.423	U	0.402
Chlorobenzene	SW8260			15000	ug/Kg	0.408	U	0.354	U	0.337
Chloroethane	SW8260			3000	ug/Kg	0.806	U	0.699	U	0.665
Chloroform	SW8260			220	ug/Kg	0.517	U	0.449	U	0.427
Chloromethane	SW8260			4700	ug/Kg	0.368	U	0.319	U	0.304
Cyclohexane	SW8260	3.9		280000	ug/Kg	0.477	UJ	0.414	U	0.394
Dibromochloromethane	SW8260			1100	ug/Kg	0.497	U	0.431	U	0.41
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.825	UJ	0.716	UJ	
Ethylbenzene	SW8260			190000	ug/Kg	0.378	U	0.328	U	0.312
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.448	UJ	0.388	U	0.369
Methyl Acetate	SW8260			2200000	ug/Kg	3.28	U	2.85	U	2.71
Methylcyclohexane	SW8260			260000	ug/Kg	0.507	U	0.44	U	0.419
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.34	U	1.16	U	1.11
Styrene	SW8260	1		440000	ug/Kg	0.388	U	0.337	U	0.32
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.527	U	0.457	U	0.435
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.378	U	0.328	U	0.312
Toluene	SW8260			66000	ug/Kg	0.338	U	0.293	U	0.279
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.448	U	0.388	U	0.369
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.497	U	0.431	U	0.41
Vinyl chloride	SW8260			79	ug/Kg	0.557	U	0.483	U	0.46
Xylenes, Total	SW8260			27000	ug/Kg	0.388	U	0.337	U	0.32
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.467	U	0.406	U	0.386
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.428	U	0.371	U	0.353
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.527	U	0.457	U	0.435
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.249	U	0.216	U	0.205

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH11A(8-10) BH11 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(3-5) BH12 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT		18.2		16.1	
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	U	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	U	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	U	125	U	125	U
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	U	125	U	125	U
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	U	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	U	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	U	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	U	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U	125	U	125	U
HMX	SW8330			310000	ug/Kg	U	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	U	125	U	125	U
RDX	SW8330			4400	ug/Kg	U	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	U	125	U	125	U
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg		14950		12360	
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	UJ	0.425	UJ	0.41	UJ
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg		7.14		13.6	
Barium (total)	SW6010B	798	826	540	mg/Kg		75.8		70.2	
Beryllium (total)	SW6010B	11.4	1		mg/Kg		0.697		0.734	
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	J	0.249	J	0.0779	J
Calcium (total)	SW6010B	1173000	52300		mg/Kg		**52810**		3030	
Chromium (total)	SW6010B	367	29		mg/Kg		22.5		20	
Cobalt (total)	SW6010B	166	116	90	mg/Kg		11		9.57	
Copper (total)	SW6010B	504	56.2	310	mg/Kg		24.1		23.4	
Iron (total)	SW6010B	412600	234000	2300	mg/Kg		23390		26430	
Lead (total)	SW6010B	227	48.6	40	mg/Kg		9.83		13	
Magnesium (total)	SW6010B	363100	10400		mg/Kg		**14220**		3440	
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg		395		426	
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg		0.0157		0.0243	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg		27.7		27.3	
Potassium (total)	SW6010B	58210	3390		mg/Kg		**3880**		1880	
Selenium (total)	SW6010B	51.8	2	39	mg/Kg		3.06		0.785	B
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	U	0.112	U	0.108	U
Sodium (total)	SW6010B	3690			mg/Kg		186		76.7	
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	U	1.24	U	1.19	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH11A(8-10) BH11 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(3-5) BH12 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg		31.6		36.9	
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg		54.9		52.7	
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	U	69.2	U	78.5	U
Acenaphthylene	SW8310	408			ug/Kg	UJ	115	NJ	42.8	UJ
Anthracene	SW8310	22.8		2200000	ug/Kg	UJ	16.1	NJ	4.88	UJ
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	U	7.6	UJ	8.63	U
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	UJ	28.6	NJ	13.8	J
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	U	3.71	U	4.21	U
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	U	13.5	U	15.3	U
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	NJ	91.5	NJ	30.9	NJ
Chrysene	SW8310	63.4		62000	ug/Kg	U	30.5	J	6.26	U
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	U	8.13	U	9.23	U
Fluoranthene	SW8310	298		230000	ug/Kg	U	227	NJ	24.8	U
Fluorene	SW8310	162		270000	ug/Kg	U	23.4	U	26.5	U
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	U	12.7	J	3.78	U
Naphthalene	SW8310	256		5600	ug/Kg	U	51.2	J	28.7	U
Phenanthrene	SW8310	247			ug/Kg	U	101	J	20.6	U
Pyrene	SW8310	96.2		230000	ug/Kg	U	25.9	U	29.4	U
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U			182	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U			1080	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U			127	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U			148	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U			216	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U			399	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	U			242	U
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	UJ	0.501	U	0.472	UJ
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	UJ	0.86	UJ	0.811	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	U	2.36	U	2.23	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	U	0.51	U	0.481	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	U	0.444	U	0.419	U
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	J	0.472	U	0.446	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	U	0.331	U	0.312	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	UJ	0.34	U	0.321	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	U	0.709	U	0.669	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	U	0.397	U	0.374	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	U	0.425	U	0.401	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH11A(8-10) BH11 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH12A(3-5) BH12 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	U	0.406	U	0.383	U
1,2-Dichloropropane	SW8260			340	ug/Kg	U	0.453	U	0.428	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	U	0.293	U	0.276	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	U	0.35	U	0.33	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	UJ	3.53	U	3.33	UJ
2-Hexanone	SW8260				ug/Kg	UJ	3.56	U	3.36	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	UJ	3.81	U	3.59	UJ
Acetone	SW8260	22.4		1400000	ug/Kg	U	6.9	BJ	3.14	U
Benzene	SW8260			640	ug/Kg	U	0.425	U	0.401	U
Bromochloromethane	SW8260				mg/Kg	U	0.000472	U	0.000446	U
Bromodichloromethane	SW8260			820	ug/Kg	U	0.463	U	0.437	U
Bromoform	SW8260			62000	ug/Kg	U	0.463	U	0.437	U
Bromomethane	SW8260			390	ug/Kg	UJ	0.472	U	0.446	U
Carbon Disulfide	SW8260			36000	ug/Kg	U	2.23	U	2.1	U
Carbon tetrachloride	SW8260			250	ug/Kg	U	0.463	U	0.437	U
Chlorobenzene	SW8260			15000	ug/Kg	U	0.387	U	0.366	U
Chloroethane	SW8260			3000	ug/Kg	U	0.765	U	0.722	U
Chloroform	SW8260			220	ug/Kg	U	0.491	U	0.464	U
Chloromethane	SW8260			4700	ug/Kg	U	0.35	U	0.33	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	U	0.453	UJ	0.428	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	UJ	0.472	U	0.446	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	UR		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	U	0.359	U	0.339	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	U	0.425	UJ	0.401	U
Methyl Acetate	SW8260			2200000	ug/Kg	UJ	3.12	U	2.94	UJ
Methylcyclohexane	SW8260			260000	ug/Kg	U	0.482	UJ	0.455	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	U	1.28	U	1.2	U
Styrene	SW8260	1		440000	ug/Kg	U	0.368	U	0.348	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	U	0.501	U	0.472	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	UJ	0.359	U	0.339	UJ
Toluene	SW8260			66000	ug/Kg	U	0.321	U	0.303	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	U	0.425	U	0.401	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	UJ	0.472	U	0.446	UJ
Vinyl chloride	SW8260			79	ug/Kg	U	0.529	U	0.499	U
Xylenes, Total	SW8260			27000	ug/Kg	U	0.368	U	0.348	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	U	0.444	U	0.419	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	U	0.406	U	0.383	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	U	0.501	U	0.472	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	U	0.236	U	0.223	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH12A(8-10) BH12 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13A(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13D(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT	13.2		18.3		16.8
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U	125	U	125
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U	125	U	125
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U	125
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U	125
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125
HMX	SW8330			310000	ug/Kg	125	U	125	U	125
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125
RDX	SW8330			4400	ug/Kg	125	U	125	U	125
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	11720		13140		13630
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.413	J	0.407	UJ	0.413
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	12.6		12.8		8.43
Barium (total)	SW6010B	798	826	540	mg/Kg	61.4		112		77.6
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.562	J	0.793		0.689
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.272	J	0.299	J	0.0682
Calcium (total)	SW6010B	1173000	52300		mg/Kg	**60300**		3420		3360
Chromium (total)	SW6010B	367	29		mg/Kg	17.6		20.6		20.8
Cobalt (total)	SW6010B	166	116	90	mg/Kg	10		16.2	J	6.2
Copper (total)	SW6010B	504	56.2	310	mg/Kg	28.6		25.7		17.6
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	23250		24350		21460
Lead (total)	SW6010B	227	48.6	40	mg/Kg	9.75		14		9.83
Magnesium (total)	SW6010B	363100	10400		mg/Kg	**14940**		3590		3820
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	446		1070	J	276
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0148		0.027		0.0257
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	29.6		34.6		22.6
Potassium (total)	SW6010B	58210	3390		mg/Kg	**3480**		2060		2070
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	2.68		0.755	B	0.629
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.104	U	0.107	U	0.108
Sodium (total)	SW6010B	3690			mg/Kg	165		82.1		83.6
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	1.15	U	1.19	U	1.2

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH12A(8-10) BH12 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13A(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13D(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
Vanadium (total)	SW6010B	536	40.9		mg/Kg	23.5		35.9		31.6
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	57.9		54.7		55.4
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	76.3	U	79.3	U	79.3
Acenaphthylene	SW8310	408			ug/Kg	169	NJ	43.2	UJ	43.2
Anthracene	SW8310	22.8		2200000	ug/Kg	22.8	NJ	4.93	UJ	4.93
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.38	U	8.72	U	8.72
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	25.6	NJ	12.5	J	14.1
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	18.8	J	4.25	U	13
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	14.9	U	15.5	U	15.5
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	142	NJ	120	NJ	74.5
Chrysene	SW8310	63.4		62000	ug/Kg	28.3	J	6.32	U	6.33
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	8.97	U	9.32	U	9.33
Fluoranthene	SW8310	298		230000	ug/Kg	298	NJ	25	U	25.7
Fluorene	SW8310	162		270000	ug/Kg	25.8	U	26.8	U	26.8
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	19.5	J	3.82	U	16.7
Naphthalene	SW8310	256		5600	ug/Kg	27.9	U	29	U	29
Phenanthrene	SW8310	247			ug/Kg	175	NJ	20.8	U	20.8
Pyrene	SW8310	96.2		230000	ug/Kg	28.5	U	29.7	U	29.7
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg			178	U	184
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg			1060	U	1090
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg			124	U	128
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg			145	U	150
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg			211	U	218
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg			390	U	403
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg			237	U	245
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.353	U	7.9	J	8.6
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.605	UJ	0.751	UJ	0.979
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	1.66	U	2.06	U	2.69
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.359	U	0.446	U	0.581
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.313	U	0.64	J	0.7
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	1.3		0.59	J	0.94
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.233	U	0.289	U	0.377
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.24	U	0.297	UJ	0.387
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.499	U	0.619	U	0.807
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.279	U	0.347	U	0.452
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.299	U	0.371	U	0.484

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH12A(8-10) BH12 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13A(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH13D(3-5) BH13 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL
1,2-Dichloroethane	SW8260			280	ug/Kg	0.286	U	0.355	U	0.463
1,2-Dichloropropane	SW8260			340	ug/Kg	0.319	U	0.396	U	0.516
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.206	U	0.256	U	0.334
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.246	U	0.305	U	0.398
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	2.49	U	3.09	UJ	4.02
2-Hexanone	SW8260				ug/Kg	2.51	U	3.11	UJ	4.06
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	2.68	U	3.33	UJ	4.34
Acetone	SW8260	22.4		1400000	ug/Kg	8.8	J	2.91	U	3.79
Benzene	SW8260			640	ug/Kg	0.299	U	0.371	U	0.484
Bromochloromethane	SW8260				mg/Kg	0.000333	U	0.000413	UJ	0.000538
Bromodichloromethane	SW8260			820	ug/Kg	0.326	U	0.404	U	0.527
Bromoform	SW8260			62000	ug/Kg	0.326	U	0.404	U	0.527
Bromomethane	SW8260			390	ug/Kg	0.333	U	0.413	U	0.538
Carbon Disulfide	SW8260			36000	ug/Kg	1.57	U	1.95	U	2.54
Carbon tetrachloride	SW8260			250	ug/Kg	0.326	U	0.404	U	0.527
Chlorobenzene	SW8260			15000	ug/Kg	0.273	U	0.338	U	0.441
Chloroethane	SW8260			3000	ug/Kg	0.539	U	0.669	U	0.871
Chloroform	SW8260			220	ug/Kg	0.346	U	0.429	U	0.559
Chloromethane	SW8260			4700	ug/Kg	0.246	U	0.305	U	0.398
Cyclohexane	SW8260	3.9		260000	ug/Kg	0.319	UJ	0.396	U	0.516
Dibromochloromethane	SW8260			1100	ug/Kg	0.333	U	0.413	UJ	0.538
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR		UR	
Ethylbenzene	SW8260			190000	ug/Kg	0.253	U	0.314	U	0.409
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.299	UJ	0.371	U	0.484
Methyl Acetate	SW8260			2200000	ug/Kg	2.2	U	2.72	UJ	3.55
Methylcyclohexane	SW8260			260000	ug/Kg	0.339	UJ	0.421	U	0.549
Methylene Chloride	SW8260	1.9		9100	ug/Kg	0.898	U	1.11	U	1.45
Styrene	SW8260	1		440000	ug/Kg	0.259	U	0.322	U	0.42
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.353	U	0.437	U	0.57
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.253	U	2.2	J	2.6
Toluene	SW8260			66000	ug/Kg	0.226	U	0.281	U	0.366
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.299	U	0.371	U	0.484
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.333	U	0.413	UJ	0.538
Vinyl chloride	SW8260			79	ug/Kg	0.373	U	0.462	U	0.602
Xylenes, Total	SW8260			27000	ug/Kg	0.259	U	0.322	U	0.42
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.313	U	0.388	U	0.506
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.286	U	0.355	U	0.463
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.353	U	0.437	U	0.57
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.166	U	0.206	U	0.269

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH13A(8-10) BH13 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(3-5) BH14 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT		22.4		18.1	
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	U	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	U	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	U	125	U	125	U
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	U	125	U	125	U
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	U	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	U	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	U	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	U	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U	125	U	125	U
HMX	SW8330			310000	ug/Kg	U	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	U	125	U	125	U
RDX	SW8330			4400	ug/Kg	U	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	U	125	U	125	U
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg		11370		12430	
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	UJ	0.419	UJ	0.407	UJ
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg		9.76		9.89	
Barium (total)	SW6010B	798	826	540	mg/Kg		64.1		87.3	
Beryllium (total)	SW6010B	11.4	1		mg/Kg		0.58	J	0.599	
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	J	0.415	J	0.467	J
Calcium (total)	SW6010B	1173000	52300		mg/Kg		47530		51910	
Chromium (total)	SW6010B	367	29		mg/Kg		18.6		19.2	
Cobalt (total)	SW6010B	166	116	90	mg/Kg	J	8.67		11.1	
Copper (total)	SW6010B	504	56.2	310	mg/Kg		25.8		22.7	
Iron (total)	SW6010B	412600	234000	2300	mg/Kg		21760		21920	
Lead (total)	SW6010B	227	48.6	40	mg/Kg		10.2		9.46	
Magnesium (total)	SW6010B	363100	10400		mg/Kg		**16400**		**17530**	
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	J	614		746	
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg		0.0195		0.0152	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg		28.3		32	
Potassium (total)	SW6010B	58210	3390		mg/Kg		2900		2620	
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	B	3.61		2.13	
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	U	0.11	U	0.107	U
Sodium (total)	SW6010B	3690			mg/Kg		164		149	
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	U	1.22	U	1.19	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH13A(8-10) BH13 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(3-5) BH14 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg		30.4		32.3	
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg		53.7		54.5	
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	U	81.7	U	81.2	U
Acenaphthylene	SW8310	408			ug/Kg	UJ	408	NJ	44.2	UJ
Anthracene	SW8310	22.8		2200000	ug/Kg	UJ	14.6	NJ	5.04	UJ
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	U	8.98	U	8.92	U
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	J	11.1	UJ	13.4	J
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	J	18.7	J	7.88	J
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	U	15.9	U	15.8	U
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	NJ	159	NJ	45.6	NJ
Chrysene	SW8310	63.4		62000	ug/Kg	U	23.3	J	6.47	U
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	U	9.61	U	9.54	U
Fluoranthene	SW8310	298		230000	ug/Kg	J	216	NJ	25.6	U
Fluorene	SW8310	162		270000	ug/Kg	U	50.1	J	27.4	U
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	J	23.1	J	3.91	U
Naphthalene	SW8310	256		5600	ug/Kg	U	256	NJ	29.6	U
Phenanthrene	SW8310	247			ug/Kg	U	130	NJ	21.3	U
Pyrene	SW8310	96.2		230000	ug/Kg	U	30.6	U	30.4	U
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U			183	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U			1090	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U			127	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U			149	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U			217	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U			400	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	U			243	U
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	J	0.472	UJ	1.1	J
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	UJ	0.81	UJ	0.826	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	U	2.23	U	2.27	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	U	0.481	U	0.49	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	J	0.419	U	0.427	U
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	J	2.1		0.454	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	U	0.312	U	0.318	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	UJ	0.321	UJ	0.327	UJ
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	U	0.668	U	0.681	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	U	0.374	U	0.381	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	U	0.401	U	0.408	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH13A(8-10) BH13 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH14A(3-5) BH14 05/24/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	U	0.383	U	0.39	U
1,2-Dichloropropane	SW8260			340	ug/Kg	U	0.427	U	0.436	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	U	0.276	U	0.281	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	U	0.329	U	0.336	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	UJ	3.33	UJ	3.39	UJ
2-Hexanone	SW8260				ug/Kg	UJ	3.36	UJ	3.42	UJ
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	UJ	3.59	UJ	3.66	UJ
Acetone	SW8260	22.4		1400000	ug/Kg	U	3.13	U	3.19	U
Benzene	SW8260			640	ug/Kg	U	0.401	U	0.408	U
Bromochloromethane	SW8260				mg/Kg	U	0.000445	U	0.000454	U
Bromodichloromethane	SW8260			820	ug/Kg	U	0.436	U	0.445	U
Bromoform	SW8260			62000	ug/Kg	U	0.436	U	0.445	U
Bromomethane	SW8260			390	ug/Kg	UJ	0.445	UJ	0.454	UJ
Carbon Disulfide	SW8260			36000	ug/Kg	U	2.1	U	2.14	U
Carbon tetrachloride	SW8260			250	ug/Kg	U	0.436	U	0.445	U
Chlorobenzene	SW8260			15000	ug/Kg	U	0.365	U	0.372	U
Chloroethane	SW8260			3000	ug/Kg	U	0.721	U	0.735	U
Chloroform	SW8260			220	ug/Kg	U	0.463	U	0.472	U
Chloromethane	SW8260			4700	ug/Kg	U	0.329	U	0.336	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	U	0.427	U	0.436	U
Dibromochloromethane	SW8260			1100	ug/Kg	UJ	0.445	UJ	0.454	UJ
Dichlorodifluoromethane	SW8260			9400	ug/Kg	UR		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	U	0.338	U	0.345	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	U	0.401	U	0.408	U
Methyl Acetate	SW8260			2200000	ug/Kg	UJ	2.94	UJ	3	UJ
Methylcyclohexane	SW8260			260000	ug/Kg	U	0.454	U	0.463	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	U	1.2	U	1.23	U
Styrene	SW8260	1		440000	ug/Kg	U	0.347	U	0.354	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	U	0.472	U	0.481	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	J	0.338	UJ	0.345	UJ
Toluene	SW8260			66000	ug/Kg	U	0.303	U	0.309	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	U	0.401	U	0.408	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	UJ	0.445	UJ	0.454	UJ
Vinyl chloride	SW8260			79	ug/Kg	U	0.499	U	0.508	U
Xylenes, Total	SW8260			27000	ug/Kg	U	0.347	U	0.354	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	U	0.419	U	0.427	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	U	0.383	U	0.39	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	U	0.472	U	0.481	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	U	0.223	U	0.227	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH14A(8-10) BH14 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(3-5 BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT	17.8		20.6		
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U	950	J	683
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U	700	J	809
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U	125
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U	125
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125
HMX	SW8330			310000	ug/Kg	125	U	125	U	125
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125
RDX	SW8330			4400	ug/Kg	125	U	125	U	125
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	11270		9690	J	10990
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.424	UJ	0.43	U	0.425
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	8.81		13.6	J	13.6
Barium (total)	SW6010B	798	826	540	mg/Kg	64.9		48.7	J	62.8
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.574	J	0.584	J	0.611
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.356	J	0.121	J	0.158
Calcium (total)	SW6010B	1173000	52300		mg/Kg	47940		9000	J	4210
Chromium (total)	SW6010B	367	29		mg/Kg	18.9		15.7	J	16.9
Cobalt (total)	SW6010B	166	116	90	mg/Kg	9.05		7.54	J	10.1
Copper (total)	SW6010B	504	56.2	310	mg/Kg	23		23	J	25.1
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	21740		22780	J	23980
Lead (total)	SW6010B	227	48.6	40	mg/Kg	10.3		10.8	J	12.8
Magnesium (total)	SW6010B	363100	10400		mg/Kg	**18820**		4450	J	3600
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	509		283	J	465
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0183		0.0252		0.0254
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	27.5		21.7	J	25.3
Potassium (total)	SW6010B	58210	3390		mg/Kg	3000		1420	J	1530
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	3.63		1.89	J	0.201
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.111	U	0.154	J	0.274
Sodium (total)	SW6010B	3690			mg/Kg	181		103	J	99
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	1.24	U	1.25	U	1.24

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH14A(8-10) BH14 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(3-5 BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL
Vanadium (total)	SW6010B	536	40.9		mg/Kg	31		28.1	J	29.6
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	53.2		49.1		51.9
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	169	NJ	81.9	U	
Acenaphthylene	SW8310	408			ug/Kg	60.8	J	66.5	J	
Anthracene	SW8310	22.8		2200000	ug/Kg	11.3	J	5.09	UJ	
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.82	U	9	U	
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	16.6	J	13.1	J	
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	27.3	NJ	5.4	J	
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	15.6	U	16	U	
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	129	NJ	42.7	NJ	
Chrysene	SW8310	63.4		62000	ug/Kg	19	J	6.53	U	
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	9.43	U	9.63	U	
Fluoranthene	SW8310	298		230000	ug/Kg	83.6	J	25.9	U	
Fluorene	SW8310	162		270000	ug/Kg	27.1	U	27.7	U	
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	16.5	J	3.95	U	
Naphthalene	SW8310	256		5600	ug/Kg	71.2	J	29.9	U	
Phenanthrene	SW8310	247			ug/Kg	83.9	J	21.5	U	
Pyrene	SW8310	96.2		230000	ug/Kg	30	U	30.7	U	
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg			195	U	
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg			1150	U	
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg			135	U	
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg			158	U	
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg			231	U	
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg			426	U	
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg			259	U	
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.496	U	12.3		11.5
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.852	UJ	0.855	U	0.82
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.34	U	2.35	U	2.25
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.506	U	0.507	U	0.487
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.44	U	0.67	J	0.65
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	0.468	U	0.62	J	0.451
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.328	U	0.329	U	0.315
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.337	U	0.338	U	0.324
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.702	U	0.705	U	0.676
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.393	U	0.395	U	0.378
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.421	U	0.423	U	0.405

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH14A(8-10) BH14 05/24/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15D(3-5 BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL
1,2-Dichloroethane	SW8260			280	ug/Kg	0.403	U	0.404	U	0.387
1,2-Dichloropropane	SW8260			340	ug/Kg	0.449	U	0.451	U	0.432
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.29	U	0.291	U	0.279
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.346	U	0.348	U	0.333
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.5	U	3.51	U	3.37
2-Hexanone	SW8260				ug/Kg	3.53	U	3.54	U	3.4
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.77	U	3.79	U	3.63
Acetone	SW8260	22.4		1400000	ug/Kg	3.3	UJ	3.31	U	3.17
Benzene	SW8260			640	ug/Kg	0.421	U	0.423	U	0.405
Bromochloromethane	SW8260				mg/Kg	0.000468	U	0.00047	U	0.000451
Bromodichloromethane	SW8260			820	ug/Kg	0.459	U	0.46	U	0.441
Bromoform	SW8260			62000	ug/Kg	0.459	U	0.46	U	0.441
Bromomethane	SW8260			390	ug/Kg	0.468	U	0.47	U	0.451
Carbon Disulfide	SW8260			36000	ug/Kg	2.21	U	2.22	U	2.13
Carbon tetrachloride	SW8260			250	ug/Kg	0.459	U	0.46	U	0.441
Chlorobenzene	SW8260			15000	ug/Kg	0.384	U	0.385	U	0.369
Chloroethane	SW8260			3000	ug/Kg	0.758	U	0.761	U	0.73
Chloroform	SW8260			220	ug/Kg	0.487	U	0.489	U	0.469
Chloromethane	SW8260			4700	ug/Kg	0.346	U	0.348	U	0.333
Cyclohexane	SW8260	3.9		280000	ug/Kg	0.449	UJ	0.451	U	0.432
Dibromochloromethane	SW8260			1100	ug/Kg	0.468	U	0.47	U	0.451
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR	0.78	U	0.748
Ethylbenzene	SW8260			190000	ug/Kg	0.356	U	0.357	U	0.342
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.421	UJ	0.423	U	0.405
Methyl Acetate	SW8260			2200000	ug/Kg	3.09	U	3.1	U	2.97
Methylcyclohexane	SW8260			260000	ug/Kg	0.477	UJ	0.479	U	0.46
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.26	U	1.27	U	1.22
Styrene	SW8260	1		440000	ug/Kg	0.365	U	0.366	U	0.351
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.496	U	0.498	U	0.478
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.356	U	2.9		3
Toluene	SW8260			66000	ug/Kg	0.318	U	0.319	U	0.306
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.421	U	0.423	U	0.405
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.468	U	0.47	U	0.451
Vinyl chloride	SW8260			79	ug/Kg	0.524	U	0.526	U	0.505
Xylenes, Total	SW8260			27000	ug/Kg	0.365	U	0.366	U	0.351
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.44	U	0.442	U	0.423
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.403	U	0.404	U	0.387
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.496	U	0.498	U	0.478
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.234	U	0.235	U	0.225

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH15D(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(8-10) BH15 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT		20.3		19.7	
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	U			125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	U			125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg				311	J
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg				506	
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	U			125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	U			125	U
2-Nitrotoluene	SW8330			880	ug/Kg	U			125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U			125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	U			125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U			125	U
HMX	SW8330			310000	ug/Kg	U			125	U
Nitrobenzene	SW8330			2000	ug/Kg	U			125	U
RDX	SW8330			4400	ug/Kg	U			125	U
Tetryl	SW8330			61000	ug/Kg	U			125	U
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	J			13040	J
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	U			0.421	U
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	J			6.82	J
Barium (total)	SW6010B	798	826	540	mg/Kg	J			67.7	J
Beryllium (total)	SW6010B	11.4	1		mg/Kg	J			0.601	J
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	J			0.305	J
Calcium (total)	SW6010B	1173000	52300		mg/Kg	J			**54050**	J
Chromium (total)	SW6010B	367	29		mg/Kg	J			18.9	J
Cobalt (total)	SW6010B	166	116	90	mg/Kg	J			9.58	J
Copper (total)	SW6010B	504	56.2	310	mg/Kg	J			22.2	J
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	J			21160	J
Lead (total)	SW6010B	227	48.6	40	mg/Kg	J			10.5	J
Magnesium (total)	SW6010B	363100	10400		mg/Kg	J			**21450**	J
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	J			491	J
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg				0.0161	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	J			25.1	J
Potassium (total)	SW6010B	58210	3390		mg/Kg	J			3360	J
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	U			3.95	J
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	J			0.16	J
Sodium (total)	SW6010B	3690			mg/Kg	J			223	J
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	U			1.23	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH15D(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(8-10) BH15 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg	J			30.6	J
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg				51	
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg		82.8	U	82.2	U
Acenaphthylene	SW8310	408			ug/Kg		52	J	44.8	UJ
Anthracene	SW8310	22.8		2200000	ug/Kg		5.15	UJ	5.15	J
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg		9.1	U	9.03	U
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg		14.7	J	11.1	U
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg		4.85	J	17.9	J
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg		16.2	U	51.9	J
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg		46.9	NJ	61.6	NJ
Chrysene	SW8310	63.4		62000	ug/Kg		6.6	U	14.2	J
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg		9.74	U	9.66	U
Fluoranthene	SW8310	298		230000	ug/Kg		26.2	U	30.6	J
Fluorene	SW8310	162		270000	ug/Kg		28	U	27.8	U
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg		3.99	U	10.8	J
Naphthalene	SW8310	256		5600	ug/Kg		30.3	U	57.3	J
Phenanthrene	SW8310	247			ug/Kg		21.7	U	37.9	J
Pyrene	SW8310	96.2		230000	ug/Kg		31	U	30.8	U
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg		190	U		
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg		1130	U		
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg		132	U		
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg		154	U		
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg		225	U		
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg		416	U		
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg		253	U		
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg				15.3	
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	U			0.852	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	U			2.34	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	U			0.505	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	J			1.7	
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	U			0.69	J
1,2,3-Trichlorobenzene	SW8260				ug/Kg	U			0.328	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	U			0.337	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	U			0.702	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	U			0.393	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	U			0.421	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH15D(3-5) BH15 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH15A(8-10) BH15 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	U			0.402	U
1,2-Dichloropropane	SW8260			340	ug/Kg	U			0.449	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	U			0.29	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	U			0.346	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	U			3.5	U
2-Hexanone	SW8260				ug/Kg	U			3.53	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	U			3.77	U
Acetone	SW8260	22.4		1400000	ug/Kg	U			3.29	U
Benzene	SW8260			640	ug/Kg	U			0.421	U
Bromochloromethane	SW8260				mg/Kg	U			0.000468	U
Bromodichloromethane	SW8260			820	ug/Kg	U			0.459	U
Bromoform	SW8260			62000	ug/Kg	U			0.459	U
Bromomethane	SW8260			390	ug/Kg	U			0.468	U
Carbon Disulfide	SW8260			36000	ug/Kg	U			2.21	U
Carbon tetrachloride	SW8260			250	ug/Kg	U			0.459	U
Chlorobenzene	SW8260			15000	ug/Kg	U			0.384	U
Chloroethane	SW8260			3000	ug/Kg	U			0.758	U
Chloroform	SW8260			220	ug/Kg	U			0.487	U
Chloromethane	SW8260			4700	ug/Kg	U			0.346	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	U			0.449	U
Dibromochloromethane	SW8260			1100	ug/Kg	U			0.468	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	U			0.777	U
Ethylbenzene	SW8260			190000	ug/Kg	U			0.356	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	U			0.421	U
Methyl Acetate	SW8260			2200000	ug/Kg	U			3.09	U
Methylcyclohexane	SW8260			260000	ug/Kg	U			0.477	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	U			1.26	U
Styrene	SW8260	1		440000	ug/Kg	U			0.365	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	U			0.496	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg				0.356	U
Toluene	SW8260			66000	ug/Kg	U			0.318	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	U			0.421	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	U			0.468	U
Vinyl chloride	SW8260			79	ug/Kg	U			0.524	U
Xylenes, Total	SW8260			27000	ug/Kg	U			0.365	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	U			0.44	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	U			0.402	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	U			0.496	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	U			0.234	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(3-5) BH16 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH16A(8-10) BH16 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(3-5) BH17 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT	17.8		19.6		17.3
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	763		229	J	125
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	417	J	639		125
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U	125
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U	125
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125
HMX	SW8330			310000	ug/Kg	125	U	125	U	125
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125
RDX	SW8330			4400	ug/Kg	125	U	125	U	125
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	14670	J	7940	J	**15660**
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.411	U	0.413	U	0.415
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	11.9	J	9.68	J	16.1
Barium (total)	SW6010B	798	826	540	mg/Kg	76.2	J	59.8	J	116
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.75		0.388	J	0.878
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.0572	U	0.398	J	0.16
Calcium (total)	SW6010B	1173000	52300		mg/Kg	3620	J	**54190**	**J**	3640
Chromium (total)	SW6010B	367	29		mg/Kg	22.9	J	12.4	J	23.6
Cobalt (total)	SW6010B	166	116	90	mg/Kg	7.27	J	7.39	J	16.7
Copper (total)	SW6010B	504	56.2	310	mg/Kg	21.1	J	22.5	J	27.8
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	26750	J	19150	J	29990
Lead (total)	SW6010B	227	48.6	40	mg/Kg	7.88	J	13.5	J	14.4
Magnesium (total)	SW6010B	363100	10400		mg/Kg	4350	J	**18320**	**J**	4420
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	256	J	492	J	856
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0346		0.0137		0.0241
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	22.8	J	19.7	J	36.1
Potassium (total)	SW6010B	58210	3390		mg/Kg	2000	J	2010	J	2570
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	1.73	J	3.53	J	0.267
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.108	U	0.109	U	0.514
Sodium (total)	SW6010B	3690			mg/Kg	91.6	J	163	J	160
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	**1.8**	**J**	1.2	U	1.21

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(3-5) BH16 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH16A(8-10) BH16 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(3-5) BH17 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL
Vanadium (total)	SW6010B	536	40.9		mg/Kg	36.2	J	21.3	J	40.2
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	52.2		47.6		61.9
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	26.9	UJ	75	U	73.1
Acenaphthylene	SW8310	408			ug/Kg	14.7	UJ	40.9	UJ	39.9
Anthracene	SW8310	22.8		2200000	ug/Kg	1.67	UJ	4.93	J	4.55
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	2.96	UJ	8.24	UJ	8.04
Benzo(a)pyrene	SW8310	26.6		62	ug/Kg	3.65	UJ	12.4	J	9.92
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	1.44	UJ	14.3	J	4
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	5.25	UJ	14.6	U	14.3
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	1.37	UJ	3.82	U	104
Chrysene	SW8310	63.4		62000	ug/Kg	2.15	UJ	12.8	J	5.83
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	3.17	UJ	8.81	U	8.6
Fluoranthene	SW8310	298		230000	ug/Kg	8.51	UJ	28.4	J	23.1
Fluorene	SW8310	162		270000	ug/Kg	9.1	UJ	25.3	U	24.7
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	1.3	UJ	9.89	J	3.53
Naphthalene	SW8310	256		5600	ug/Kg	9.84	UJ	57.6	J	26.7
Phenanthrene	SW8310	247			ug/Kg	7.06	UJ	22.6	J	19.2
Pyrene	SW8310	96.2		230000	ug/Kg	10.1	UJ	28.1	U	27.4
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	175	U			189
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1040	U			1120
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	122	U			131
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	142	U			153
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	208	U			224
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	384	U			413
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	233	U			251
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.8	J	0.77	J	0.464
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.823	U	0.866	U	0.796
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.26	U	2.38	U	2.19
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.488	U	0.514	U	0.473
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.425	U	0.84	J	0.411
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	0.452	U	0.5	J	1.1
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.316	U	0.333	U	0.306
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.325	U	0.343	U	0.315
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.678	U	0.714	U	0.656
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.38	U	0.4	U	0.368
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.407	U	0.428	U	0.394

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH16A(3-5) BH16 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH16A(8-10) BH16 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH17A(3-5) BH17 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL
1,2-Dichloroethane	SW8260			280	ug/Kg	0.389	U	0.409	U	0.376
1,2-Dichloropropane	SW8260			340	ug/Kg	0.434	U	0.457	U	0.42
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.28	U	0.295	U	0.271
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.334	U	0.352	U	0.324
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.38	U	3.56	U	3.6
2-Hexanone	SW8260				ug/Kg	3.41	U	3.59	U	3.3
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.64	U	3.84	U	3.53
Acetone	SW8260	22.4		1400000	ug/Kg	3.18	U	3.35	U	22.4
Benzene	SW8260			640	ug/Kg	0.407	U	0.428	U	0.394
Bromochloromethane	SW8260				mg/Kg	0.000452	U	0.000476	U	0.000438
Bromodichloromethane	SW8260			820	ug/Kg	0.443	U	0.466	U	0.429
Bromoform	SW8260			62000	ug/Kg	0.443	U	0.466	U	0.429
Bromomethane	SW8260			390	ug/Kg	0.452	U	0.476	U	0.438
Carbon Disulfide	SW8260			36000	ug/Kg	2.13	U	2.25	U	2.07
Carbon tetrachloride	SW8260			250	ug/Kg	0.443	U	0.466	U	0.429
Chlorobenzene	SW8260			15000	ug/Kg	0.371	U	0.39	U	0.359
Chloroethane	SW8260			3000	ug/Kg	0.732	U	0.771	U	0.709
Chloroform	SW8260			220	ug/Kg	0.47	U	0.495	U	0.455
Chloromethane	SW8260			4700	ug/Kg	0.334	U	0.352	U	0.324
Cyclohexane	SW8260	3.9		280000	ug/Kg	0.434	U	0.457	U	0.83
Dibromochloromethane	SW8260			1100	ug/Kg	0.452	U	0.476	U	0.438
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.75	U	0.79	U	0.726
Ethylbenzene	SW8260			190000	ug/Kg	0.343	U	0.362	U	0.333
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.407	U	0.428	U	0.394
Methyl Acetate	SW8260			2200000	ug/Kg	2.98	U	3.14	U	2.89
Methylcyclohexane	SW8260			260000	ug/Kg	0.461	U	0.485	U	0.446
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.22	U	1.28	U	1.18
Styrene	SW8260	1		440000	ug/Kg	0.353	U	0.371	U	0.341
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.479	U	0.504	U	0.464
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	1.2		0.362	U	0.333
Toluene	SW8260			66000	ug/Kg	0.307	U	0.324	U	0.298
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.407	U	0.428	U	0.394
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.452	U	0.476	U	0.438
Vinyl chloride	SW8260			79	ug/Kg	0.506	U	0.533	U	0.49
Xylenes, Total	SW8260			27000	ug/Kg	0.353	U	0.371	U	0.341
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.425	U	0.447	U	0.411
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.389	U	0.409	U	0.376
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.479	U	0.504	U	0.464
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.226	U	0.238	U	0.219

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH17A(8-10) BH17 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH18A(3-5) BH18 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT		18.5		18.2	
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	U	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	U	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	U	125	U	**17900**	**J**
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	U	125	U	**19200**	**J**
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	U	125	U	**15400**	**J**
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	U	125	U	4980	J
2-Nitrotoluene	SW8330			880	ug/Kg	U	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	U	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U	125	U	125	U
HMX	SW8330			310000	ug/Kg	U	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	U	125	U	125	U
RDX	SW8330			4400	ug/Kg	U	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	U	125	U	125	U
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg		13810		**17390**	
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	UJ	0.724	BJ	0.415	U
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	J	8.79	J	10.2	J
Barium (total)	SW6010B	798	826	540	mg/Kg	J	97	J	99.2	J
Beryllium (total)	SW6010B	11.4	1		mg/Kg		0.674		0.909	
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	BJ	0.375	J	0.0826	BJ
Calcium (total)	SW6010B	1173000	52300		mg/Kg		**54080**	**J**	4100	J
Chromium (total)	SW6010B	367	29		mg/Kg		20.8		27.1	
Cobalt (total)	SW6010B	166	116	90	mg/Kg	J	11.9	J	7.77	J
Copper (total)	SW6010B	504	56.2	310	mg/Kg	J	34.3	J	25.3	J
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	J	24330	J	28250	J
Lead (total)	SW6010B	227	48.6	40	mg/Kg	J	18.1		**103**	
Magnesium (total)	SW6010B	363100	10400		mg/Kg		**16970**		5760	
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	J	723	J	226	J
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg		0.0182		0.0232	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	J	35.3	J	30.2	J
Potassium (total)	SW6010B	58210	3390		mg/Kg	J	**3440**	**J**	2870	J
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	BJ	2.9		1.27	
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	J	0.28	J	0.368	J
Sodium (total)	SW6010B	3690			mg/Kg		212		138	
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	U	1.21	U	**2.07**	**J**

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH17A(8-10) BH17 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH18A(3-5) BH18 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg		32.5		40.8	
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	J	64.7	J	106	J
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	U	68.8	U	78.1	U
Acenaphthylene	SW8310	408			ug/Kg	UJ	146	NJ	67.5	J
Anthracene	SW8310	22.8		2200000	ug/Kg	UJ	10.9	NJ	4.86	UJ
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	U	7.56	U	8.59	U
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	UJ	23.4	NJ	18.9	J
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	J	17.7	J	6.98	J
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	U	49.4	J	15.2	U
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	NJ	94.2	NJ	146	NJ
Chrysene	SW8310	63.4		62000	ug/Kg	U	26.3	J	6.23	U
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	U	8.09	U	39.6	NJ
Fluoranthene	SW8310	298		230000	ug/Kg	U	59.5	J	24.7	U
Fluorene	SW8310	162		270000	ug/Kg	U	23.2	U	26.4	U
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	U	12.9	J	3.77	U
Naphthalene	SW8310	256		5600	ug/Kg	U	74.8	J	234	NJ
Phenanthrene	SW8310	247			ug/Kg	U	33.6	J	20.5	U
Pyrene	SW8310	96.2		230000	ug/Kg	U	25.7	U	29.2	U
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U	181	U	181	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U	1070	U	1070	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U	126	U	125	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U	147	U	147	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U	214	U	214	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U	396	U	395	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	U	240	U	240	U
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	U	0.48	U	0.463	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	UJ	0.823	UJ	0.795	UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	U	2.26	U	2.18	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	U	0.489	U	0.472	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	U	0.425	U	0.411	U
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg		0.59	J	1.9	
1,2,3-Trichlorobenzene	SW8260				ug/Kg	U	0.317	U	0.306	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	U	0.326	U	0.314	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	U	0.679	U	0.655	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	U	0.38	U	0.367	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	U	0.407	U	0.393	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH17A(8-10) BH17 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH18A(3-5) BH18 05/26/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	U	0.389	U	0.376	U
1,2-Dichloropropane	SW8260			340	ug/Kg	U	0.434	U	0.419	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	U	0.28	U	0.271	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	U	0.335	U	0.323	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	J	3.38	U	3.27	U
2-Hexanone	SW8260				ug/Kg	U	3.41	U	3.29	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	U	3.65	U	3.52	U
Acetone	SW8260	22.4		1400000	ug/Kg		3.18	U	3.07	U
Benzene	SW8260			640	ug/Kg	U	0.407	U	0.393	U
Bromochloromethane	SW8260				mg/Kg	U	0.000452	U	0.000437	U
Bromodichloromethane	SW8260			820	ug/Kg	U	0.443	U	0.428	U
Bromoform	SW8260			62000	ug/Kg	U	0.443	U	0.428	U
Bromomethane	SW8260			390	ug/Kg	U	0.452	U	0.437	U
Carbon Disulfide	SW8260			36000	ug/Kg	U	2.14	U	2.06	U
Carbon tetrachloride	SW8260			250	ug/Kg	U	0.443	U	0.428	U
Chlorobenzene	SW8260			15000	ug/Kg	U	0.371	U	0.358	U
Chloroethane	SW8260			3000	ug/Kg	U	0.733	U	0.707	U
Chloroform	SW8260			220	ug/Kg	U	0.47	U	0.454	U
Chloromethane	SW8260			4700	ug/Kg	U	0.335	U	0.323	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	J	0.434	UJ	0.419	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	U	0.452	U	0.437	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	UJ	0.751	UJ	0.725	UJ
Ethylbenzene	SW8260			190000	ug/Kg	U	0.344	U	0.332	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	UJ	0.407	UJ	0.393	UJ
Methyl Acetate	SW8260			2200000	ug/Kg	U	2.99	U	2.88	U
Methylcyclohexane	SW8260			260000	ug/Kg	UJ	0.461	UJ	0.445	UJ
Methylene Chloride	SW8260	1.9		9100	ug/Kg	U	1.22	U	1.18	U
Styrene	SW8260	1		440000	ug/Kg	U	0.353	U	0.341	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	U	0.48	U	0.463	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	U	0.344	U	0.332	U
Toluene	SW8260			66000	ug/Kg	U	0.308	U	0.297	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	U	0.407	U	0.393	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	U	0.452	U	0.437	U
Vinyl chloride	SW8260			79	ug/Kg	U	0.507	U	0.489	U
Xylenes, Total	SW8260			27000	ug/Kg	U	0.353	U	0.341	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	U	0.425	U	0.411	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	U	0.389	U	0.376	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	U	0.48	U	0.463	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	U	0.226	U	0.218	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(8-10) BH18 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(3-5) BH19 05/26/2004 3.0-5.0 ft.SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(8-10) BH19 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT	22.8		17.5		18.3
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U	125	U	423
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U	125	U	125
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U	125	U	125
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U	125	U	125
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125
HMX	SW8330			310000	ug/Kg	125	U	125	U	125
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125
RDX	SW8330			4400	ug/Kg	125	U	125	U	125
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	12560		11490		12140
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.414	U	0.412	U	0.416
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	9.45	J	7.07	J	7.72
Barium (total)	SW6010B	798	826	540	mg/Kg	55.7	J	57.8	J	55.1
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.629		0.635		0.569
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.381	J	0.111	BJ	0.297
Calcium (total)	SW6010B	1173000	52300		mg/Kg	49400	J	2950	J	**55790**
Chromium (total)	SW6010B	367	29		mg/Kg	19.5		19.2		19.4
Cobalt (total)	SW6010B	166	116	90	mg/Kg	8.11	J	8.37	J	7.26
Copper (total)	SW6010B	504	56.2	310	mg/Kg	29	J	16.1	J	23.1
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	22070	J	19620	J	20980
Lead (total)	SW6010B	227	48.6	40	mg/Kg	13.5	J	8.94	J	10.5
Magnesium (total)	SW6010B	363100	10400		mg/Kg	**17330**		3190		**18310**
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	388	J	229	J	368
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0152		0.023		0.0143
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	24.7	J	23.4	J	23.7
Potassium (total)	SW6010B	58210	3390		mg/Kg	3180	J	1770	J	3080
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	2.23		0.756	B	3.13
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.109	U	0.19	J	0.109
Sodium (total)	SW6010B	3690			mg/Kg	195		184		199
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	1.21	U	**1.63**	J	1.21

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(8-10) BH18 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(3-5) BH19 05/26/2004 3.0-5.0 ft.SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(8-10) BH19 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL
Vanadium (total)	SW6010B	536	40.9		mg/Kg	33.5		29.6		29
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	60.7		50.2	J	57.4
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	75.2	U	241	NJ	74.6
Acenaphthylene	SW8310	408		41	ug/Kg	41	UJ	42.2	J	73.1
Anthracene	SW8310	22.8		2200000	ug/Kg	5.72	J	4.69	J	9.15
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.27	U	9.7	J	24.3
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	10.2	UJ	9.65	UJ	27.9
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	17.2	J	3.82	U	29.9
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	50.8	J	13.9	U	70.9
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	77.2	NJ	103	NJ	41.7
Chrysene	SW8310	63.4		62000	ug/Kg	18.9	J	5.68	U	63.4
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	8.84	U	8.37	U	8.77
Fluoranthene	SW8310	298		230000	ug/Kg	37	J	22.5	U	110
Fluorene	SW8310	162		270000	ug/Kg	25.4	U	25.6	J	162
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	11.5	J	3.43	U	18.2
Naphthalene	SW8310	256		5600	ug/Kg	37.9	J	26	U	52.2
Phenanthrene	SW8310	247			ug/Kg	24.2	J	247	NJ	98.7
Pyrene	SW8310	96.2		230000	ug/Kg	28.2	U	26.6	U	96.2
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	191	U	183	U	182
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1130	U	1090	U	1080
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	133	U	127	U	127
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	155	U	149	U	148
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	226	U	217	U	216
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	418	U	401	U	399
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	254	U	243	U	242
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.498	U	0.48	U	0.503
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.856	UJ	0.824	UJ	0.864
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.35	U	2.26	U	2.37
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.508	U	0.489	U	0.513
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	0.442	U	0.426	U	0.446
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	0.47	U	2.2		0.58
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.329	U	0.317	U	0.332
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.339	U	0.326	U	0.342
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.705	U	0.679	U	0.712
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.395	U	0.38	U	0.399
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.423	U	0.407	U	0.427

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH18A(8-10) BH18 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(3-5) BH19 05/26/2004 3.0-5.0 ft.SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH19A(8-10) BH19 05/26/2004 8.0-10.0 ft. SO RESULT / QUAL
1,2-Dichloroethane	SW8260			280	ug/Kg	0.404	U	0.389	U	0.408
1,2-Dichloropropane	SW8260			340	ug/Kg	0.451	U	0.435	U	0.456
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.292	U	0.281	U	0.294
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.348	U	0.335	U	0.351
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.52	U	4.2	J	3.55
2-Hexanone	SW8260				ug/Kg	3.55	U	3.41	U	3.58
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.79	U	3.65	U	3.83
Acetone	SW8260	22.4		1400000	ug/Kg	3.31	U	22.1		8.8
Benzene	SW8260			640	ug/Kg	0.423	U	0.407	U	0.427
Bromochloromethane	SW8260				mg/Kg	0.00047	U	0.000453	U	0.000475
Bromodichloromethane	SW8260			820	ug/Kg	0.461	U	0.444	U	0.465
Bromoform	SW8260			62000	ug/Kg	0.461	U	0.444	U	0.465
Bromomethane	SW8260			390	ug/Kg	0.47	U	0.453	U	0.475
Carbon Disulfide	SW8260			36000	ug/Kg	2.22	U	2.14	U	2.24
Carbon tetrachloride	SW8260			250	ug/Kg	0.461	U	0.444	U	0.465
Chlorobenzene	SW8260			15000	ug/Kg	0.386	U	0.371	U	0.389
Chloroethane	SW8260			3000	ug/Kg	0.762	U	0.733	U	0.769
Chloroform	SW8260			220	ug/Kg	0.489	U	0.471	U	0.494
Chloromethane	SW8260			4700	ug/Kg	0.348	U	0.335	U	0.351
Cyclohexane	SW8260	3.9		280000	ug/Kg	2.8	J	0.435	UJ	0.63
Dibromochloromethane	SW8260			1100	ug/Kg	0.47	U	0.453	U	0.475
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.781	UJ	0.752	UJ	0.788
Ethylbenzene	SW8260			190000	ug/Kg	0.357	U	0.344	U	0.361
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.423	UJ	0.407	UJ	0.427
Methyl Acetate	SW8260			2200000	ug/Kg	3.1	U	2.99	U	3.13
Methylcyclohexane	SW8260			260000	ug/Kg	0.48	UJ	0.462	UJ	0.484
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.27	U	1.9	J	1.28
Styrene	SW8260	1		440000	ug/Kg	0.367	U	0.353	U	0.37
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.498	U	0.48	U	0.503
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.357	U	0.344	U	0.361
Toluene	SW8260			66000	ug/Kg	0.32	U	0.308	U	0.323
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.423	U	0.407	U	0.427
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.47	U	0.453	U	0.475
Vinyl chloride	SW8260			79	ug/Kg	0.527	U	0.507	U	0.532
Xylenes, Total	SW8260			27000	ug/Kg	0.367	U	0.353	U	0.37
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.442	U	0.426	U	0.446
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.404	U	0.389	U	0.408
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.498	U	0.48	U	0.503
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.235	U	0.226	U	0.237

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH20A(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH20D(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry										
Moisture, Percent	D2216	22.8			PERCENT		16.6			
Explosives										
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	U	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	U	125	U	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg		249	J	539	
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	U	370	J	125	U
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	U	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	U	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	U	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	U	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U	125	U	125	U
HMX	SW8330			310000	ug/Kg	U	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	U	125	U	125	U
RDX	SW8330			4400	ug/Kg	U	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	U	125	U	125	U
Metals										
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg		11000	J	10180	J
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	U	0.404	U	0.394	U
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	J	9.89	J	11.6	J
Barium (total)	SW6010B	798	826	540	mg/Kg	J	63.3	J	64.9	J
Beryllium (total)	SW6010B	11.4	1		mg/Kg	J	0.604		0.59	
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	J	0.0941	J	0.0549	U
Calcium (total)	SW6010B	1173000	52300		mg/Kg	J	3080	J	2810	J
Chromium (total)	SW6010B	367	29		mg/Kg		17	J	16.5	J
Cobalt (total)	SW6010B	166	116	90	mg/Kg	J	7.42	J	10.1	J
Copper (total)	SW6010B	504	56.2	310	mg/Kg	J	9.98	J	9.65	J
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	J	23370	J	24630	J
Lead (total)	SW6010B	227	48.6	40	mg/Kg	J	9.39	J	9.47	J
Magnesium (total)	SW6010B	363100	10400		mg/Kg		3000	J	2810	J
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	J	344	J	346	J
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg		0.0205		0.0231	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	J	19.3	J	18.6	J
Potassium (total)	SW6010B	58210	3390		mg/Kg	J	1490	J	1420	J
Selenium (total)	SW6010B	51.8	2	39	mg/Kg		1.62	J	0.957	J
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	U	0.165	J	0.241	J
Sodium (total)	SW6010B	3690			mg/Kg		74.7	J	75.2	J
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	U	1.18	U	1.15	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH20A(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH20D(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg		31.6	J	33	J
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	J	51.4		45.7	
Polyaromatic Hydrocarbon (PAH) Compounds										
Acenaphthene	SW8310	241		370000	ug/Kg	UJ	90.9	J		
Acenaphthylene	SW8310	408			ug/Kg	J	78.6	J		
Anthracene	SW8310	22.8		2200000	ug/Kg	J	4.9	UJ		
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	NJ	11.2	J		
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	NJ	10.7	UJ		
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	NJ	4.22	U		
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	NJ	15.4	U		
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	NJ	59.2	NJ		
Chrysene	SW8310	63.4		62000	ug/Kg	NJ	6.28	U		
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	UJ	16.1	J		
Fluoranthene	SW8310	298		230000	ug/Kg	J	24.9	U		
Fluorene	SW8310	162		270000	ug/Kg	J	26.6	U		
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	J	151	NJ		
Naphthalene	SW8310	256		5600	ug/Kg	J	28.8	U		
Phenanthrene	SW8310	247			ug/Kg	J	20.6	U		
Pyrene	SW8310	96.2		230000	ug/Kg	J	29.5	U		
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U	175	U		
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U	1040	U		
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U	122	U		
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U	142	U		
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U	207	U		
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U	383	U		
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	U	232	U		
Volatile Organic Compounds										
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	U	0.67	J	1.5	
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	U	0.829	U	0.79	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	U	2.28	U	2.17	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	U	0.492	U	0.469	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	U	0.428	U	0.408	U
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	J	0.62	J	0.434	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	U	0.319	U	0.304	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	U	0.328	U	0.313	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	U	0.683	U	0.651	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	U	0.383	U	0.365	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	U	0.41	U	0.391	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-04-SO-2BG-BH20A(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-BH20D(3-5) BH20 05/25/2004 3.0-5.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	U	0.392	U	0.373	U
1,2-Dichloropropane	SW8260			340	ug/Kg	U	0.437	U	0.417	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	U	0.282	U	0.269	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	U	0.337	U	0.321	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	U	3.41	U	3.25	U
2-Hexanone	SW8260				ug/Kg	U	3.43	U	3.27	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	U	3.67	U	3.5	U
Acetone	SW8260	22.4		1400000	ug/Kg		3.21	U	3.06	U
Benzene	SW8260			640	ug/Kg	U	0.41	U	0.391	U
Bromochloromethane	SW8260				mg/Kg	U	0.000455	U	0.000434	U
Bromodichloromethane	SW8260			820	ug/Kg	U	0.446	U	0.426	U
Bromoform	SW8260			62000	ug/Kg	U	0.446	U	0.426	U
Bromomethane	SW8260			390	ug/Kg	U	0.455	U	0.434	U
Carbon Disulfide	SW8260			36000	ug/Kg	U	2.15	U	2.05	U
Carbon tetrachloride	SW8260			250	ug/Kg	U	0.446	U	0.426	U
Chlorobenzene	SW8260			15000	ug/Kg	U	0.373	U	0.356	U
Chloroethane	SW8260			3000	ug/Kg	U	0.738	U	0.704	U
Chloroform	SW8260			220	ug/Kg	U	0.474	U	0.452	U
Chloromethane	SW8260			4700	ug/Kg	U	0.337	U	0.321	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	J	2.9		0.417	U
Dibromochloromethane	SW8260			1100	ug/Kg	U	0.455	U	0.434	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	UJ	0.756	U	0.721	U
Ethylbenzene	SW8260			190000	ug/Kg	U	0.346	U	0.33	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	U	0.41	U	0.391	U
Methyl Acetate	SW8260			2200000	ug/Kg	U	3.01	U	2.87	U
Methylcyclohexane	SW8260			260000	ug/Kg	U	0.465	U	0.443	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	U	1.23	U	1.17	U
Styrene	SW8260	1		440000	ug/Kg	U	0.355	U	0.339	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	U	0.483	U	0.46	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	U	0.346	U	0.87	
Toluene	SW8260			66000	ug/Kg	U	0.31	U	0.295	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	U	0.41	U	0.391	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	U	0.455	U	0.434	U
Vinyl chloride	SW8260			79	ug/Kg	U	0.51	U	0.486	U
Xylenes, Total	SW8260			27000	ug/Kg	U	0.355	U	0.339	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	U	0.428	U	0.408	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	U	0.392	U	0.373	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	U	0.483	U	0.46	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	U	0.228	U	0.217	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH20A(8-10) BH20 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Wet Chemistry							
Moisture, Percent	D2216	22.8			PERCENT	17.6	
Explosives							
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U
2,4,6-Trinitrotoluene	SW8330	17900		16000	ug/Kg	125	U
2,4-Dinitrotoluene	SW8330	19200		12000	ug/Kg	125	U
2,6-Dinitrotoluene	SW8330	15400		6100	ug/Kg	125	U
2-Amino-4,6-Dinitrotoluene	SW8330	4980			ug/Kg	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U
HMX	SW8330			310000	ug/Kg	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U
RDX	SW8330			4400	ug/Kg	125	U
Tetryl	SW8330			61000	ug/Kg	125	U
Metals							
Aluminum (total)	SW6010B	233600	15500	7600	mg/Kg	12600	J
Antimony (total)	SW6010B	0.724	9.3	3.1	mg/Kg	0.412	U
Arsenic (total)	SW6010B	131	36.5	0.39	mg/Kg	9.78	J
Barium (total)	SW6010B	798	826	540	mg/Kg	103	J
Beryllium (total)	SW6010B	11.4	1		mg/Kg	0.603	
Cadmium (total)	SW6010B	8.64		3.7	mg/Kg	0.319	J
Calcium (total)	SW6010B	1173000	52300		mg/Kg	**53910**	**J**
Chromium (total)	SW6010B	367	29		mg/Kg	18.8	J
Cobalt (total)	SW6010B	166	116	90	mg/Kg	9.45	J
Copper (total)	SW6010B	504	56.2	310	mg/Kg	23.5	J
Iron (total)	SW6010B	412600	234000	2300	mg/Kg	25710	J
Lead (total)	SW6010B	227	48.6	40	mg/Kg	10.5	J
Magnesium (total)	SW6010B	363100	10400		mg/Kg	**18240**	**J**
Manganese (total)	SW6010B	8230	3506.2	180	mg/Kg	542	J
Mercury (total)	SW7471A	0.0346	0.1	2.3	mg/Kg	0.0157	
Nickel (total)	SW6010B	475	55.1	160	mg/Kg	26.7	J
Potassium (total)	SW6010B	58210	3390		mg/Kg	3250	J
Selenium (total)	SW6010B	51.8	2	39	mg/Kg	4.57	J
Silver (total)	SW6010B	3.21	11.1	39	mg/Kg	0.108	U
Sodium (total)	SW6010B	3690			mg/Kg	213	J
Thallium (total)	SW6010B	2.07	1.3	0.52	mg/Kg	1.2	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-BH20A(8-10) BH20 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
Vanadium (total)	SW6010B	536	40.9		mg/Kg	30.6	J
Zinc (total)	SW6010B	1140	321.8	2300	mg/Kg	57.3	
Polyaromatic Hydrocarbon (PAH) Compounds							
Acenaphthene	SW8310	241		370000	ug/Kg	79.3	U
Acenaphthylene	SW8310	408			ug/Kg	43.2	UJ
Anthracene	SW8310	22.8		2200000	ug/Kg	4.93	UJ
Benzo(a)anthracene	SW8310	24.3		620	ug/Kg	8.72	U
Benzo(a)pyrene	SW8310	28.6		62	ug/Kg	12.4	J
Benzo(b)fluoranthene	SW8310	29.9		620	ug/Kg	15.9	J
Benzo(g,h,i)perylene	SW8310	70.9			ug/Kg	35.7	J
Benzo(k)fluoranthene	SW8310	191		6200	ug/Kg	74.6	NJ
Chrysene	SW8310	63.4		62000	ug/Kg	13.9	J
Dibenz(a,h)anthracene	SW8310	39.6		62	ug/Kg	9.33	U
Fluoranthene	SW8310	298		230000	ug/Kg	25	U
Fluorene	SW8310	162		270000	ug/Kg	26.8	U
Indeno(1,2,3-cd)pyrene	SW8310	151		620	ug/Kg	9.59	J
Naphthalene	SW8310	256		5600	ug/Kg	68.1	J
Phenanthrene	SW8310	247			ug/Kg	42	J
Pyrene	SW8310	96.2		230000	ug/Kg	29.7	U
Polychlorinated Biphenyls (PCBs)							
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	182	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	1080	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	126	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	147	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	215	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	397	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	241	U
Volatile Organic Compounds							
1,1,1-Trichloroethane	SW8260	15.3		200000	ug/Kg	0.495	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	0.849	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	2.33	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.504	U
1,1-Dichloroethane	SW8260	1.7		51000	ug/Kg	1.6	
1,1-Dichloroethene	SW8260	2.2		12000	ug/Kg	2	
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.327	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.336	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	0.7	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.392	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.42	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-BH20A(8-10) BH20 05/25/2004 8.0-10.0 ft. SO RESULT / QUAL	VQ
1,2-Dichloroethane	SW8260			280	ug/Kg	0.401	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.448	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.289	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.345	U
2-Butanone (Methyl ethyl ketone)	SW8260	4.2		2200000	ug/Kg	3.49	U
2-Hexanone	SW8260				ug/Kg	3.52	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	3.76	U
Acetone	SW8260	22.4		1400000	ug/Kg	3.28	U
Benzene	SW8260			640	ug/Kg	0.42	U
Bromochloromethane	SW8260				mg/Kg	0.000467	U
Bromodichloromethane	SW8260			820	ug/Kg	0.457	U
Bromoform	SW8260			62000	ug/Kg	0.457	U
Bromomethane	SW8260			390	ug/Kg	0.467	U
Carbon Disulfide	SW8260			36000	ug/Kg	2.2	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.457	U
Chlorobenzene	SW8260			15000	ug/Kg	0.383	U
Chloroethane	SW8260			3000	ug/Kg	0.756	U
Chloroform	SW8260			220	ug/Kg	0.485	U
Chloromethane	SW8260			4700	ug/Kg	0.345	U
Cyclohexane	SW8260	3.9		280000	ug/Kg	0.448	U
Dibromochloromethane	SW8260			1100	ug/Kg	0.467	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	0.775	U
Ethylbenzene	SW8260			190000	ug/Kg	0.355	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.42	U
Methyl Acetate	SW8260			2200000	ug/Kg	3.08	U
Methylcyclohexane	SW8260			260000	ug/Kg	0.476	U
Methylene Chloride	SW8260	1.9		9100	ug/Kg	1.26	U
Styrene	SW8260	1		440000	ug/Kg	0.364	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.495	U
Tetrachloroethene (PCE)	SW8260	3		480	ug/Kg	0.355	U
Toluene	SW8260			66000	ug/Kg	0.317	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.42	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.467	U
Vinyl chloride	SW8260			79	ug/Kg	0.523	U
Xylenes, Total	SW8260			27000	ug/Kg	0.364	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.439	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.401	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.495	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.233	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR05-1-A TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-1-D TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-2-A TR05-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	6.91	J	12.1	J	29	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	8.34	J	16	J	20.8	
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	0.932	J	1.95	J	3.02	
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	0.345	U	0.369	U	0.74	J
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	20.5	J	37.3	J	48.5	
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	0.579	J	0.944	J	2.14	J
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	7.27	J	15.2	J	15.3	
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	0.585	J	0.782	J	2.09	J
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	1.59	U	4.21	J	3.82	J
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	0.587	J	0.39	J	0.7	J
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	14.2	J	24.8	J	27.4	
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	12.6	J	26.1	J	27.2	J
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	41.4	J	75.4	J	77.5	J
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	0.452	J	0.263	J	0.117	U
2,3,7,8-TCDF	SW8290	1880			ng/Kg	44	J	77.3	J	85.8	J
OCDD	SW8290	816			ng/Kg	33.6	J	66.7	J	93.9	J
OCDF	SW8290	358			ng/Kg	2.12	J	4.69	J	12.9	
Total HpCDD	SW8290	217			ng/Kg	12.2		22.1		49.9	
Total HpCDF	SW8290	999			ng/Kg	13		25.7		35.1	
Total HxCDD	SW8290	56.9			ng/Kg	4.33		6.2		18.6	
Total HxCDF	SW8290	7180			ng/Kg	99.3		189		225	
Total PeCDD	SW8290	22.3			ng/Kg	3.02		1.43		2.84	
Total PeCDF	SW8290	12600			ng/Kg	227		409		444	
Total TCDD	SW8290	22.9			ng/Kg	0.717		1.13		1.12	
Total TCDF	SW8290	12500			ng/Kg	278		512		586	
Explosives											
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg	53600	J	56100	J		
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg	**4320**		**2770**	J		
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg	**885000**		**1120000**			
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg	**104000**	J	**88100**			
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg	**111000**		**102000**			
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg	49800		59000			
2-Nitrotoluene	SW8330	7040		880	ug/Kg	**4500**	J	**4280**	J		
3-Nitrotoluene	SW8330	942		73000	ug/Kg	612	J	942	J		
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg	125	U	125	U		
4-Nitrotoluene	SW8330	6670		12000	ug/Kg	4110	J	3730	J		
HMX	SW8330			310000	ug/Kg	125	U	125	U		
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U		

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR05-1-A TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-1-D TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-2-A TR05-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	125	U	125	U		
Tetryl	SW8330			61000	ug/Kg	125	U	125	U		
Metals											
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg	6000	J	7150	J		
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg	4.08	J	7.02	J		
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg	14.6	J	8.29	J		
Barium (total)	SW6010B	5200	826	540	mg/Kg	**2730**	**J**	**5200**	**J**		
Beryllium (total)	SW6010B	1.27	1		mg/Kg	0.541	J	0.659	J		
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg	0.658	J	1.13	J		
Calcium (total)	SW6010B	21120	52300		mg/Kg	11140	J	6690	J		
Chromium (total)	SW6010B	114	29		mg/Kg	**114**	**J**	**48.9**	**J**		
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg	10.7	J	18.3	J		
Copper (total)	SW6010B	1840	56.2	310	mg/Kg	**1320**	**J**	**1840**	**J**		
Iron (total)	SW6010B	40460	234000	2300	mg/Kg	27690	J	40460	J		
Lead (total)	SW6010B	11930	48.6	40	mg/Kg	**4510**	**J**	**11930**	**J**		
Magnesium (total)	SW6010B	9360	10400		mg/Kg	6300		9360			
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg	213	J	551	J		
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg	0.0371	J	0.0562	J		
Nickel (total)	SW6010B	113	55.1	160	mg/Kg	89.9		113			
Potassium (total)	SW6010B	2450	3390		mg/Kg	1580	J	2290	J		
Selenium (total)	SW6010B	5.55	2	39	mg/Kg	3.39	J	5.55	J		
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg	1.14		1.43			
Sodium (total)	SW6010B	1390			mg/Kg	730	J	1270	J		
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg	**2.21**		**1.79**			
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg	15.2		20.1			
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg	482	J	834	J		
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	67400		370000	ug/Kg	4550	NJ	4810	NJ		
Acenaphthylene	SW8310	131000			ug/Kg	4550	NJ	6190	NJ		
Anthracene	SW8310	73.2		2200000	ug/Kg	16.9	UJ	17.3	UJ		
Benzo(a)anthracene	SW8310	501		620	ug/Kg	44.5	NJ	59.4	NJ		
Benzo(a)pyrene	SW8310	108		62	ug/Kg	36.8	UJ	37.7	UJ		
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg	24.8	J	31	J		
Benzo(g,h,i)perylene	SW8310				ug/Kg	52.9	U	54.3	U		
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg	13.8	U	14.2	U		
Chrysene	SW8310	928		62000	ug/Kg	113	J	67.1	J		
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg	31.9	U	32.7	U		
Fluoranthene	SW8310	720		230000	ug/Kg	140	J	133	J		
Fluorene	SW8310	328		270000	ug/Kg	306	J	328	J		

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR05-1-A TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-1-D TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-2-A TR05-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg	13.1	U	13.4	U		
Naphthalene	SW8310	51300		5600	ug/Kg	**15900**	**NJ**	102	U		
Phenanthrene	SW8310	1550			ug/Kg	163	J	175	J		
Pyrene	SW8310			230000	ug/Kg	102	U	104	U		
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	6490	U	664	U		
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	38500	U	3940	U		
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	4510	U	461	U		
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	5270	U	539	U		
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	7680	U	786	U		
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg	14200	U	1450	U		
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg	8620	U	882	U		
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg	106	J	174	J		
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	2.25	U	2.24	UJ		
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	6.19	U	6.16	U		
1,1,2-Trichloroethane	SW8260			730	ug/Kg	1.34	U	1.33	U		
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg	8.8		11.4			
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg	2.6		2.5			
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.867	U	0.862	UJ		
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.892	U	0.887	UJ		
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	1.86	U	1.85	UJ		
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	1.04	U	1.03	U		
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	1.11	U	1.11	UJ		
1,2-Dichloroethane	SW8260			280	ug/Kg	1.07	U	1.06	U		
1,2-Dichloropropane	SW8260			340	ug/Kg	1.19	U	1.18	U		
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.768	U	0.764	UJ		
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.917	U	0.912	UJ		
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	9.27	U	9.22	U		
2-Hexanone	SW8260				ug/Kg	9.34	U	9.29	U		
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	9.99	U	9.93	UJ		
Acetone	SW8260	8.7		1400000	ug/Kg	8.72	U	8.67	U		
Benzene	SW8260	2.8		640	ug/Kg	2.8	J	1.6	J		
Bromochloromethane	SW8260				mg/Kg	0.00124	U	0.00123	U		
Bromodichloromethane	SW8260			820	ug/Kg	1.21	U	1.21	U		
Bromoform	SW8260			62000	ug/Kg	1.21	U	1.21	U		
Bromomethane	SW8260			390	ug/Kg	1.24	U	1.23	U		
Carbon Disulfide	SW8260			36000	ug/Kg	5.85	U	5.82	U		
Carbon tetrachloride	SW8260			250	ug/Kg	1.21	U	1.21	U		

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR05-1-A TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-1-D TR05-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR05-2-A TR05-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	1.02	U	1.01	U		
Chloroethane	SW8260			3000	ug/Kg	2.01	U	2	U		
Chloroform	SW8260			220	ug/Kg	1.29	U	1.28	U		
Chloromethane	SW8260			4700	ug/Kg	0.917	U	0.912	U		
Cyclohexane	SW8260	24.9		280000	ug/Kg	24.9	J	1.18	UJ		
Dibromochloromethane	SW8260			1100	ug/Kg	1.24	U	1.23	U		
Dichlorodifluoromethane	SW8260			9400	ug/Kg	2.06	UJ	2.05	UJ		
Ethylbenzene	SW8260	2.3		190000	ug/Kg	0.942	U	0.936	U		
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg	1.11	U	1.11	UJ		
Methyl Acetate	SW8260			2200000	ug/Kg	8.18	U	8.13	U		
Methylcyclohexane	SW8260	23.9		260000	ug/Kg	1.4	J	1.26	U		
Methylene Chloride	SW8260			9100	ug/Kg	3.34	U	3.33	U		
Styrene	SW8260			440000	ug/Kg	0.966	U	0.961	U		
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	1.31	U	1.31	U		
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.942	U	0.936	U		
Toluene	SW8260	79.5		66000	ug/Kg	0.99	J	0.838	U		
Trichloroethene (TCE)	SW8260			53	ug/Kg	1.11	U	1.11	U		
Trichlorofluoromethane	SW8260			39000	ug/Kg	1.24	U	1.23	U		
Vinyl chloride	SW8260			79	ug/Kg	1.39	U	1.38	U		
Xylenes, Total	SW8260	12.5		27000	ug/Kg	0.966	U	0.961	U		
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	1.16	U	1.16	U		
cis-1,3-Dichloropropene	SW8260				ug/Kg	1.07	U	1.06	U		
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	1.31	U	1.31	U		
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.619	U	0.616	U		

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR06-1-A TR06-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-2-A TR06-2 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-3-A TR06-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	39.8	J	0.272	U	1.57	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	30.2		0.272	U	0.737	J
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	3.43		0.272	U	0.288	U
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	1.29	J	0.272	U	0.288	U
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	40.8		0.272	U	0.64	J
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	3.87		0.272	U	0.288	U
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	15.4		0.272	U	0.391	J
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	3.49		0.441	J	0.292	J
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	2.38	J	0.272	U	0.288	U
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	1.39	J	0.319	J	0.288	U
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	21.1	J	0.272	U	0.357	J
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	25.5	J	0.272	U	0.414	J
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	67.5	J	0.272	U	0.817	J
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	0.481	J	1.39		0.361	J
2,3,7,8-TCDF	SW8290	1880			ng/Kg	75.4	J	0.109	U	0.842	J
OCDD	SW8290	816			ng/Kg	177	J	2.99	J	20.7	J
OCDF	SW8290	358			ng/Kg	32.6		0.543	U	0.626	J
Total HpCDD	SW8290	217			ng/Kg	71.5		0.791		3.08	
Total HpCDF	SW8290	999			ng/Kg	47.2		0.287		0.958	
Total HxCDD	SW8290	56.9			ng/Kg	39.6		5.14		1.44	
Total HxCDF	SW8290	7180			ng/Kg	186		0.404		4.02	
Total PeCDD	SW8290	22.3			ng/Kg	16.4		5.76		1.22	
Total PeCDF	SW8290	12600			ng/Kg	328		0.485		6.16	
Total TCDD	SW8290	22.9			ng/Kg	7.56		1.93		0.509	
Total TCDF	SW8290	12500			ng/Kg	391		0.528		4.35	
Explosives											
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg	125	U				
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg	125	U				
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg	**74900**					
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg	**26200**	J				
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg	**10600**					
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg	125	U				
2-Nitrotoluene	SW8330	7040		880	ug/Kg	782	J				
3-Nitrotoluene	SW8330	942		73000	ug/Kg	125	U				
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg	10600	J				
4-Nitrotoluene	SW8330	6670		12000	ug/Kg	444	J				
HMX	SW8330			310000	ug/Kg	125	U				
Nitrobenzene	SW8330			2000	ug/Kg	125	U				

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-TR06-1-A TR06-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-2-A TR06-2 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-3-A TR06-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	125	U				
Tetryl	SW8330			61000	ug/Kg	125	U				
Metals											
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg	11350	J				
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg	2.34	J				
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg	12.7	J				
Barium (total)	SW6010B	5200	826	540	mg/Kg	**2490**	**J**				
Beryllium (total)	SW6010B	1.27	1		mg/Kg	**1.27**					
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg	2.04					
Calcium (total)	SW6010B	21120	52300		mg/Kg	21120	J				
Chromium (total)	SW6010B	114	29		mg/Kg	**32**					
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg	13.4	J				
Copper (total)	SW6010B	1840	56.2	310	mg/Kg	297	J				
Iron (total)	SW6010B	40460	234000	2300	mg/Kg	25460	J				
Lead (total)	SW6010B	11930	46.6	40	mg/Kg	**3640**					
Magnesium (total)	SW6010B	9360	10400		mg/Kg	7050					
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg	462	J				
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg	0.207	J				
Nickel (total)	SW6010B	113	55.1	160	mg/Kg	83.4					
Potassium (total)	SW6010B	2450	3390		mg/Kg	2390	J				
Selenium (total)	SW6010B	5.55	2	39	mg/Kg	2.46	J				
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg	0.989					
Sodium (total)	SW6010B	1390			mg/Kg	1390	J				
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg	**3.32**					
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg	24.2					
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg	1540	J				
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	67400		370000	ug/Kg	1440	NJ				
Acenaphthylene	SW8310	131000			ug/Kg	226	J				
Anthracene	SW8310	73.2		2200000	ug/Kg	73.2	NJ				
Benzo(a)anthracene	SW8310	501		620	ug/Kg	31	U				
Benzo(a)pyrene	SW8310	108		62	ug/Kg	**108**	**NJ**				
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg	212	NJ				
Benzo(g,h,i)perylene	SW8310				ug/Kg	54.9	U				
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg	469	NJ				
Chrysene	SW8310	928		62000	ug/Kg	128	J				
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg	**302**	**NJ**				
Fluoranthene	SW8310	720		230000	ug/Kg	718	NJ				
Fluorene	SW8310	328		270000	ug/Kg	166	J				

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR06-1-A TR06-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-2-A TR06-2 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-3-A TR06-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg	13.6	U				
Naphthalene	SW8310	51300		5600	ug/Kg	2400	NJ				
Phenanthrene	SW8310	1550			ug/Kg	418	J				
Pyrene	SW8310			230000	ug/Kg	105	U				
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	657	U				
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	3900	U				
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	456	U				
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	533	U				
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	778	U				
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg	**1660**	J				
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg	**1870**					
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg	0.882	U				
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.51	UJ				
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	4.16	U				
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.898	U				
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg	0.782	U				
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg	1.2	J				
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.582	UJ				
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.599	UJ				
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	1.25	UJ				
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.699	U				
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.749	UJ				
1,2-Dichloroethane	SW8260			280	ug/Kg	0.715	U				
1,2-Dichloropropane	SW8260			340	ug/Kg	0.799	U				
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.516	UJ				
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.616	UJ				
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	6.22	U				
2-Hexanone	SW8260				ug/Kg	6.27	U				
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	6.7	UJ				
Acetone	SW8260	8.7		1400000	ug/Kg	5.86	U				
Benzene	SW8260	2.8		640	ug/Kg	0.749	U				
Bromochloromethane	SW8260				mg/Kg	0.000832	U				
Bromodichloromethane	SW8260			820	ug/Kg	0.815	U				
Bromoform	SW8260			62000	ug/Kg	0.815	UJ				
Bromomethane	SW8260			390	ug/Kg	0.832	U				
Carbon Disulfide	SW8260			36000	ug/Kg	3.93	U				
Carbon tetrachloride	SW8260			250	ug/Kg	0.815	U				

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR06-1-A TR06-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-2-A TR06-2 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR06-3-A TR06-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	0.682	UJ				
Chloroethane	SW8260			3000	ug/Kg	1.35	U				
Chloroform	SW8260			220	ug/Kg	0.865	U				
Chloromethane	SW8260			4700	ug/Kg	0.616	U				
Cyclohexane	SW8260	24.9		280000	ug/Kg	11.9	J				
Dibromochloromethane	SW8260			1100	ug/Kg	0.832	UJ				
Dichlorodifluoromethane	SW8260			9400	ug/Kg	1.38	UJ				
Ethylbenzene	SW8260	2.3		190000	ug/Kg	0.632	UJ				
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg	0.749	UJ				
Methyl Acetate	SW8260			2200000	ug/Kg	5.49	U				
Methylcyclohexane	SW8260	23.9		260000	ug/Kg	0.849	U				
Methylene Chloride	SW8260			9100	ug/Kg	2.25	U				
Styrene	SW8260			440000	ug/Kg	0.649	UJ				
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.882	U				
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.632	UJ				
Toluene	SW8260	79.5		66000	ug/Kg	0.566	U				
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.749	U				
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.832	U				
Vinyl chloride	SW8260			79	ug/Kg	0.932	U				
Xylenes, Total	SW8260	12.5		27000	ug/Kg	0.649	UJ				
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.782	U				
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.715	U				
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.882	U				
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.416	U				

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR07-1-A TR07-1 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-2-A TR07-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-3-A TR07-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	27.9	J	1.23	J	0.573	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	10.8		0.364	J	0.249	U
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	1.22		0.258	U	0.249	U
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	0.229	U	0.258	U	0.249	U
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	19		0.258	U	0.249	U
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	1.7	J	0.258	U	0.249	U
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	8.29		0.258	U	0.249	U
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	1.34	J	0.258	U	0.249	U
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	1.55	J	0.258	U	0.249	UJ
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	0.924	J	0.258	U	0.249	U
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	12.7		0.258	U	0.249	U
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	12.7	J	0.258	U	0.249	UJ
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	36.7	J	0.258	U	0.249	U
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	0.554	J	0.461	J	0.826	J
2,3,7,8-TCDF	SW8290	1880			ng/Kg	39.3	J	0.23	J	0.0995	U
OCDD	SW8290	816			ng/Kg	208	J	14.3	J	2.29	J
OCDF	SW8290	358			ng/Kg	4.49	J	0.517	U	0.498	U
Total HpCDD	SW8290	217			ng/Kg	50.6		2.48		1.2	
Total HpCDF	SW8290	999			ng/Kg	17.4		0.488		0.249	U
Total HxCDD	SW8290	56.9			ng/Kg	13.4		2.88		2.68	
Total HxCDF	SW8290	7180			ng/Kg	92.6		0.999		0.249	U
Total PeCDD	SW8290	22.3			ng/Kg	4.54		1.59		3.71	
Total PeCDF	SW8290	12600			ng/Kg	199		1.49		0.249	U
Total TCDD	SW8290	22.9			ng/Kg	2.89		0.461		1.27	
Total TCDF	SW8290	12500			ng/Kg	248		2.16		0.587	
Explosives											
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg	85400	J				
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg	625	U				
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg	**9580000**					
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg	**632000**					
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg	**402000**					
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg	56600					
2-Nitrotoluene	SW8330	7040		880	ug/Kg	**7040**	J				
3-Nitrotoluene	SW8330	942		73000	ug/Kg	625	U				
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg	625	U				
4-Nitrotoluene	SW8330	6670		12000	ug/Kg	6670	J				
HMX	SW8330			310000	ug/Kg	625	U				
Nitrobenzene	SW8330			2000	ug/Kg	625	U				

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR07-1-A TR07-1 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-2-A TR07-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-3-A TR07-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	625	U				
Tetryl	SW8330			61000	ug/Kg	625	U				
Metals											
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg	4640	J				
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg	1.77	J				
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg	8.43	J				
Barium (total)	SW6010B	5200	826	540	mg/Kg	176	J				
Beryllium (total)	SW6010B	1.27	1		mg/Kg	0.859					
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg	1.83					
Calcium (total)	SW6010B	21120	52300		mg/Kg	13930	J				
Chromium (total)	SW6010B	114	29		mg/Kg	8.86					
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg	25.2	J				
Copper (total)	SW6010B	1840	56.2	310	mg/Kg	187	J				
Iron (total)	SW6010B	40460	234000	2300	mg/Kg	13130	J				
Lead (total)	SW6010B	11930	48.6	40	mg/Kg	**891**					
Magnesium (total)	SW6010B	9360	10400		mg/Kg	2550					
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg	152	J				
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg	0.104	J				
Nickel (total)	SW6010B	113	55.1	160	mg/Kg	103					
Potassium (total)	SW6010B	2450	3390		mg/Kg	1140	J				
Selenium (total)	SW6010B	5.55	2	39	mg/Kg	0.564	J				
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg	0.437	J				
Sodium (total)	SW6010B	1390			mg/Kg	592	J				
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg	**2.13**					
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg	10.5					
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg	710	J				
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	67400		370000	ug/Kg	40700	NJ				
Acenaphthylene	SW8310	131000			ug/Kg	19600	NJ				
Anthracene	SW8310	73.2		2200000	ug/Kg	35.7	UJ				
Benzo(a)anthracene	SW8310	501		620	ug/Kg	275	NJ				
Benzo(a)pyrene	SW8310	108		62	ug/Kg	77.8	UJ				
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg	36.5	J				
Benzo(g,h,i)perylene	SW8310				ug/Kg	112	U				
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg	42.3	J				
Chrysene	SW8310	928		62000	ug/Kg	119	J				
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg	67.4	U				
Fluoranthene	SW8310	720		230000	ug/Kg	720	J				
Fluorene	SW8310	328		270000	ug/Kg	194	U				

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR07-1-A TR07-1 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-2-A TR07-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-3-A TR07-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg	27.6	U				
Naphthalene	SW8310	51300		5600	ug/Kg	**20700**	**NJ**				
Phenanthrene	SW8310	1550			ug/Kg	1010	NJ				
Pyrene	SW8310			230000	ug/Kg	215	U				
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	348	U				
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	2070	U				
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	242	U				
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	283	U				
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	412	U				
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg	762	U				
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg	**632**	**J**				
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg	1.05	U				
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.81	U				
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	4.96	U				
1,1,2-Trichloroethane	SW8260			730	ug/Kg	1.07	U				
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg	0.933	U				
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg	0.993	U				
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.695	U				
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.715	U				
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	1.49	U				
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.834	U				
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.893	U				
1,2-Dichloroethane	SW8260			280	ug/Kg	0.854	U				
1,2-Dichloropropane	SW8260			340	ug/Kg	0.953	U				
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.615	U				
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.735	U				
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	7.43	U				
2-Hexanone	SW8260				ug/Kg	7.48	U				
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	8	U				
Acetone	SW8260	8.7		1400000	ug/Kg	8.7	B				
Benzene	SW8260	2.8		640	ug/Kg	2.8					
Bromochloromethane	SW8260				mg/Kg	0.000993	U				
Bromodichloromethane	SW8260			820	ug/Kg	0.973	U				
Bromoform	SW8260			62000	ug/Kg	0.973	U				
Bromomethane	SW8260			390	ug/Kg	0.993	U				
Carbon Disulfide	SW8260			36000	ug/Kg	4.69	U				
Carbon tetrachloride	SW8260			250	ug/Kg	0.973	U				

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR07-1-A TR07-1 05/19/2004 1.5-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-2-A TR07-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR07-3-A TR07-3 05/19/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	0.814	U				
Chloroethane	SW8260			3000	ug/Kg	1.61	U				
Chloroform	SW8260			220	ug/Kg	1.03	U				
Chloromethane	SW8260			4700	ug/Kg	0.735	U				
Cyclohexane	SW8260	24.9		280000	ug/Kg	16.6	J				
Dibromochloromethane	SW8260			1100	ug/Kg	0.993	U				
Dichlorodifluoromethane	SW8260			9400	ug/Kg	1.65	UJ				
Ethylbenzene	SW8260	2.3		190000	ug/Kg	2.3					
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg	1.3	J				
Methyl Acetate	SW8260			2200000	ug/Kg	6.55	U				
Methylcyclohexane	SW8260	23.9		260000	ug/Kg	23.9					
Methylene Chloride	SW8260			9100	ug/Kg	2.68	U				
Styrene	SW8260			440000	ug/Kg	0.774	U				
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	1.05	U				
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.754	U				
Toluene	SW8260	79.5		66000	ug/Kg	79.5					
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.893	U				
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.993	U				
Vinyl chloride	SW8260			79	ug/Kg	1.11	U				
Xylenes, Total	SW8260	12.5		27000	ug/Kg	12.5					
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.933	U				
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.854	U				
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	1.05	U				
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.496	U				

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR08-1-A TR08-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR08-2-A TR08-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-1-A TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	117	J	46.8	J	68.1	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	73.8		5.71		50	
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	9.97		0.915	J	6.8	
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	1.94	J	1.01	J	1.64	J
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	181		11.8		107	
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	5.78		3.11	J	5.25	
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	55.8		4.51		41.9	
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	6.78		3.08	J	4.92	
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	15.7	J	1.48	J	14.9	J
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	1.82	J	0.81	J	1.53	J
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	89.4		17.7		70.8	
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	1.75	UJ	7.3	J	77.2	J
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	287	J	23	J	222	J
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	0.651	J	0.495	J	1.03	
2,3,7,8-TCDF	SW8290	1860			ng/Kg	299	J	67.6	J	225	J
OCDD	SW8290	816			ng/Kg	816	J	136	J	426	J
OCDF	SW8290	358			ng/Kg	39.5		3.47	J	17.6	
Total HpCDD	SW8290	217			ng/Kg	217		81.3		122	
Total HpCDF	SW8290	999			ng/Kg	130		11.5		83.5	
Total HxCDD	SW8290	56.9			ng/Kg	56.9		28.6		48.8	
Total HxCDF	SW8290	7180			ng/Kg	719		55.9		556	
Total PeCDD	SW8290	22.3			ng/Kg	18.3		8.02		14.5	
Total PeCDF	SW8290	12600			ng/Kg	1520		167		1120	
Total TCDD	SW8290	22.9			ng/Kg	9.58		2.98		5.02	
Total TCDF	SW8290	12500			ng/Kg	1840		493		1430	
Explosives											
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg	46100				12500	U
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg	12500	U			12500	U
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg	**35400000**				**28700000**	
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg	**9700000**	**J**			**6770000**	**J**
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg	12500	U			**1400000**	
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg	342000				95500	
2-Nitrotoluene	SW8330	7040		880	ug/Kg	12500	U			12500	U
3-Nitrotoluene	SW8330	942		73000	ug/Kg	12500	U			12500	U
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg	12500	U			12500	U
4-Nitrotoluene	SW8330	6670		12000	ug/Kg	12500	U			12500	U
HMX	SW8330			310000	ug/Kg	12500	U			12500	U
Nitrobenzene	SW8330			2000	ug/Kg	12500	U			12500	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR08-1-A TR08-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR08-2-A TR08-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-1-A TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	12500	U			12500	U
Tetryl	SW8330			61000	ug/Kg	12500	U			12500	U
Metals											
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg	8990	J			8320	J
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg	1.29	J			2.21	J
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg	27.8	J			8.13	J
Barium (total)	SW6010B	5200	826	540	mg/Kg	164	J			256	J
Beryllium (total)	SW6010B	1.27	1		mg/Kg	0.849				0.628	J
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg	0.0657	J			0.568	J
Calcium (total)	SW6010B	21120	52300		mg/Kg	3430	J			10910	J
Chromium (total)	SW6010B	114	29		mg/Kg	18.2				18.4	
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg	12.8	J			7.71	J
Copper (total)	SW6010B	1840	56.2	310	mg/Kg	159	J			69.7	J
Iron (total)	SW6010B	40460	234000	2300	mg/Kg	36260	J			23690	J
Lead (total)	SW6010B	11930	48.6	40	mg/Kg	**560**				**551**	
Magnesium (total)	SW6010B	9360	10400		mg/Kg	2910				4110	
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg	184	J			294	J
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg	0.12	J			0.184	J
Nickel (total)	SW6010B	113	55.1	160	mg/Kg	48				29.1	
Potassium (total)	SW6010B	2450	3390		mg/Kg	2450	J			1500	J
Selenium (total)	SW6010B	5.55	2	39	mg/Kg	3.81	J			1.57	J
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg	0.58	J			0.52	J
Sodium (total)	SW6010B	1390			mg/Kg	800	J			764	J
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg	**1.91**				**2.44**	
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg	21.3				23.4	
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg	250	J			267	J
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	67400		370000	ug/Kg	67400	NJ			20700	NJ
Acenaphthylene	SW8310	131000			ug/Kg	131000	NJ			115000	NJ
Anthracene	SW8310	73.2		2200000	ug/Kg	191	UJ			170	UJ
Benzo(a)anthracene	SW8310	501		620	ug/Kg	501	NJ			300	U
Benzo(a)pyrene	SW8310	108		62	ug/Kg	418	UJ			370	UJ
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg	188	J			146	U
Benzo(g,h,i)perylene	SW8310				ug/Kg	601	U			532	U
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg	157	U			139	U
Chrysene	SW8310	928		62000	ug/Kg	928	J			308	J
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg	362	U			321	U
Fluoranthene	SW8310	720		230000	ug/Kg	973	U			862	U
Fluorene	SW8310	328		270000	ug/Kg	1040	U			922	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR08-1-A TR08-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR08-2-A TR08-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-1-A TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg	148	U			132	U
Naphthalene	SW8310	51300		5600	ug/Kg	**51300**	NJ			4310	NJ
Phenanthrene	SW8310	1550			ug/Kg	1390	J			1550	J
Pyrene	SW8310			230000	ug/Kg	1150	U			1020	U
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	1430	U			648	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	8470	U			3840	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	992	U			450	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	1160	U			526	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	1690	U			767	U
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg	**3670**	J			1420	U
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg	**4010**				**1220**	J
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg	0.917	U			1.16	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.57	U			1.99	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	4.32	U			5.47	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.934	U			1.18	U
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg	0.813	U			1.03	U
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg	0.865	U			1.09	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.605	U			0.766	U
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.623	U			0.788	U
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	1.3	U			1.64	U
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.727	U			0.919	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.778	U			0.985	U
1,2-Dichloroethane	SW8260			280	ug/Kg	0.744	U			0.941	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.83	U			1.05	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.536	U			0.679	U
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.64	U			0.81	U
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg	6.47	U			8.19	U
2-Hexanone	SW8260				ug/Kg	6.52	U			8.25	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	6.97	U			8.82	U
Acetone	SW8260	8.7		1400000	ug/Kg	6.09	U			7.71	U
Benzene	SW8260	2.8		640	ug/Kg	1.4	J			2.6	
Bromochloromethane	SW8260				mg/Kg	0.000865	U			0.00109	U
Bromodichloromethane	SW8260			820	ug/Kg	0.848	U			1.07	U
Bromoform	SW8260			62000	ug/Kg	0.848	U			1.07	U
Bromomethane	SW8260			390	ug/Kg	0.865	U			1.09	U
Carbon Disulfide	SW8260			36000	ug/Kg	4.08	U			5.17	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.848	U			1.07	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR08-1-A TR08-1 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR08-2-A TR08-2 05/19/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-1-A TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	0.709	U			0.898	U
Chloroethane	SW8260			3000	ug/Kg	1.4	U			1.77	U
Chloroform	SW8260			220	ug/Kg	0.9	U			1.14	U
Chloromethane	SW8260			4700	ug/Kg	0.64	U			0.81	U
Cyclohexane	SW8260	24.9		280000	ug/Kg	0.83	UJ			1.05	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.865	U			1.09	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg	1.44	UJ			1.82	UJ
Ethylbenzene	SW8260	2.3		190000	ug/Kg	0.657	U			0.832	U
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg	0.778	U			0.985	U
Methyl Acetate	SW8260			2200000	ug/Kg	5.71	U			7.22	U
Methylcyclohexane	SW8260	23.9		260000	ug/Kg	1.1	J			1.12	U
Methylene Chloride	SW8260			9100	ug/Kg	2.34	U			2.96	U
Styrene	SW8260			440000	ug/Kg	0.675	U			0.854	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.917	U			1.16	U
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.657	U			0.832	U
Toluene	SW8260	79.5		66000	ug/Kg	1.1	J			1.7	J
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.778	U			0.985	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.865	U			1.09	U
Vinyl chloride	SW8260			79	ug/Kg	0.969	U			1.23	U
Xylenes, Total	SW8260	12.5		27000	ug/Kg	0.78	J			0.854	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.813	U			1.03	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.744	U			0.941	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.917	U			1.16	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.432	U			0.547	U

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR09-1-D TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-2-A TR09-2 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-1-A TR10-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	62.2	J	70.2	J	9.43	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	51.5		36.1		23.6	
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	6.92		8.31		2.32	J
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	1.47	J	1.79	J	0.274	U
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	116		65		30.3	
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	5.43		6.2		0.757	J
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	45.9		24.1		14.1	
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	5.17		5.85		0.537	J
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	12.9	J	5.72	J	2.64	J
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	1.36	J	1.38	J	0.316	J
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	70.2		42.3		19.9	
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	79.6	J	48.4	J	15.1	J
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	208	J	121	J	42.1	J
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	1.05	J	0.586	J	0.11	U
2,3,7,8-TCDF	SW8290	1880			ng/Kg	218	J	145	J	53	J
OCDD	SW8290	816			ng/Kg	412	J	278	J	60.7	J
OCDF	SW8290	358			ng/Kg	22		64.2		15.1	
Total HpCDD	SW8290	217			ng/Kg	113		124		16.9	
Total HpCDF	SW8290	999			ng/Kg	84.5		68.8		33.2	
Total HxCDD	SW8290	56.9			ng/Kg	49.4		55		6.25	
Total HxCDF	SW8290	7180			ng/Kg	590		326		139	
Total PeCDD	SW8290	22.3			ng/Kg	15.4		14		3.03	
Total PeCDF	SW8290	12600			ng/Kg	1120		651		260	
Total TCDD	SW8290	22.9			ng/Kg	7.21		2.95		4.14	
Total TCDF	SW8290	12500			ng/Kg	1390		936		300	
Explosives											
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg						
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg						
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg						
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg						
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg						
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg						
2-Nitrotoluene	SW8330	7040		880	ug/Kg						
3-Nitrotoluene	SW8330	942		73000	ug/Kg						
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg						
4-Nitrotoluene	SW8330	6670		12000	ug/Kg						
HMX	SW8330			310000	ug/Kg						
Nitrobenzene	SW8330			2000	ug/Kg						

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-04-SO-2BG-TR09-1-D TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-2-A TR09-2 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-1-A TR10-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg						
Tetryl	SW8330			61000	ug/Kg						
Metals											
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg						
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg						
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg						
Barium (total)	SW6010B	5200	826	540	mg/Kg						
Beryllium (total)	SW6010B	1.27	1		mg/Kg						
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg						
Calcium (total)	SW6010B	21120	52300		mg/Kg						
Chromium (total)	SW6010B	114	29		mg/Kg						
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg						
Copper (total)	SW6010B	1840	56.2	310	mg/Kg						
Iron (total)	SW6010B	40460	234000	2300	mg/Kg						
Lead (total)	SW6010B	11930	48.6	40	mg/Kg						
Magnesium (total)	SW6010B	9360	10400		mg/Kg						
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg						
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg						
Nickel (total)	SW6010B	113	55.1	160	mg/Kg						
Potassium (total)	SW6010B	2450	3390		mg/Kg						
Selenium (total)	SW6010B	5.55	2	39	mg/Kg						
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg						
Sodium (total)	SW6010B	1390			mg/Kg						
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg						
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg						
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg						
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	67400		370000	ug/Kg						
Acenaphthylene	SW8310	131000			ug/Kg						
Anthracene	SW8310	73.2		2200000	ug/Kg						
Benzo(a)anthracene	SW8310	501		620	ug/Kg						
Benzo(a)pyrene	SW8310	108		62	ug/Kg						
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg						
Benzo(g,h,i)perylene	SW8310				ug/Kg						
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg						
Chrysene	SW8310	928		62000	ug/Kg						
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg						
Fluoranthene	SW8310	720		230000	ug/Kg						
Fluorene	SW8310	328		270000	ug/Kg						

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR09-1-D TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-2-A TR09-2 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-1-A TR10-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg						
Naphthalene	SW8310	51300		5600	ug/Kg						
Phenanthrene	SW8310	1550			ug/Kg						
Pyrene	SW8310			230000	ug/Kg						
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg						
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg						
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg						
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg						
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg						
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg						
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg						
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg						
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg						
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg						
1,1,2-Trichloroethane	SW8260			730	ug/Kg						
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg						
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg						
1,2,3-Trichlorobenzene	SW8260				ug/Kg						
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg						
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg						
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg						
1,2-Dichlorobenzene	SW8260			110000	ug/Kg						
1,2-Dichloroethane	SW8260			280	ug/Kg						
1,2-Dichloropropane	SW8260			340	ug/Kg						
1,3-Dichlorobenzene	SW8260			53000	ug/Kg						
1,4-Dichlorobenzene	SW8260			3400	ug/Kg						
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg						
2-Hexanone	SW8260				ug/Kg						
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg						
Acetone	SW8260	8.7		1400000	ug/Kg						
Benzene	SW8260	2.8		640	ug/Kg						
Bromochloromethane	SW8260				mg/Kg						
Bromodichloromethane	SW8260			820	ug/Kg						
Bromoform	SW8260			62000	ug/Kg						
Bromomethane	SW8260			390	ug/Kg						
Carbon Disulfide	SW8260			36000	ug/Kg						
Carbon tetrachloride	SW8260			250	ug/Kg						

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR09-1-D TR09-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR09-2-A TR09-2 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-1-A TR10-1 05/19/2004 1.0-1.5 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg						
Chloroethane	SW8260			3000	ug/Kg						
Chloroform	SW8260			220	ug/Kg						
Chloromethane	SW8260			4700	ug/Kg						
Cyclohexane	SW8260	24.9		280000	ug/Kg						
Dibromochloromethane	SW8260			1100	ug/Kg						
Dichlorodifluoromethane	SW8260			9400	ug/Kg						
Ethylbenzene	SW8260	2.3		190000	ug/Kg						
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg						
Methyl Acetate	SW8260			2200000	ug/Kg						
Methylcyclohexane	SW8260	23.9		260000	ug/Kg						
Methylene Chloride	SW8260			9100	ug/Kg						
Styrene	SW8260			440000	ug/Kg						
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg						
Tetrachloroethene (PCE)	SW8260			480	ug/Kg						
Toluene	SW8260	79.5		66000	ug/Kg						
Trichloroethene (TCE)	SW8260			53	ug/Kg						
Trichlorofluoromethane	SW8260			39000	ug/Kg						
Vinyl chloride	SW8260			79	ug/Kg						
Xylenes, Total	SW8260	12.5		27000	ug/Kg						
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg						
cis-1,3-Dichloropropene	SW8260				ug/Kg						
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg						
trans-1,3-Dichloropropene	SW8260				ug/Kg						

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR10-2-A TR10-2 05/20/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-3-A TR10-3 05/20/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Dioxin/Furans									
1,2,3,4,6,7,8-HpCDD	SW8290	117			ng/Kg	24.1	J	0.452	J
1,2,3,4,6,7,8-HpCDF	SW8290	708			ng/Kg	708		0.242	U
1,2,3,4,7,8,9-HpCDF	SW8290	75.8			ng/Kg	75.8		0.242	U
1,2,3,4,7,8-HxCDD	SW8290	1.94			ng/Kg	1.68	J	0.242	U
1,2,3,4,7,8-HxCDF	SW8290	693			ng/Kg	693	J	0.242	U
1,2,3,6,7,8-HxCDD	SW8290	6.2			ng/Kg	3.49		0.242	U
1,2,3,6,7,8-HxCDF	SW8290	569			ng/Kg	569	J	0.242	U
1,2,3,7,8,9-HxCDD	SW8290	6.78			ng/Kg	2.84		0.242	U
1,2,3,7,8,9-HxCDF	SW8290	121			ng/Kg	121	J	0.242	UJ
1,2,3,7,8-PeCDD	SW8290	1.82			ng/Kg	2.74	U	0.242	U
1,2,3,7,8-PeCDF	SW8290	792			ng/Kg	792		0.242	U
2,3,4,6,7,8-HxCDF	SW8290	980			ng/Kg	980	J	0.242	UJ
2,3,4,7,8-PeCDF	SW8290	2430			ng/Kg	2430	J	0.242	U
2,3,7,8-TCDD	SW8290	1.39		3.9	ng/Kg	0.112	U	0.444	J
2,3,7,8-TCDF	SW8290	1880			ng/Kg	1880	J	0.136	J
OCDD	SW8290	816			ng/Kg	89.8	J	2.25	J
OCDF	SW8290	358			ng/Kg	358		0.485	U
Total HpCDD	SW8290	217			ng/Kg	43.6		0.942	
Total HpCDF	SW8290	999			ng/Kg	999		0.242	U
Total HxCDD	SW8290	56.9			ng/Kg	37		0.242	U
Total HxCDF	SW8290	7180			ng/Kg	7180		0.242	U
Total PeCDD	SW8290	22.3			ng/Kg	22.3		1.22	
Total PeCDF	SW8290	12600			ng/Kg	12600		0.242	U
Total TCDD	SW8290	22.9			ng/Kg	22.9		0.539	
Total TCDF	SW8290	12500			ng/Kg	12500		0.393	
Explosives									
1,3,5-Trinitrobenzene	SW8330	85400		180000	ug/Kg				
1,3-Dinitrobenzene	SW8330	4320		610	ug/Kg				
2,4,6-Trinitrotoluene	SW8330	35400000		16000	ug/Kg				
2,4-Dinitrotoluene	SW8330	9700000		12000	ug/Kg				
2,6-Dinitrotoluene	SW8330	1400000		6100	ug/Kg				
2-Amino-4,6-Dinitrotoluene	SW8330	342000			ug/Kg				
2-Nitrotoluene	SW8330	7040		880	ug/Kg				
3-Nitrotoluene	SW8330	942		73000	ug/Kg				
4-Amino-2,6-Dinitrotoluene	SW8330	10600			ug/Kg				
4-Nitrotoluene	SW8330	6670		12000	ug/Kg				
HMX	SW8330			310000	ug/Kg				
Nitrobenzene	SW8330			2000	ug/Kg				

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Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR10-2-A TR10-2 05/20/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-3-A TR10-3 05/20/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg				
Tetryl	SW8330			61000	ug/Kg				
Metals									
Aluminum (total)	SW6010B	11350	15500	7600	mg/Kg				
Antimony (total)	SW6010B	7.02	9.3	3.1	mg/Kg				
Arsenic (total)	SW6010B	27.8	36.5	0.39	mg/Kg				
Barium (total)	SW6010B	5200	826	540	mg/Kg				
Beryllium (total)	SW6010B	1.27	1		mg/Kg				
Cadmium (total)	SW6010B	2.04		3.7	mg/Kg				
Calcium (total)	SW6010B	21120	52300		mg/Kg				
Chromium (total)	SW6010B	114	29		mg/Kg				
Cobalt (total)	SW6010B	25.2	116	90	mg/Kg				
Copper (total)	SW6010B	1840	56.2	310	mg/Kg				
Iron (total)	SW6010B	40460	234000	2300	mg/Kg				
Lead (total)	SW6010B	11930	48.6	40	mg/Kg				
Magnesium (total)	SW6010B	9360	10400		mg/Kg				
Manganese (total)	SW6010B	551	3506.2	180	mg/Kg				
Mercury (total)	SW7471A	0.207	0.1	2.3	mg/Kg				
Nickel (total)	SW6010B	113	55.1	160	mg/Kg				
Potassium (total)	SW6010B	2450	3390		mg/Kg				
Selenium (total)	SW6010B	5.55	2	39	mg/Kg				
Silver (total)	SW6010B	1.43	11.1	39	mg/Kg				
Sodium (total)	SW6010B	1390			mg/Kg				
Thallium (total)	SW6010B	3.32	1.3	0.52	mg/Kg				
Vanadium (total)	SW6010B	24.2	40.9		mg/Kg				
Zinc (total)	SW6010B	1540	321.8	2300	mg/Kg				
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	67400		370000	ug/Kg				
Acenaphthylene	SW8310	131000			ug/Kg				
Anthracene	SW8310	73.2		2200000	ug/Kg				
Benzo(a)anthracene	SW8310	501		620	ug/Kg				
Benzo(a)pyrene	SW8310	108		62	ug/Kg				
Benzo(b)fluoranthene	SW8310	212		620	ug/Kg				
Benzo(g,h,i)perylene	SW8310				ug/Kg				
Benzo(k)fluoranthene	SW8310	469		6200	ug/Kg				
Chrysene	SW8310	928		62000	ug/Kg				
Dibenz(a,h)anthracene	SW8310	302		62	ug/Kg				
Fluoranthene	SW8310	720		230000	ug/Kg				
Fluorene	SW8310	328		270000	ug/Kg				

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR10-2-A TR10-2 05/20/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-3-A TR10-3 05/20/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310			620	ug/Kg				
Naphthalene	SW8310	51300		5600	ug/Kg				
Phenanthrene	SW8310	1550			ug/Kg				
Pyrene	SW8310			230000	ug/Kg				
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg				
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg				
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg				
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg				
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg				
PCB-1254 (Aroclor 1254)	SW8082	3670		220	ug/Kg				
PCB-1260 (Aroclor 1260)	SW8082	4010		220	ug/Kg				
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260	174		200000	ug/Kg				
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg				
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg				
1,1,2-Trichloroethane	SW8260			730	ug/Kg				
1,1-Dichloroethane	SW8260	11.4		51000	ug/Kg				
1,1-Dichloroethene	SW8260	2.6		12000	ug/Kg				
1,2,3-Trichlorobenzene	SW8260				ug/Kg				
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg				
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg				
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg				
1,2-Dichlorobenzene	SW8260			110000	ug/Kg				
1,2-Dichloroethane	SW8260			280	ug/Kg				
1,2-Dichloropropane	SW8260			340	ug/Kg				
1,3-Dichlorobenzene	SW8260			53000	ug/Kg				
1,4-Dichlorobenzene	SW8260			3400	ug/Kg				
2-Butanone (Methyl ethyl ketone)	SW8260			2200000	ug/Kg				
2-Hexanone	SW8260				ug/Kg				
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg				
Acetone	SW8260	8.7		1400000	ug/Kg				
Benzene	SW8260	2.8		640	ug/Kg				
Bromochloromethane	SW8260				mg/Kg				
Bromodichloromethane	SW8260			820	ug/Kg				
Bromoform	SW8260			62000	ug/Kg				
Bromomethane	SW8260			390	ug/Kg				
Carbon Disulfide	SW8260			36000	ug/Kg				
Carbon tetrachloride	SW8260			250	ug/Kg				

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2004 Burn Layer Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SO-2BG-TR10-2-A TR10-2 05/20/2004 1.0-2.0 ft. SO RESULT / QUAL	VQ	PBOW-04-SO-2BG-TR10-3-A TR10-3 05/20/2004 3.0-3.5 ft. SO RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg				
Chloroethane	SW8260			3000	ug/Kg				
Chloroform	SW8260			220	ug/Kg				
Chloromethane	SW8260			4700	ug/Kg				
Cyclohexane	SW8260	24.9		280000	ug/Kg				
Dibromochloromethane	SW8260			1100	ug/Kg				
Dichlorodifluoromethane	SW8260			9400	ug/Kg				
Ethylbenzene	SW8260	2.3		190000	ug/Kg				
Isopropylbenzene (Cumene)	SW8260	1.3		57000	ug/Kg				
Methyl Acetate	SW8260			2200000	ug/Kg				
Methylcyclohexane	SW8260	23.9		260000	ug/Kg				
Methylene Chloride	SW8260			9100	ug/Kg				
Styrene	SW8260			440000	ug/Kg				
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg				
Tetrachloroethene (PCE)	SW8260			480	ug/Kg				
Toluene	SW8260	79.5		66000	ug/Kg				
Trichloroethene (TCE)	SW8260			53	ug/Kg				
Trichlorofluoromethane	SW8260			39000	ug/Kg				
Vinyl chloride	SW8260			79	ug/Kg				
Xylenes, Total	SW8260	12.5		27000	ug/Kg				
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg				
cis-1,3-Dichloropropene	SW8260				ug/Kg				
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg				
trans-1,3-Dichloropropene	SW8260				ug/Kg				

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD01-A SD01 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-A SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-D SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
Dioxin/Furans											
1,2,3,4,6,7,8-HpCDD	SW8290	68.8			ng/Kg	3.43	J	28.7	J	13.3	J
1,2,3,4,6,7,8-HpCDF	SW8290	18.2			ng/Kg	0.985	J	8.09	J	3.91	J
1,2,3,4,7,8,9-HpCDF	SW8290	1.52			ng/Kg	0.342	UJ	0.722	J	0.57	U
1,2,3,4,7,8-HxCDD	SW8290	1.72			ng/Kg	0.342	UJ	0.446	U	0.57	U
1,2,3,4,7,8-HxCDF	SW8290	2.22			ng/Kg	0.342	U	1.39	J	0.652	J
1,2,3,6,7,8-HxCDD	SW8290	3.55			ng/Kg	0.342	U	1.66	J	1.03	J
1,2,3,6,7,8-HxCDF	SW8290	1.82			ng/Kg	0.342	U	1.02	J	0.57	U
1,2,3,7,8,9-HxCDD	SW8290	4.51			ng/Kg	0.38	J	1.85	J	0.985	J
1,2,3,7,8,9-HxCDF	SW8290				ng/Kg	0.342	UJ	0.5	U	0.57	U
1,2,3,7,8-PeCDD	SW8290	1.46			ng/Kg	0.342	U	0.974	J	0.57	U
1,2,3,7,8-PeCDF	SW8290	0.823			ng/Kg	0.342	U	0.823	J	0.57	U
2,3,4,6,7,8-HxCDF	SW8290	2.94			ng/Kg	0.342	U	1.43	J	0.597	J
2,3,4,7,8-PeCDF	SW8290	2.41			ng/Kg	0.342	U	1.77	J	0.853	J
2,3,7,8-TCDD	SW8290	2.32		3.9	ng/Kg	0.189	U	2.32	J	0.283	U
2,3,7,8-TCDF	SW8290	2.38			ng/Kg	0.353	J	2.36	J	1.2	J
OCDD	SW8290	508			ng/Kg	22.7		213	J	84.8	J
OCDF	SW8290	31.7			ng/Kg	1.35		16.3	J	6.69	J
Total HpCDD	SW8290	131			ng/Kg	6.86		50.1		23.3	
Total HpCDF	SW8290	46.2			ng/Kg	1.91		21.5		9.71	
Total HxCDD	SW8290	34.4			ng/Kg	2.17		16.8		8.38	
Total HxCDF	SW8290	42.7			ng/Kg	1.55		19.4		7.79	
Total PeCDD	SW8290	11.7			ng/Kg	2.46		11.7		3.39	
Total PeCDF	SW8290	21.7			ng/Kg	1.99		18.8		7.52	
Total TCDD	SW8290	5.44			ng/Kg	0.512	U	5.44		0.843	
Total TCDF	SW8290	15.9			ng/Kg	1.44		15.9		6.71	
Explosives											
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U	125	U	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U	125	U	125	U
2,4,6-Trinitrotoluene	SW8330			16000	ug/Kg	125	U	125	U	125	U
2,4-Dinitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125	U
2,6-Dinitrotoluene	SW8330			6100	ug/Kg	125	U	125	U	125	U
2-Amino-4,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U	125	U	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U	125	U	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U	125	U	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U	125	U	125	U
HMX	SW8330			310000	ug/Kg	125	U	125	U	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U	125	U	125	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD01-A SD01 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-A SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-D SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	125	U	125	U	125	U
Tetryl	SW8330			61000	ug/Kg	125	U	125	U	125	U
Metals											
Aluminum (total)	SW6010B	11310	15500	7600	mg/Kg	9460		11310		8650	
Antimony (total)	SW6010B		9.3	3.1	mg/Kg	0.542	UJ	0.681	UJ	0.698	UJ
Arsenic (total)	SW6010B	6.09	36.5	0.39	mg/Kg	6.09		5.55		4.3	
Barium (total)	SW6010B	77.3	826	540	mg/Kg	51.2		77.3		63.2	
Beryllium (total)	SW6010B	0.648	1		mg/Kg	0.45	J	0.648	J	0.483	J
Cadmium (total)	SW6010B	2.88		3.7	mg/Kg	0.711	J	0.93	J	2.88	
Calcium (total)	SW6010B	82280	52300		mg/Kg	**82280**		9150		9190	
Chromium (total)	SW6010B	17.2	29		mg/Kg	14.3		17.2		13.5	
Cobalt (total)	SW6010B	6.86	116	90	mg/Kg	5.82		6.86		5.48	
Copper (total)	SW6010B	26.7	56.2	310	mg/Kg	19.7		26.6		23.6	
Iron (total)	SW6010B	18510	234000	2300	mg/Kg	15540		18510		14350	
Lead (total)	SW6010B	28.1	48.6	40	mg/Kg	14		28.1		21.7	
Magnesium (total)	SW6010B	11900	10400		mg/Kg	**11900**		3770		3000	
Manganese (total)	SW6010B	181	3506.2	180	mg/Kg	181		114		99.6	
Mercury (total)	SW7471A	0.0739	0.1	2.3	mg/Kg	0.0402		0.0711		0.0739	
Nickel (total)	SW6010B	21.2	55.1	160	mg/Kg	19		21.2		16.7	
Potassium (total)	SW6010B	2310	3390		mg/Kg	2050		2280		2310	
Selenium (total)	SW6010B	3.69	2	39	mg/Kg	3.61		2.82		2.6	
Silver (total)	SW6010B		11.1	39	mg/Kg	0.142	U	0.179	U	0.183	U
Sodium (total)	SW6010B	107			mg/Kg	107		89.9		90.6	
Thallium (total)	SW6010B		1.3	0.52	mg/Kg	1.58	U	1.98	U	2.03	U
Vanadium (total)	SW6010B	27.5	40.9		mg/Kg	23.5		27.5		22.5	
Zinc (total)	SW6010B	98.6	321.8	2300	mg/Kg	60.2		98.6		85.4	
Polyaromatic Hydrocarbon (PAH) Compounds											
Acenaphthene	SW8310	5750		370000	ug/Kg	34.3	U	46.9	U	226	U
Acenaphthylene	SW8310	853			ug/Kg	18.7	U	53	J	123	U
Anthracene	SW8310	288		2200000	ug/Kg	6.41	NJ	9.78	NJ	14.1	UJ
Benzo(a)anthracene	SW8310	1130		620	ug/Kg	22.5	NJ	26.9	NJ	24.8	U
Benzo(a)pyrene	SW8310	1590		62	ug/Kg	**126**	NJ	**178**	NJ	**234**	NJ
Benzo(b)fluoranthene	SW8310	1230		620	ug/Kg	31.9	NJ	49.5	NJ	52.3	J
Benzo(g,h,i)perylene	SW8310	728			ug/Kg	22.3	J	56.5	NJ	44.1	U
Benzo(k)fluoranthene	SW8310	881		6200	ug/Kg	49.8	NJ	40.3	NJ	42.7	J
Chrysene	SW8310	1330		62000	ug/Kg	33.4	NJ	45.5	NJ	38.5	J
Dibenz(a,h)anthracene	SW8310	31.6		62	ug/Kg	23.9	NJ	16.5	NJ	26.6	U
Fluoranthene	SW8310	3680		230000	ug/Kg	75.5	NJ	138	NJ	116	J
Fluorene	SW8310			270000	ug/Kg	11.6	U	15.9	U	76.4	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD01-A SD01 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-A SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-D SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310	751		620	ug/Kg	13.6	NJ	36	NJ	31.4	J
Naphthalene	SW8310	2660		5600	ug/Kg	12.5	U	195	NJ	237	J
Phenanthrene	SW8310	1460			ug/Kg	66.8	NJ	382	NJ	63.3	J
Pyrene	SW8310	2440		230000	ug/Kg	30.9	J	64.5	J	84.6	U
Polychlorinated Biphenyls (PCBs)											
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	1210	U	1570	U	1460	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	7200	U	9340	U	8660	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	843	U	1090	U	1010	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	985	U	1280	U	1180	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	1440	U	1860	U	1730	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	2660	U	3440	U	3190	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	1610	U	2090	U	1940	U
Volatile Organic Compounds											
1,1,1-Trichloroethane	SW8260			200000	ug/Kg	0.727	U	1.35	U	1.07	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg	1.25	U		UR		UR
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	3.43	U	6.36	U	5.04	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.74	U	1.37	U	1.09	U
1,1-Dichloroethane	SW8260	4.5		51000	ug/Kg	0.644	U	1.2	U	0.948	U
1,1-Dichloroethene	SW8260	1.8		12000	ug/Kg	1	J	1.8	J	1.3	J
1,2,3-Trichlorobenzene	SW8260				ug/Kg	0.48	U		UR		UR
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg	0.494	U		UR		UR
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg	1.03	U		UR		UR
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.576	U	1.07	U	0.847	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg	0.617	U		UR		UR
1,2-Dichloroethane	SW8260			280	ug/Kg	0.59	U	1.09	U	0.867	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.658	U	1.22	U	0.968	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg	0.425	U		UR		UR
1,4-Dichlorobenzene	SW8260			3400	ug/Kg	0.507	U		UR		UR
2-Butanone (Methyl ethyl ketone)	SW8260	51.2		2200000	ug/Kg	5.13	U	39.7		33.3	
2-Hexanone	SW8260				ug/Kg	5.17	U	9.59	U	7.6	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg	5.52	U		UR		UR
Acetone	SW8260	234		1400000	ug/Kg	13.8		197		175	
Benzene	SW8260			640	ug/Kg	0.617	U	1.14	U	0.908	U
Bromochloromethane	SW8260				mg/Kg	0.000685	U	0.00127	U	0.00101	U
Bromodichloromethane	SW8260			820	ug/Kg	0.672	U	1.25	U	0.988	U
Bromoform	SW8260			62000	ug/Kg	0.672	U	1.25	U	0.988	U
Bromomethane	SW8260			390	ug/Kg	0.685	U	1.27	U	1.01	U
Carbon Disulfide	SW8260			36000	ug/Kg	3.24	U	6	U	4.76	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.672	U	1.25	U	0.988	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD01-A SD01 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-A SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ	PBOW-04-SD-2BG-SD02-D SD02 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	0.562	U	1.04	U	0.827	U
Chloroethane	SW8260			3000	ug/Kg	1.11	U	2.06	U	1.63	U
Chloroform	SW8260			220	ug/Kg	0.713	U	1.32	U	1.05	U
Chloromethane	SW8260			4700	ug/Kg	0.507	U	0.941	U	0.746	U
Cyclohexane	SW8260	11		280000	ug/Kg	2.3	J	1.22	UJ	11	J
Dibromochloromethane	SW8260			1100	ug/Kg	0.685	U	1.27	U	1.01	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR		UR		UR
Ethylbenzene	SW8260			190000	ug/Kg	0.521	U	0.967	U	0.766	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg	0.617	U		UR		UR
Methyl Acetate	SW8260			2200000	ug/Kg	4.52	UJ	8.39	UJ	6.66	UJ
Methylcyclohexane	SW8260			260000	ug/Kg		UR		UR		UR
Methylene Chloride	SW8260			9100	ug/Kg	1.85	U	3.43	U	2.72	U
Styrene	SW8260			440000	ug/Kg	0.535	U	0.992	U	0.787	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.727	U	1.35	U	1.07	U
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.521	U	0.967	U	0.766	U
Toluene	SW8260	0.86		66000	ug/Kg	0.52	J	0.865	U	0.686	U
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.617	U	1.14	U	0.908	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.685	U	1.27	U	1.01	U
Vinyl chloride	SW8260			79	ug/Kg	0.768	U	1.42	U	1.13	U
Xylenes, Total	SW8260			27000	ug/Kg	0.535	U	0.992	U	0.787	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.644	U	1.2	U	0.948	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.59	U	1.09	U	0.867	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.727	U	1.35	U	1.07	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.343	U	0.636	U	0.504	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD03-A SD03 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
Dioxin/Furans							
1,2,3,4,6,7,8-HpCDD	SW8290	68.8			ng/Kg	68.8	J
1,2,3,4,6,7,8-HpCDF	SW8290	18.2			ng/Kg	18.2	J
1,2,3,4,7,8,9-HpCDF	SW8290	1.52			ng/Kg	1.52	J
1,2,3,4,7,8-HxCDD	SW8290	1.72			ng/Kg	1.72	J
1,2,3,4,7,8-HxCDF	SW8290	2.22			ng/Kg	2.22	J
1,2,3,6,7,8-HxCDD	SW8290	3.55			ng/Kg	3.55	J
1,2,3,6,7,8-HxCDF	SW8290	1.82			ng/Kg	1.82	J
1,2,3,7,8,9-HxCDD	SW8290	4.51			ng/Kg	4.51	J
1,2,3,7,8,9-HxCDF	SW8290				ng/Kg	0.854	U
1,2,3,7,8-PeCDD	SW8290	1.46			ng/Kg	1.46	J
1,2,3,7,8-PeCDF	SW8290	0.823			ng/Kg	0.615	J
2,3,4,6,7,8-HxCDF	SW8290	2.94			ng/Kg	2.94	J
2,3,4,7,8-PeCDF	SW8290	2.41			ng/Kg	2.41	J
2,3,7,8-TCDD	SW8290	2.32		3.9	ng/Kg	1.52	J
2,3,7,8-TCDF	SW8290	2.38			ng/Kg	0.831	J
OCDD	SW8290	508			ng/Kg	508	J
OCDF	SW8290	31.7			ng/Kg	31.7	J
Total HpCDD	SW8290	131			ng/Kg	131	
Total HpCDF	SW8290	46.2			ng/Kg	46.2	
Total HxCDD	SW8290	34.4			ng/Kg	34.4	
Total HxCDF	SW8290	42.7			ng/Kg	42.7	
Total PeCDD	SW8290	11.7			ng/Kg	9.41	
Total PeCDF	SW8290	21.7			ng/Kg	21.7	
Total TCDD	SW8290	5.44			ng/Kg	3.16	
Total TCDF	SW8290	15.9			ng/Kg	14.5	
Explosives							
1,3,5-Trinitrobenzene	SW8330			180000	ug/Kg	125	U
1,3-Dinitrobenzene	SW8330			610	ug/Kg	125	U
2,4,6-Trinitrotoluene	SW8330			16000	ug/Kg	125	U
2,4-Dinitrotoluene	SW8330			12000	ug/Kg	125	U
2,6-Dinitrotoluene	SW8330			6100	ug/Kg	125	U
2-Amino-4,6-Dinitrotoluene	SW8330				ug/Kg	125	U
2-Nitrotoluene	SW8330			880	ug/Kg	125	U
3-Nitrotoluene	SW8330			73000	ug/Kg	125	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/Kg	125	U
4-Nitrotoluene	SW8330			12000	ug/Kg	125	U
HMX	SW8330			310000	ug/Kg	125	U
Nitrobenzene	SW8330			2000	ug/Kg	125	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD03-A SD03 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
RDX	SW8330			4400	ug/Kg	125	U
Tetryl	SW8330			61000	ug/Kg	125	U
Metals							
Aluminum (total)	SW6010B	11310	15500	7600	mg/Kg	7790	
Antimony (total)	SW6010B		9.3	3.1	mg/Kg	0.615	UJ
Arsenic (total)	SW6010B	6.09	36.5	0.39	mg/Kg	4.3	
Barium (total)	SW6010B	77.3	826	540	mg/Kg	51.9	
Beryllium (total)	SW6010B	0.648	1		mg/Kg	0.427	J
Cadmium (total)	SW6010B	2.88		3.7	mg/Kg	0.586	J
Calcium (total)	SW6010B	82280	52300		mg/Kg	29640	
Chromium (total)	SW6010B	17.2	29		mg/Kg	12	
Cobalt (total)	SW6010B	6.86	116	90	mg/Kg	4.56	
Copper (total)	SW6010B	26.7	56.2	310	mg/Kg	26.7	
Iron (total)	SW6010B	18510	234000	2300	mg/Kg	12100	
Lead (total)	SW6010B	28.1	48.6	40	mg/Kg	19.3	
Magnesium (total)	SW6010B	11900	10400		mg/Kg	7760	
Manganese (total)	SW6010B	181	3506.2	180	mg/Kg	147	
Mercury (total)	SW7471A	0.0739	0.1	2.3	mg/Kg	0.0467	
Nickel (total)	SW6010B	21.2	55.1	160	mg/Kg	16.1	
Potassium (total)	SW6010B	2310	3390		mg/Kg	1510	
Selenium (total)	SW6010B	3.69	2	39	mg/Kg	3.69	
Silver (total)	SW6010B		11.1	39	mg/Kg	0.162	U
Sodium (total)	SW6010B	107			mg/Kg	98.6	
Thallium (total)	SW6010B		1.3	0.52	mg/Kg	1.79	U
Vanadium (total)	SW6010B	27.5	40.9		mg/Kg	21.5	
Zinc (total)	SW6010B	98.6	321.8	2300	mg/Kg	64.9	
Polyaromatic Hydrocarbon (PAH) Compounds							
Acenaphthene	SW8310	5750		370000	ug/Kg	5750	NJ
Acenaphthylene	SW8310	853			ug/Kg	853	NJ
Anthracene	SW8310	288		2200000	ug/Kg	288	NJ
Benzo(a)anthracene	SW8310	1130		620	ug/Kg	**1130**	**NJ**
Benzo(a)pyrene	SW8310	1590		62	ug/Kg	**1590**	**NJ**
Benzo(b)fluoranthene	SW8310	1230		620	ug/Kg	**1230**	**NJ**
Benzo(g,h,i)perylene	SW8310	728			ug/Kg	728	NJ
Benzo(k)fluoranthene	SW8310	881		6200	ug/Kg	881	NJ
Chrysene	SW8310	1330		62000	ug/Kg	1330	NJ
Dibenz(a,h)anthracene	SW8310	31.6		62	ug/Kg	31.6	J
Fluoranthene	SW8310	3680		230000	ug/Kg	3680	NJ
Fluorene	SW8310			270000	ug/Kg	73.6	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD03-A SD03 05/23/2004 0.0-0.0 ft. SE RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8310	751		620	ug/Kg	**751**	**NJ**
Naphthalene	SW8310	2660		5600	ug/Kg	2660	NJ
Phenanthrene	SW8310	1460			ug/Kg	1460	NJ
Pyrene	SW8310	2440		230000	ug/Kg	2440	NJ
Polychlorinated Biphenyls (PCBs)							
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	1120	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	6610	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	775	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	905	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	1320	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	2440	U
PCB-1260 (Aroclor 1260)	SW8082			220	ug/Kg	1480	U
Volatile Organic Compounds							
1,1,1-Trichloroethane	SW8260			200000	ug/Kg	0.842	U
1,1,2,2-Tetrachloroethane	SW8260			410	ug/Kg		UR
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			2100000	ug/Kg	3.97	U
1,1,2-Trichloroethane	SW8260			730	ug/Kg	0.857	U
1,1-Dichloroethane	SW8260	4.5		51000	ug/Kg	4.5	
1,1-Dichloroethene	SW8260	1.8		12000	ug/Kg	0.794	U
1,2,3-Trichlorobenzene	SW8260				ug/Kg		UR
1,2,4-Trichlorobenzene	SW8260			6200	ug/Kg		UR
1,2-Dibromo-3-chloropropane	SW8260			460	ug/Kg		UR
1,2-Dibromoethane (EDB)	SW8260			32	ug/Kg	0.667	U
1,2-Dichlorobenzene	SW8260			110000	ug/Kg		UR
1,2-Dichloroethane	SW8260			280	ug/Kg	0.683	U
1,2-Dichloropropane	SW8260			340	ug/Kg	0.762	U
1,3-Dichlorobenzene	SW8260			53000	ug/Kg		UR
1,4-Dichlorobenzene	SW8260			3400	ug/Kg		UR
2-Butanone (Methyl ethyl ketone)	SW8260	51.2		2200000	ug/Kg	51.2	
2-Hexanone	SW8260				ug/Kg	5.99	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			530000	ug/Kg		UR
Acetone	SW8260	234		1400000	ug/Kg	234	
Benzene	SW8260			640	ug/Kg	0.715	U
Bromochloromethane	SW8260				mg/Kg	0.000794	U
Bromodichloromethane	SW8260			820	ug/Kg	0.778	U
Bromoform	SW8260			62000	ug/Kg	0.778	U
Bromomethane	SW8260			390	ug/Kg	0.794	U
Carbon Disulfide	SW8260			36000	ug/Kg	3.75	U
Carbon tetrachloride	SW8260			250	ug/Kg	0.778	U

Plum Brook
2004 Sediment Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-04-SD-2BG-SD03-A SD03 05/23/2004 0.0-0.0 ft, SE RESULT / QUAL	VQ
Chlorobenzene	SW8260			15000	ug/Kg	0.651	U
Chloroethane	SW8260			3000	ug/Kg	1.29	U
Chloroform	SW8260			220	ug/Kg	0.826	U
Chloromethane	SW8260			4700	ug/Kg	0.588	U
Cyclohexane	SW8260	11		280000	ug/Kg	0.762	UJ
Dibromochloromethane	SW8260			1100	ug/Kg	0.794	U
Dichlorodifluoromethane	SW8260			9400	ug/Kg		UR
Ethylbenzene	SW8260			190000	ug/Kg	0.603	U
Isopropylbenzene (Cumene)	SW8260			57000	ug/Kg		UR
Methyl Acetate	SW8260			2200000	ug/Kg	5.24	UJ
Methylcyclohexane	SW8260			260000	ug/Kg		UR
Methylene Chloride	SW8260			9100	ug/Kg	2.14	U
Styrene	SW8260			440000	ug/Kg	0.619	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			32000	ug/Kg	0.842	U
Tetrachloroethene (PCE)	SW8260			480	ug/Kg	0.603	U
Toluene	SW8260	0.86		66000	ug/Kg	0.86	J
Trichloroethene (TCE)	SW8260			53	ug/Kg	0.715	U
Trichlorofluoromethane	SW8260			39000	ug/Kg	0.794	U
Vinyl chloride	SW8260			79	ug/Kg	0.889	U
Xylenes, Total	SW8260			27000	ug/Kg	0.619	U
cis-1,2-Dichloroethene	SW8260			4300	ug/Kg	0.746	U
cis-1,3-Dichloropropene	SW8260				ug/Kg	0.683	U
trans-1,2-Dichloroethene	SW8260			6900	ug/Kg	0.842	U
trans-1,3-Dichloropropene	SW8260				ug/Kg	0.397	U

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Trip Blanks Associated with 2004 Soil Investigation

METHOD	ANALYTE	SAMP. NUM. DATE UNITS	PBOW-04-TB-051904-1 05/19/2004 RESULT / QUAL	VQ	PBOW-04-TB-052304-1 05/23/2004 RESULT / QUAL	VQ	PBOW-04-TB-052404-1 05/24/2004 RESULT / QUAL	VQ	PBOW-04-TB-052404-2 05/24/2004 RESULT / QUAL	VQ	PBOW-04-TB-052504-1 05/25/2004 RESULT / QUAL
	Volatile Organic Compounds										
SW8260	1,1,1-Trichloroethane	ug/L	0.34	U	0.34	U	0.34	U	0.34	U	0.34
SW8260	1,1,2,2-Tetrachloroethane	ug/L	0.49	U	0.49	U	0.49	U	0.49	U	0.49
SW8260	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5
SW8260	1,1,2-Trichloroethane	ug/L	0.44	U	0.44	U	0.44	U	0.44	U	0.44
SW8260	1,1-Dichloroethane	ug/L	0.41	U	0.41	U	0.41	U	0.41	U	0.41
SW8260	1,1-Dichloroethene	ug/L	0.41	U	0.41	U	0.41	U	0.41	U	0.41
SW8260	1,2,3-Trichlorobenzene	ug/L	0.32	U	0.32	U	0.32	U	0.32	U	0.32
SW8260	1,2,4-Trichlorobenzene	ug/L	0.42	U	0.42	U	0.42	U	0.42	U	0.42
SW8260	1,2-Dibromo-3-chloropropane	ug/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75
SW8260	1,2-Dibromoethane (EDB)	ug/L	0.25	U	0.25	U	0.25	U	0.25	U	0.25
SW8260	1,2-Dichlorobenzene	ug/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36
SW8260	1,2-Dichloroethane	ug/L	0.29	U	0.29	U	0.29	U	0.29	U	0.29
SW8260	1,2-Dichloropropane	ug/L	0.25	U	0.25	U	0.25	U	0.25	U	0.25
SW8260	1,3-Dichlorobenzene	ug/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33
SW8260	1,4-Dichlorobenzene	ug/L	0.25	U	0.25	U	0.25	U	0.25	U	0.25
SW8260	2-Butanone (Methyl ethyl ketone)	ug/L	2.31	U	2.31	U	2.31	U	2.31	U	2.31
SW8260	2-Hexanone	ug/L	1.45	U	1.45	U	1.45	U	1.45	U	1.45
SW8260	4-Methyl-2-pentanone (Methyl isobutyl ketone)	ug/L	1.78	U	1.78	U	1.78	U	1.78	U	1.78
SW8260	Acetone	ug/L	4.5	J	2.29	U	2.29	U	2.29	U	2.29
SW8260	Benzene	ug/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33
SW8260	Bromochloromethane	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Bromodichloromethane	ug/L	0.38	U	0.38	U	0.38	U	0.38	U	0.38
SW8260	Bromoform	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Bromomethane	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Carbon Disulfide	ug/L	1.91	U	1.91	U	1.91	U	1.91	U	1.91
SW8260	Carbon tetrachloride	ug/L	0.29	U	0.29	U	0.29	U	0.29	U	0.29
SW8260	Chlorobenzene	ug/L	0.32	U	0.32	U	0.32	U	0.32	U	0.32
SW8260	Chloroethane	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Chloroform	ug/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36
SW8260	Chloromethane	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Cyclohexane	ug/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33
SW8260	Dibromochloromethane	ug/L	0.29	U	0.29	U	0.29	U	0.29	U	0.29
SW8260	Dichlorodifluoromethane	ug/L	0.43	U	0.43	U	0.43	U	0.43	U	0.43
SW8260	Ethylbenzene	ug/L	0.21	U	0.21	U	0.21	U	0.21	U	0.21
SW8260	Isopropylbenzene (Cumene)	ug/L	0.29	U	0.29	U	0.29	U	0.29	U	0.29
SW8260	Methyl Acetate	ug/L	1.45	U	1.45	U	1.45	U	1.45	U	1.45
SW8260	Methylcyclohexane	ug/L	0.34	U	0.34	U	0.34	U	0.34	U	0.34
SW8260	Methylene Chloride	ug/L	1.9	U	1.9	U	1.9	U	1.9	U	1.9
SW8260	Styrene	ug/L	0.25	U	0.25	U	0.25	U	0.25	U	0.25
SW8260	Tert-Butyl Methyl Ether (MTBE)	ug/L	0.32	U	0.32	U	0.32	U	0.32	U	0.32

Plum Brook

Trip Blanks Associated with 2004 Soil Investigation

METHOD	ANALYTE	SAMP. NUM. DATE UNITS	PBOW-04-TB-051904-1 05/19/2004 RESULT / QUAL	VQ	PBOW-04-TB-052304-1 05/23/2004 RESULT / QUAL	VQ	PBOW-04-TB-052404-1 05/24/2004 RESULT / QUAL	VQ	PBOW-04-TB-052404-2 05/24/2004 RESULT / QUAL	VQ	PBOW-04-TB-052504-1 05/25/2004 RESULT / QUAL
SW8260	Tetrachloroethene (PCE)	ug/L	0.33	U	0.33	U	0.33	U	0.33	U	0.33
SW8260	Toluene	ug/L	0.39	U	0.39	U	0.39	U	0.39	U	0.39
SW8260	Trichloroethene (TCE)	ug/L	0.36	U	0.36	U	0.36	U	0.36	U	0.36
SW8260	Trichlorofluoromethane	ug/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5
SW8260	Vinyl chloride	ug/L	0.55	U	0.55	U	0.55	U	0.55	U	0.55
SW8260	Xylenes, Total	ug/L	0.25	U	0.25	U	0.25	U	0.25	U	0.25
SW8260	cis-1,2-Dichloroethene	ug/L	0.3	U	0.3	U	0.3	U	0.3	U	0.3
SW8260	cis-1,3-Dichloropropene	ug/L	0.3	U	0.3	U	0.3	U	0.3	U	0.3
SW8260	trans-1,2-Dichloroethene	ug/L	0.37	U	0.37	U	0.37	U	0.37	U	0.37
SW8260	trans-1,3-Dichloropropene	ug/L	0.29	U	0.29	U	0.29	U	0.29	U	0.29

Plum Brook

Trip Blanks Associated with 2004 Soil Investigation

METHOD	ANALYTE	SAMP. NUM. DATE UNITS	VQ	PBOW-04-TB-052504-3 05/25/2004 RESULT / QUAL	VQ	PBOW-04-TB-052604-1 05/26/2004 RESULT / QUAL	VQ
	Volatile Organic Compounds						
SW8260	1,1,1-Trichloroethane	ug/L	U	0.34	U	0.34	U
SW8260	1,1,2,2-Tetrachloroethane	ug/L	U	0.49	U	0.49	U
SW8260	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	U	2.5	U	2.5	U
SW8260	1,1,2-Trichloroethane	ug/L	U	0.44	U	0.44	U
SW8260	1,1-Dichloroethane	ug/L	U	0.41	U	0.41	U
SW8260	1,1-Dichloroethene	ug/L	U	0.41	U	0.41	U
SW8260	1,2,3-Trichlorobenzene	ug/L	U	0.32	U	0.32	U
SW8260	1,2,4-Trichlorobenzene	ug/L	U	0.42	U	0.42	U
SW8260	1,2-Dibromo-3-chloropropane	ug/L	U	0.75	U	0.75	U
SW8260	1,2-Dibromoethane (EDB)	ug/L	U	0.25	U	0.25	U
SW8260	1,2-Dichlorobenzene	ug/L	U	0.36	U	0.36	U
SW8260	1,2-Dichloroethane	ug/L	U	0.29	U	0.29	U
SW8260	1,2-Dichloropropane	ug/L	U	0.25	U	0.25	U
SW8260	1,3-Dichlorobenzene	ug/L	U	0.33	U	0.33	U
SW8260	1,4-Dichlorobenzene	ug/L	U	0.25	U	0.25	U
SW8260	2-Butanone (Methyl ethyl ketone)	ug/L	U	2.31	U	2.31	U
SW8260	2-Hexanone	ug/L	U	1.45	U	1.45	U
SW8260	4-Methyl-2-pentanone (Methyl isobutyl ketone)	ug/L	U	1.78	U	1.78	U
SW8260	Acetone	ug/L	U	2.29	U	2.29	U
SW8260	Benzene	ug/L	U	0.33	U	0.33	U
SW8260	Bromochloromethane	ug/L	U	0.5	U	0.5	U
SW8260	Bromodichloromethane	ug/L	U	0.38	U	0.38	U
SW8260	Bromoform	ug/L	U	0.5	U	0.5	U
SW8260	Bromomethane	ug/L	U	0.5	U	0.5	U
SW8260	Carbon Disulfide	ug/L	U	1.91	U	1.91	U
SW8260	Carbon tetrachloride	ug/L	U	0.29	U	0.29	U
SW8260	Chlorobenzene	ug/L	U	0.32	U	0.32	U
SW8260	Chloroethane	ug/L	U	0.5	U	0.5	U
SW8260	Chloroform	ug/L	U	0.36	U	0.36	U
SW8260	Chloromethane	ug/L	U	0.5	U	0.5	U
SW8260	Cyclohexane	ug/L	U	0.33	U	0.33	U
SW8260	Dibromochloromethane	ug/L	U	0.29	U	0.29	U
SW8260	Dichlorodifluoromethane	ug/L	U	0.43	U	0.43	U
SW8260	Ethylbenzene	ug/L	U	0.21	U	0.21	U
SW8260	Isopropylbenzene (Cumene)	ug/L	U	0.29	U	0.29	U
SW8260	Methyl Acetate	ug/L	U	1.45	U	1.45	U
SW8260	Methylcyclohexane	ug/L	U	0.34	U	0.34	U
SW8260	Methylene Chloride	ug/L	U	1.9	U	1.9	U
SW8260	Styrene	ug/L	U	0.25	U	0.25	U
SW8260	Tert-Butyl Methyl Ether (MTBE)	ug/L	U	0.32	U	0.32	U

Plum Brook

Trip Blanks Associated with 2004 Soil Investigation

METHOD	ANALYTE	SAMP. NUM. DATE UNITS	VQ	PBOW-04-TB-052504-3 05/25/2004 RESULT / QUAL	VQ	PBOW-04-TB-052604-1 05/26/2004 RESULT / QUAL	VQ
SW8260	Tetrachloroethene (PCE)	ug/L	U	0.33	U	0.33	U
SW8260	Toluene	ug/L	U	0.39	U	0.39	U
SW8260	Trichloroethene (TCE)	ug/L	U	0.36	U	0.36	U
SW8260	Trichlorofluoromethane	ug/L	U	0.5	U	0.5	U
SW8260	Vinyl chloride	ug/L	U	0.55	U	0.55	U
SW8260	Xylenes, Total	ug/L	U	0.25	U	0.25	U
SW8260	cis-1,2-Dichloroethene	ug/L	U	0.3	U	0.3	U
SW8260	cis-1,3-Dichloropropene	ug/L	U	0.3	U	0.3	U
SW8260	trans-1,2-Dichloroethene	ug/L	U	0.37	U	0.37	U
SW8260	trans-1,3-Dichloropropene	ug/L	U	0.29	U	0.29	U

Appendix H

Chemical Quality Assurance Report
(assessment of the QA analytical laboratory data).

CHEMICAL DATA QUALITY REPORT

GROUNDWATER DATA FOR THE REMEDIAL INVESTIGATION, PART 1, RESERVOIR NUMBER 2 BURNING GROUND (2BG)

FORMER PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO

Prepared for:

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0002

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June 2005

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ATTACHMENT 1 SAMPLE INFORMATION TABLES

ATTACHMENT 2 TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Abbreviations and Acronyms

C	Celsius
CDQR	Chemical Data Quality Report
CLP	USEPA Contract Laboratory Program
COC	Chain of Custody
CQAR	Chemical Quality Assurance Report
%D	Percent Difference
DQO	Data Quality Objectives
GC	Gas Chromatograph or Gas Chromatography
HTRW-CX	Hazardous, Toxic, and Radioactive Waste - Center of Expertise
Jacobs	Jacobs Engineering Group Inc
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not Detected
PAH	Polynuclear Aromatic Hydrocarbon Compounds
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl Compounds
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
%R	Percent Recovery
RL	Reporting Level
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SD	Serial Dilution QC sample
SDG	Sample Delivery Group
SW-846	Solid Waste Analytical Protocols
TAL	Target Analyte List
TB	Trip Blank
TCL	Target Compound List
TOC	Total Organic Carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This Chemical Data Quality Report (CDQR) presents an evaluation of the quality and usability of the analytical data generated in support of the groundwater remedial investigation at Reservoir Number 2 Burning Ground (2BG) at the former Plum Brook Ordnance Works (PBOW). Jacobs Engineering (Jacobs) performed this remedial investigation for the United States Army Corps of Engineers (USACE) Nashville District under contract number DACW62-03-D-0004, task order 0002.

Only primary environmental samples were collected by Jacobs and submitted to approved laboratories for chemical analyses. Insufficient sample volume was available from the 2BG wells to collect quality assurance (QA) and some field quality control (QC) samples. Jacobs provided data quality evaluation services for the primary data. This CDQR covers Jacobs' evaluation of the primary data.

This evaluation meets and completes the requirement of Step 2 "data verification" of the project data quality assessment (DQA) process. Completion of this step completes Jacob's portion of the requirement in the DQA process. A description of the DQA process is included in Section 8.2.2 of the approved Quality Assurance Project Plan (QAPP). As specified in the QAPP, the findings of this evaluation were discussed in terms of data precision, accuracy, representativeness, sensitivity and completeness.

1.1 REPORT ORGANIZATION

The CDQR has been organized into four sections and two attachments:

- Section 1 - Report organization and data quality program including: analytical laboratory used, analytical samples included in the evaluation, analytical protocols/methods employed, data evaluation procedures followed, and summary of data reporting formats.
- Section 2 - Definitions of qualifiers that may be assigned to data based on this evaluation.
- Section 3 - Statement of the project overall data quality and summary of qualifiers applied to the data as a result of this evaluation.
- Section 4 - Data quality narratives.
- Attachment 1 - Sample information tables including field and laboratory ID cross-reference.
- Attachment 2 - Test result tables with review qualifiers applied.

1.2 DATA QUALITY ASSURANCE PROGRAM

In order to verify compliance with project objectives, it was required that certain measurements of chemical constituents in environmental samples be made that met definitive data quality standards. This CDQR is applicable to those data.

Definitive data standards are specified by the USEPA in *"Data Quality Objectives Process for Superfund,"* EPA540-R-93-071, USEPA Office of Emergency and Remedial Response, September 1993. Definitive data are defined as follows:

> "Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are

satisfied. For the data to be definitive, either analytical or total measurement error must be determined."

Specific project data quality objectives (DQOs) and procedures to achieve the DQOs are documented in the approved project Sampling and Analysis Plan Addendum (SAP). Key elements of the quality program relating to this evaluation include:

- Use of approved, USACE-validated laboratories.
- Use of a sampling program designed to meet the project objectives.
- Use of appropriate analytical methods and measurement parameters.
- Evaluation of reported QA/QC to verify compliance with DQOs.
- Use of appropriate analytical data reporting formats.

These elements are discussed in the following paragraphs.

1.2.1 Project Analytical Laboratories

The analytical laboratories employed on this project were evaluated by the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise (HTRW-CX) and hold a current letters of validation from HTRW-CX to perform sample analyses in support of the USACE HTRW Program. This validation confirms their ability to produce reliable and defensible data. The primary analytical laboratories used were:

General Engineering Laboratories (GEL)(Primary VOCs, explosives, and metals analyses)
Contact: Jake Crook, Project Manager (PM)
2040 Savage Road
Charleston, SC 29414
Phone: 843-556-8171 Fax: 843- 766-1178

Ecology and Environment, Inc. (E&E)(Primary PAHs and PCBs)
Analytical Services Center
Contact: Alan Laffin
4493 Walden Avenue
Lancaster, NY 14086
Phone: 716-685-8080
Fax: 716-685-0852

1.2.2 Sampling Program Design/Project Samples

The sampling program was designed to collect samples representative of site conditions at the time of sampling and to generate data of sufficient quality and quantity to make the intended decisions. Project analytical samples were collected using standardized, USACE approved procedures documented in the sampling and analysis plan (SAP). The SAP was approved by the USACE prior to collection of the associated project samples and included the basis for selecting the sampling locations, sample collection procedures, frequency and type of samples collected, and the analytical parameters for each sample.

Only three of the six planned 2BG groundwater wells produced sufficient water to collect samples for analytical testing. However, the three wells did not produce sufficient volume to collect; the full suite of planned analytical tests in the SAP, a QA split sample, a QC field duplicate or MS/MSD. The wells were sampled until dry and the sample volume aliquoted to the most important analytical tests

as determined by CELRN.

The chain-of-custody (COC) form requested several tests that were not able to be performed due to the sample volume shortages. Sample PBOW-05-GW-2BG-BEDMW002-01A lacked sufficient volume to perform the TOC and PAH analyses requested on the COC. The dissolved metals requested for samples PBOW-05-GW-2BG-BEDMW002-01A and PBOW-05-GW-2BG-BEDMW003-01A was also not able to be performed due to insufficient sample volume.

Definitive data measurements were required for the samples collected in support of this investigation. The investigation utilized the EPA Target Analyte List/Target Compound List (TAL/TCL) of analytes as the constituents of concern. The rationale for required analytical measurements and resulting data use is specified in the project QAPP.

Project samples included in this evaluation consist of three primary groundwater samples, and the associated field trip blank collected in January of 2005. The laboratories reported the groundwater and field QC analyses in a single sample delivery group (SDG). The SDG included in this evaluation is:

GEL SDG # 129791 (includes E&E 0502003)

A listing of specific project samples contained in the SDG, along with a cross reference of sample field ID numbers to laboratory ID numbers, is included in the Sample Information Table at the beginning of the data package from each lab. The respective Sample Information tables have been compiled into a single table listing the samples evaluated from this SDG, and are included with this report as Attachment 1.

1.2.3 Project Analytical Methods and Measurement Parameters

In order to obtain definitive data and promote data comparability, the laboratory was required to perform testing within the guidelines of standardized, USEPA and USACE approved methods and procedures included in the following protocols:

- *"Test Methods for Evaluating Solid Waste,"* SW-846, 3rd Edition, Update III, U.S. EPA, November 1986, (SW-846).
- "*Shell for Analytical Chemistry Requirements*," Appendix I, from EM 200-1-3 "*Requirements for the Preparation of Sampling and Analysis Plans*" USACE HTRW-CX, February 2001.

The project included collection of definitive data for organics and metals analyses, and screening level data for the water quality parameters for the groundwater samples. Specific analytical methods used in the analysis of each project sample were included in the laboratory case narratives included in each SDG and are summarized below for each primary sample type.

Definitive Data Methods for Groundwater Samples

- TCL Volatile organic compounds (VOCs) by 5030/8260B
- Polynuclear aromatic hydrocarbons (PAHs) by 3520/8310
- Polychlorinated biphenyls (PCBs) by 3520/8082
- Nitroaromatics by SW-846 8330
- TAL Total and Dissolved Metals by 3005A/6020/7470A
- Total Organic Carbon (TOC) by SW846 9060

- Cyanide by SW-846 9010A/9012

Water Quality Parameters for Groundwater Samples

- Turbidity by EPA 180.1
- Alkalinity by EPA 310.1
- Anions by EPA 300 (Nitrate, Chloride, and Sulfate)
- Hardness by EPA 130.2
- Total Dissolved Solids by EPA 160.1
- Total Suspended Solids by EPA 160.2

1.2.3.1 Deviations from Planned Analytical Procedures

The QAPP assumed that the PAH confirmation analyses would be accomplished by 8310 HPLC utilizing a dissimilar column. However, the primary lab performing the PAH analyses, E&E, was directed by USACE HTRW-CX in a recent audit to discontinue using the 8310 HPLC confirmation column, and report PAH data as not confirmed and flagged with an "N" qualifier. USACE HTRW-CX was not satisfied that the primary and confirmation columns for 8310 HPLC were dissimilar enough to constitute an actual confirmation. Unfortunately, another PAH HPLC confirmation column is not currently available. Several laboratories not involved with this project were contacted, and confirmed that they were experiencing the same problem. Jacobs also learned that the EPA is working with several chromatography vendors to develop a new confirmation column for the PAH analyses.

This leaves GC/MS SIM as the only acceptable confirmation for the 8310 PAH HPLC analyses. The SIM analysis is a GC/MS analysis and is considerably more costly then the HPLC analysis, and since it was not specifically requested it was not performed. This information was not communicated to Jacobs by the laboratories until the data evaluator questioned why there were not PAH confirmation analyses present in the data packages. By the time the data were evaluated, the holding times for the sample analyses had expired. Thus, eliminating the possibility of requesting the confirmation analyses be performed by GC/MS.

The resulting PAH data from the primary laboratory, E&E, was evaluated as reported, and positive detects were qualified as estimated but not confirmed "JN". The PAH data should be treated as screening data since it is not confirmed. The PAH results should not be used to drive a remedial action since they are potentially false positives and high biased. It is recommended that if locations have only PAH exceedances to risk criteria that might drive future decisions, that PAH samples be resampled and re-analyzed using the GC/MS SIM method to confirm the PAH results.

1.2.4 Data Evaluation Procedure

The quality of this data has been evaluated following the "data verification" procedure included in the QAPP as Step 2 of the five-step USACE DQA process. The procedure was derived from the USACE "*Shell for Analytical Chemistry Requirements*" and considers the project DQOs, QC requirements of the analytical methods, and informed professional judgment of the evaluator. Qualified Jacobs personnel, experienced in the evaluation of analytical data quality, performed data evaluation.

A brief description of the procedure followed in this evaluation is presented below.

Data Verification Procedure

At a minimum, the following data quality issues were addressed in this evaluation with respect to 100% of the sample data.

- Review of chain-of-custody and sample receipt forms to evaluate sample receipt data, damaged sample containers, etc.
- Review of laboratory testing methods, detection limits, holding times, data qualifiers, etc.
- Review of field QC blank data to detect contamination from outside sources.
- Review of field QC duplicates to evaluate data reproducibility.
- Review of laboratory QC including laboratory blanks, spike recoveries, and duplicates.
- Verification of calibrations as summarized by the laboratory on the CLP-like reporting forms and within their case narratives.
- Qualification of unusable data as rejected and attachment of appropriate qualifiers to usable data.
- Presentation of data evaluation findings in terms of the data quality parameters precision, accuracy, representativeness, sensitivity and completeness.

Data quality parameters were evaluated as follows:

- Precision - by evaluation of Matrix Spike/Matrix Spike Duplicate (MS/MSD), laboratory duplicate, and field duplicate relative percent differences (RPD).
- Accuracy - by evaluation of surrogate (SUR), Laboratory Control Sample (LCS), and MS/MSD percent recoveries (%R).
- Representativeness - by evaluation of sample receipt records, technical holding times, and blank sample results (field and laboratory).
- Sensitivity - by evaluation of laboratory detection limits, reporting units, and the overall performance of the chosen methods.
- Completeness - by comparing the number of valid measurements obtained to the number of measurements planned for these samples.

1.2.5 Data Reporting Formats

1.2.5.1 Laboratory Data Packages and Analytical Results

The laboratory reported field sample and supporting QC data in a format consistent with the USEPA Contract Laboratory Program (CLP) data reporting requirements. This "CLP-like" format included most applicable report summary forms and was sufficient to complete Step 2 of the DQA process. In a few cases the raw quantitation reports had to be reviewed to evaluate dilutions, manual integrations, and to check for proper quantitation.

The supplied reports did include chromatograms and other raw data that are necessary to complete a third party validation of the DQA process for all parameters of interest. However, third party validation is not currently planned for 2BG. Due to insufficient sample volume, QA split samples were not collected for this sampling event, and thus, there are no QA data nor CQAR Report associated with the 2BG groundwater.

The complete analytical data packages received from the project laboratories and evaluated in this review are available from Jacobs upon request from the CELRN.

1.2.5.2 Data Quality Non-Conformances

Data quality non-conformances identified as a result of this review are presented in Section 4.0, Data Quality Narratives. The data quality narratives are detailed explanations of the findings of this evaluation in terms of precision, accuracy, representativeness, sensitivity and completeness. They are intended to present a compilation of laboratory QC results found outside project acceptance criteria and provide an assessment of the potential impact those results had on the analytical data. Typically, the bulk of the project analytical protocol requirements are fulfilled and, therefore, are not summarized in the narratives.

Tabular presentations of the analytical sample results were included in each SDG. The respective laboratory test results tables were compiled into Data Summary Tables from the Electronic Data Deliverable (EDD) and were included with this report as Attachment 2. In addition, the validation qualifiers were applied to sample data to indicate data use limitations based on the findings of this evaluation.

2.0 DATA QUALIFIER DEFINITIONS

The following definitions provide explanations of the data qualifiers that may be assigned to results based on this evaluation. The data qualifier definitions are consistent with those used within the USEPA NFG referenced in Section 1.2.3 of this report.

U- The analyte was analyzed for but not detected (ND). The value preceding the U is the Contract Required Quantitation Limit (CRQL).

J- The identification of the analyte is acceptable, but the quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision (i.e. the quantitative value is considered estimated).

UJ- This flag is a combination of the U and J qualifiers. This indicates that the analyte is not present and the reported value is considered to be an estimated CRQL.

R- Data are considered to be rejected and shall not be used. This flag denotes the failure of quality control criteria such that it cannot be determined if the analyte is present or absent from the sample.

B- The B flag is to be used for both organic and inorganic analyses when the analyte is found in the associated blank as well as the in the sample. The result is considered ND, and the reported value is considered to be an estimated CRQL.

N- There is presumptive evidence that the analyte is present, but it has not been confirmed. The analyte is tentatively identified. There is an indication that the reported analyte is present, however, all quality control requirements necessary for confirmation were not met.

3.0 DATA EVALUATION SUMMARY

3.1 OVERALL ASSESSMENT OF PROJECT DATA QUALITY

In general, QA/QC results associated with this data indicated that the data met "definitive data" standards and were of known quality with the exception of the PAH limitations discussed in Section 1.2.3.1. QC data demonstrated that the QA mechanisms were effective in ensuring measurement data reliability within expected limits of sampling and analytical error and were considered, as qualified, representative of actual site conditions at the time sampled.

Data reported are acceptable for the uses as intended with the required qualifications and limitations. The data users are urged to review the Data Quality Narratives and associated data qualifications before utilizing this data for decision-making.

Summary of Required Data Qualifications

This section provides a summary of qualifiers applied to the data as a result of this evaluation. Attachment 2 includes tabular presentations of the analytical sample results with data qualifiers applied based on the findings of this evaluation. The data qualifier definitions applied during this review are presented in Section 2.0. Section 4.0, Data Quality Narratives, contains discussion of the evaluation findings along with an assessment of the impact on project data. Data qualified as estimated ("J") due to detection at a level below the laboratory quantitation limit but above the method detection limit were not included in this summary since they were not qualified due to QC non-conformance.

SDG GEL 129791 (includes E&E 0502003 PAHs and PCBs)

1. For the VOC (method 8260) analysis of all four samples, the non-detect results of 2-Butanone were qualified as estimated ("UJ") due to a marginal CCV outlier.
2. For the VOC (method 8260) analysis of all four samples, the non-detect results of Trichlorotrifluoroethane were qualified as rejected ("R") due to a CCV outlier >30%D.
3. For the PAH (method 8310) analysis of sample PBOW-05-GW-2BG-BEDMW003-01A, the non-detect result for Fluorene was qualified as estimated ("UJ") due to a marginal ICV outlier.
4. For the PAH (method 8310) analysis of sample PBOW-05-GW-2BG-BEDMW003-01A, all results reported as positive detects were qualified as estimated "NJ" due to the absence of a confirmation analysis.
5. For the PCB (method 8082) analysis of all three samples, the non-detect results for all PCB target analytes were qualified as estimated ("UJ") due to low surrogate recoveries for one of the two surrogates (DCB).
6. For the metals (method 6020) analysis of sample PBOW-05-GW-2BG-BEDMW001-01A, the Cadmium detect was qualified as estimated "J" due to a marginally high lab duplicate RPD.
7. For the metals (method 6020) analysis of all three samples, the Selenium low level detects were qualified as undetected ("U") due to blank contamination, and further qualified as estimated ("UJ") due to a marginally low MS recovery.
8. For the metals (method 6020) analysis of sample PBOW-05-GW-2BG-BEDMW003-01A, the low level Thallium and Chromium detects were qualified as undetected ("U") due to blank contamination.
9. For the Mercury (method 7470A) analysis of sample PBOW-05-GW-2BG-BEDMW001-01A, the low level Mercury detect was qualified as undetected ("U") due to blank contamination.

4.0 DATA QUALITY NARRATIVES

The findings of this data quality evaluation are presented below in terms of precision, accuracy, representativeness, sensitivity and completeness.

4.1 DATA PRECISION

4.1.1 Field QC Duplicate Precision Review

Project field duplicate precision indicators were not able to be assessed because insufficient sample volume was available for field duplicate samples to be collected at each of the three monitoring wells.

4.1.2 Laboratory Duplicate Precision Review

Project laboratory duplicate precision indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Findings:

1. The metals duplicate performed on sample PBOW-05-GW-2BG-BEDMW001-01A had a RPD outlier for Cadmium as detailed in the table below. Cadmium was qualified as estimated "J" in all three samples in the SDG to indicate the potential imprecise measurement. The table below details the outlier for PBOW-05-GW-2BG-BEDMW001-01A and the qualification applied to the associated samples.

Analyte	RPD	Qualifier	Affected Samples
Cadmium	33.4%	J	PBOW-05-GW-2BG-BEDMW001-01A PBOW-05-GW-2BG-BEDMW002-01A PBOW-05-GW-2BG-BEDMW003-01A

2. The PAHs were analyzed on a single column. A confirmation analysis was not performed and the precision of the detected results could not be assessed. As well, the identity of the positive detects could not be positively confirmed. The positive PAH results in all three groundwater samples were qualified as estimated "NJ" to indicate the uncertainty in the identification and concentration of the analytes.

4.2 DATA ACCURACY

4.2.1 Data Accuracy Indicators Review

Project accuracy indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification. Instances where dilutions caused surrogate or spike recoveries to be diluted out (dilutions greater than 4X) are not discussed as findings if qualification was not deemed necessary.

Specific Findings:

1. The VOC Initial Calibration Verification (ICV) associated with all three of the samples and the trip blank failed the criteria (80-120% R or 20%D) marginally high for Methyl Acetate (30.8%D). The finding indicated a potential high bias for Methyl Acetate. However, all three of the samples and the trip blank were non-detect for the analyte and no qualification was necessary.
2. The VOC Continuing Calibration Verification (CCV) associated with all three of the samples and the trip blank failed the criteria (80-120% R or 20%D) marginally high for Methyl Acetate (25.4%D). The finding indicated a potential high bias for Methyl Acetate. However, all three of the samples and the trip blank were non-detect for the analyte and no qualification was necessary.
3. The VOC Continuing Calibration Verification (CCV) associated with all three of the samples and the trip blank failed the percent drift criteria marginally for 2-Butanone (21.9%) with a low bias. The finding indicated a potential low bias for the analyte, thus, the results were qualified as estimated ("UJ") for the non-detect results in all three samples and the trip blank.
4. The VOC Continuing Calibration Verification (CCV) associated with all three of the samples and the trip blank failed the percent drift criteria for Trichlorotrifluoroethane (36.1%) with a low bias. The finding indicated a potential low bias for the analyte, thus, the non-detect results in all three samples and the trip blank were qualified as rejected ("R").

Analyte	QC Outlier	Bias/% Difference	Qualifier	Affected Samples
Methyl acetate	ICV	+ 30.8%	J/none	PBOW-05-GW-2BG-BEDMW001-01A PBOW-05-GW-2BG-BEDMW002-01A PBOW-05-GW-2BG-BEDMW003-01A PBOW-05-TB-012805-02
Methyl acetate	CCV	+ 25.4%	J/none	
2-Butanone	CCV	- 21.9%	J/UJ	
Trichlortrifluoroethane	CCV	- 36.1%	J/R	

5. The Nitroaromatic surrogate recoveries for all three samples recovered below the lower control limit. However, the samples were analyzed at a 100X dilution due to non-target analyte matrix interference. The surrogates were considered diluted out, and no qualification was necessary.
6. The PAH Initial Calibration Verification (ICV) associated with all three of the samples failed with marginally low biased % differences for three compounds. The finding indicated a potential low bias for the analytes. Therefore, the analytes were qualified as estimated ("J" for detects and "UJ for non-detects).
7. The PAH Continuing Calibration Verification (CCVs) associated with all three of the samples failed with marginally low biased % differences for Benzo(a)pyrene. However, the mean % differenece for the analytes was acceptable and the outliers for the analyte were less than 30%. Therefore, no qualification was necessary.

Analyte	QC Outlier	Bias/% Difference	Qualifier	Affected Samples
Fluorene	ICV	-16.8%	J/UJ	PBOW-05-GW-2BG-BEDMW001-01A PBOW-05-GW-2BG-BEDMW002-01A PBOW-05-GW-2BG-BEDMW003-01A
Phenanthrene	ICV	-17.9%	J/UJ	
Fluoranthene	ICV	-17.2%	J/UJ	
Benzo(a)pyrene	CCV	-16.3%	none	
Benzo(a)pyrene	CCV	-16.8%	none	

8. The PCB surrogate recoveries for all three samples recovered below the lower control limit for one of the two surrogates (DCB). The other surrogate (TCMX) was acceptable in all three samples. Sample PBOW-05-GW-2BG-BEDMW001-01A was analyzed at a 5X dilution due to non-target matrix interference. The surrogate in this sample was considered diluted out and no qualification was necessary for sample PBOW-05-GW-2BG-BEDMW001-01A. However, the other two samples were analyzed undiluted and had low DCB surrogate recoveries. The non-detect results for all PCB target analytes in samples PBOW-05-GW-2BG-BEDMW002-01A and PBOW-05-GW-2BG-BEDMW003-01A were qualified as estimated ("UJ").
9. The metals MS performed on sample PBOW-05-GW-2BG-BEDMW001-01A recovered marginally low for Selenium (52%). The trace level detects for Selenium in the three associated samples were already qualified as undetected ("U") due to blank contamination. The marginally low biased Selenium MS recovery caused the results to be qualified as estimated ("UJ") for all three samples.

4.3 DATA REPRESENTATIVENESS

4.3.1 Sample Custody/Handling Documentation Review

The project samples were received at the laboratory adequately preserved, chilled within the required range of 4 ± 2 degrees Celsius, in good condition, and with required custody documentation in order. There were a couple of tests requested on the COC form that could not be performed due to insufficient sample volume. The TOC, PAH, and dissolved metals analyses requested on sample PBOW-05-GW-2BG-BEDMW002-01A could not be performed, and the dissolved metals on sample PBOW-05-GW-2BG-BEDMW003-01A could not be performed.

4.3.2 Sample Holding Time Review

QC data indicated requirements for holding times were met for each sample analysis.

4.3.3 Blank Sample Results Review

QC data indicated requirements for blank sample results were met for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Finding:

1. The VOC trip blank associated with the three groundwater samples contained a detect of Chloroform at 1.6 ug/L. All three associated samples were non-detect for Chloroform and there was no adverse affect on data quality.
2. The metals method blank had trace level detects of Chromium, Iron, Potassium, Selenium, Sodium, Thallium, and Mercury. Most of the blank detections did not affect the data quality due to the magnitude of the detects of the compounds in the samples. However, the Chromium detect in sample PBOW-05-GW-2BG-BEDMW003-01A and the Mercury detect in sample PBOW-05-GW-2BG-BEDMW003-01A were less than five times the blank value and qualified as undetected ("U").
3. The metals initial calibration and continuing calibration blanks contained trace levels of Antimony, Selenium, Thallium, and Mercury. Most of the blank detections did not affect the data quality due to the magnitude of the detects of the compounds in the samples. However, the Thallium detect in sample PBOW-05-GW-2BG-BEDMW003-01A and the Mercury detect in sample PBOW-05-GW-2BG-BEDMW001-01A were less than five times the blank value

and qualified as undetected ("U").

4.4 DATA SENSITIVITY

The samples included in this evaluation had high analyte concentrations and/or matrix interferences forcing initial sample dilutions to be performed for the VOC, PAH, nitroaromatic, and PCB analyses. Therefore, non-detect sample data are impacted by a decrease in sensitivity and elevated detection limits that accompany diluted samples. The laboratories reported target analytes to the Method Detection Level (MDL) to achieve maximum sensitivity and to meet as many of the Region IX preliminary remediation goals and data quality objectives detailed in the project QAPP as possible. Analytes detected above the MDL but below the Method Reporting Limit (MRL) are "J" qualified to indicate the result is estimated and does have less certainty than a result greater than the MRL.

4.5 DATA COMPLETENESS

Data completeness was found to be 100% for all analyses and all analytes with the exception of the VOC analyte Trichlorotrifluoroethane. The VOC analyte Trichlorotrifluoroethane was rejected in all three groundwater samples and the associated trip blank due to a calibration outlier. The project completeness goal of 95% was met for all analytes except Trichlorotrifluoroethane. Overall the data were found to be complete and acceptable for the intended data usages as qualified. The one VOC rejected data point must be considered when evaluating the data for risk or remedial type decisions.

ATTACHMENT 1

SAMPLE INFORMATION TABLES

Plum Brook Ordnance Works 2BG Round 1 Groundwater Cross Reference Table

Sample Date	Sample Time	Matrix	Location	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
1/28/2005	14:50	WG	2BG-BED-MW01	PBOW-05-GW-2BG-BEDMW001-01A	ECEN	0502003-01A	N1	0502003-ecen	SW8082
1/28/2005	14:50	WG	2BG-BED-MW01	PBOW-05-GW-2BG-BEDMW001-01A	GEL	129791001	N1	129791-gel	SW6020, SW7470A, SW8260, SW8330
1/28/2005	16:30	WQ	FIELDQC	PBOW-05-TB-012805-02	GEL	129791004	TB1	129791-gel	SW8260
1/31/2005	13:30	WG	2BG-BED-MW02	PBOW-05-GW-2BG-BEDMW002-01A	ECEN	0502003-02A	N1	0502003-ecen	SW8082
1/31/2005	13:30	WG	2BG-BED-MW02	PBOW-05-GW-2BG-BEDMW002-01A	GEL	129791002	N1	129791-gel	E130.2, E160.1, E160.2, E180.1, E300.0, E310.1, SW6020, SW7470A, SW8260, SW8330, SW9012
1/31/2005	14:30	WG	2BG-BED-MW03	PBOW-05-GW-2BG-BEDMW003-01A	ECEN	0502003-03A	N1	0502003-ecen	SW8082, SW8310
1/31/2005	14:30	WG	2BG-BED-MW03	PBOW-05-GW-2BG-BEDMW003-01A	GEL	129791003	N1	129791-gel	E130.2, E160.1, E160.2, E180.1, E300.0, E310.1, SW6020, SW7470A, SW8260, SW8330, SW9012

ATTACHMENT 2

TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Plum Brook
2005 Groundwater Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW001-01A 2BG-BED-MW01 01/28/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ	PBOW-05-GW-2BG-BEDMW002-01A 2BG-BED-MW02 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Wet Chemistry									
Alkalinity, Total (as CaCO3)	E310.1	457			mg/L			72.7	
Chloride (as Cl)	E300.0	1810			mg/L			1810	
Cyanide	SW9012	290		73	ug/L			**290**	
Hardness (as CACO3)	E130.2	1440			mg/L			1440	
Nitrate	E300.0	137			ug/L			137	
Sulfate (as SO4)	E300.0	78			mg/L			78	
Suspended Solids (residue, Non-filterable)	E160.2	109000			mg/L			109000	
Total Dissolved Solids	E160.1	3310			mg/L			3310	
Turbidity	E180.1	1910			NTU			1910	
Explosives									
1,3,5-Trinitrobenzene	SW8330			110	ug/L	16.2	U	16.2	U
1,3-Dinitrobenzene	SW8330			0.36	ug/L	16.2	U	16.2	U
2,4,6-Trinitrotoluene	SW8330			2.2	ug/L	8.12	U	8.12	U
2,4-Dinitrotoluene	SW8330			7.3	ug/L	16.2	U	16.2	U
2,6-Dinitrotoluene	SW8330			3.6	ug/L	9.09	U	9.09	U
2-Amino-4,6-Dinitrotoluene	SW8330				ug/L	16.2	U	16.2	U
2-Nitrotoluene	SW8330			0.049	ug/L	8.12	U	8.12	U
3-Nitrotoluene	SW8330			12	ug/L	16.2	U	16.2	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/L	8.12	U	8.12	U
4-Nitrotoluene	SW8330			0.66	ug/L	16.2	U	16.2	U
HMX	SW8330			180	ug/L	8.12	U	8.12	U
Nitrobenzene	SW8330			0.34	ug/L	8.12	U	8.12	U
RDX	SW8330			0.61	ug/L	8.12	U	8.12	U
Tetryl	SW8330			36	ug/L	24.4	U	24.4	U
Metals									
Aluminum (total)	SW6020	11600	309	3600	ug/L	**11600**		**6820**	
Antimony (total)	SW6020	3		1.5	ug/L	**2.6**		**3**	
Arsenic (total)	SW6020	221	7.4	0.045	ug/L	**221**		**45.3**	
Barium (total)	SW6020	842	11800	260	ug/L	286		340	
Beryllium (total)	SW6020	0.76		7.3	ug/L	0.76		0.44	
Cadmium (total)	SW6020	1.4		1.8	ug/L	1.4	J	0.24	J
Calcium (total)	SW6020	743000	316000		ug/L	**743000**		**699000**	
Chromium (total)	SW6020	31.7			ug/L	31.7		20	
Cobalt (total)	SW6020	9.9	12.1	73	ug/L	9.9		6.7	
Copper (total)	SW6020	17.7	19.8	150	ug/L	17.7		13.7	
Iron (total)	SW6020	27300	1550	1100	ug/L	**27300**		**14900**	
Lead (total)	SW6020	17.9			ug/L	17.9		12.5	
Magnesium (total)	SW6020	263000	217000		ug/L	118000		**263000**	

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW001-01A 2BG-BED-MW01 01/28/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ	PBOW-05-GW-2BG-BEDMW002-01A 2BG-BED-MW02 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Manganese (total)	SW6020	1020	636	88	ug/L	**1020**		**678**	
Nickel (total)	SW6020	36.5	8.6	73	ug/L	36.5		27.9	
Potassium (total)	SW6020	56400	116000		ug/L	40500		56400	
Silver (total)	SW6020	0.13		18	ug/L	0.13	J	0.082	J
Sodium (total)	SW6020	785000	1390000		ug/L	380000		785000	
Thallium (total)	SW6020	2.3		0.24	ug/L	**2.3**	J	**0.36**	J
Vanadium (total)	SW6020	22.4			ug/L	22.4		8.9	J
Zinc (total)	SW6020	47.2	507	1100	ug/L	47.2	J	30.4	J
Polyaromatic Hydrocarbon (PAH) Compounds									
Acenaphthene	SW8310	535		37	ug/L				
Acenaphthylene	SW8310	26.2			ug/L				
Anthracene	SW8310	3.24		180	ug/L				
Benzo(a)anthracene	SW8310	0.283		0.092	ug/L				
Benzo(a)pyrene	SW8310			0.0092	ug/L				
Benzo(b)fluoranthene	SW8310			0.092	ug/L				
Benzo(g,h,i)perylene	SW8310				ug/L				
Benzo(k)fluoranthene	SW8310			0.92	ug/L				
Chrysene	SW8310			9.2	ug/L				
Dibenz(a,h)anthracene	SW8310			0.0092	ug/L				
Fluoranthene	SW8310	1.65		150	ug/L				
Fluorene	SW8310			24	ug/L				
Indeno(1,2,3-cd)pyrene	SW8310			0.092	ug/L				
Naphthalene	SW8310	8.87		0.62	ug/L				
Phenanthrene	SW8310	1.86			ug/L				
Pyrene	SW8310	2.34		18	ug/L				
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	SW8082			0.96	ug/L	3.37	U	0.666	UJ
PCB-1221 (Aroclor 1221)	SW8082			3.40E-02	ug/L	10	U	1.98	UJ
PCB-1232 (Aroclor 1232)	SW8082			3.40E-02	ug/L	4.87	U	0.964	UJ
PCB-1242 (Aroclor 1242)	SW8082			3.40E-02	ug/L	7.4	U	1.47	UJ
PCB-1248 (Aroclor 1248)	SW8082			3.40E-02	ug/L	9.95	U	1.97	UJ
PCB-1254 (Aroclor 1254)	SW8082			0.034	ug/L	1.49	U	0.295	UJ
PCB-1260 (Aroclor 1260)	SW8082			3.40E-02	ug/L	1.51	U	0.299	UJ
Volatile Organic Compounds									
1,1,1-Trichloroethane	SW8260			320	ug/L	1.7	U	17	U
1,1,2,2-Tetrachloroethane	SW8260			0.055	ug/L	2.45	U	24.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			5900	ug/L		UR		UR
1,1,2-Trichloroethane	SW8260			0.2	ug/L	2.2	U	22	U
1,1-Dichloroethane	SW8260			81	ug/L	2.05	U	20.5	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW001-01A 2BG-BED-MW01 01/28/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ	PBOW-05-GW-2BG-BEDMW002-01A 2BG-BED-MW02 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
1,1-Dichloroethene	SW8260			34	ug/L	2.05	U	20.5	U
1,2,3-Trichlorobenzene	SW8260				ug/L	1.6	U	16	U
1,2,4-Trichlorobenzene	SW8260			0.72	ug/L	2.1	U	21	U
1,2-Dibromo-3-chloropropane	SW8260			0.048	ug/L	3.75	U	37.5	U
1,2-Dibromoethane (EDB)	SW8260			0.0056	ug/L	1.25	U	12.5	U
1,2-Dichlorobenzene	SW8260			37	ug/L	1.8	U	18	U
1,2-Dichloroethane	SW8260			0.12	ug/L	1.45	U	14.5	U
1,2-Dichloropropane	SW8260			0.16	ug/L	1.25	U	12.5	U
1,3-Dichlorobenzene	SW8260			18	ug/L	1.65	U	16.5	U
1,4-Dichlorobenzene	SW8260			0.5	ug/L	1.25	U	12.5	U
2-Butanone (Methyl ethyl ketone)	SW8260			700	ug/L	11.6	UJ	116	UJ
2-Hexanone	SW8260				ug/L	7.25	U	72.5	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			200	ug/L	8.9	U	89	U
Acetone	SW8260	518		550	ug/L	27.4		473	
Benzene	SW8260	2460	2.4	0.35	ug/L	1.65	U	**2460**	
Bromochloromethane	SW8260				ug/L	2.5	U	25	U
Bromodichloromethane	SW8260			0.18	ug/L	1.9	U	19	U
Bromoform	SW8260			8.5	ug/L	2.5	U	25	U
Bromomethane	SW8260			0.87	ug/L	2.5	U	25	U
Carbon Disulfide	SW8260	234		100	ug/L	**146**		**234**	J
Carbon tetrachloride	SW8260			0.17	ug/L	1.45	U	14.5	U
Chlorobenzene	SW8260			11	ug/L	1.6	U	16	U
Chloroethane	SW8260			4.6	ug/L	2.5	U	25	U
Chloroform	SW8260			0.17	ug/L	1.8	U	18	U
Chloromethane	SW8260	54		16	ug/L	**54**		25	U
Cyclohexane	SW8260	683		1000	ug/L	295		683	
Dibromochloromethane	SW8260			0.13	ug/L	1.45	U	14.5	U
Dichlorodifluoromethane	SW8260			39	ug/L	2.15	U	21.5	U
Ethylbenzene	SW8260	137	0.87	130	ug/L	9.6		**137**	
Isopropylbenzene (Cumene)	SW8260	37.1		66	ug/L	5.1		37.1	J
Methyl Acetate	SW8260			610	ug/L	7.25	U	72.5	U
Methylcyclohexane	SW8260	337		520	ug/L	132		337	
Methylene Chloride	SW8260			4.3	ug/L	9.5	U	95	U
Styrene	SW8260			160	ug/L	1.25	U	12.5	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			11	ug/L	1.6	U	16	U
Tetrachloroethene (PCE)	SW8260			0.1	ug/L	1.65	U	16.5	U
Toluene	SW8260	403	1.7	72	ug/L	17.6		**403**	
Trichloroethene (TCE)	SW8260			0.028	ug/L	1.8	U	18	U
Trichlorofluoromethane	SW8260			130	ug/L	2.5	U	25	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW001-01A 2BG-BED-MW01 01/28/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ	PBOW-05-GW-2BG-BEDMW002-01A 2BG-BED-MW02 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Vinyl chloride	SW8260			0.02	ug/L	2.75	U	27.5	U
Xylenes, Total	SW8260	1610	5.5	21	ug/L	**145**		**1610**	
cis-1,2-Dichloroethene	SW8260			6.1	ug/L	1.5	U	15	U
cis-1,3-Dichloropropene	SW8260				ug/L	1.5	U	15	U
m,p-Xylene (sum of isomers)	SW8260	1160			ug/L	115		1160	
o-Xylene (1,2-Dimethylbenzene)	SW8260	454			ug/L	29.9		454	
trans-1,2-Dichloroethene	SW8260			12	ug/L	1.85	U	18.5	U
trans-1,3-Dichloropropene	SW8260				ug/L	1.45	U	14.5	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num Location Date Depth Units	PBOW-05-GW-2BG-BEDMW003-01A 2BG-BED-MW03 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Wet Chemistry							
Alkalinity, Total (as CaCO3)	E310.1	457			mg/L	457	
Chloride (as Cl)	E300.0	1810			mg/L	1420	
Cyanide	SW9012	290		73	ug/L	1.72	U
Hardness (as CACO3)	E130.2	1440			mg/L	936	
Nitrate	E300.0	137			ug/L	34.1	U
Sulfate (as SO4)	E300.0	78			mg/L	45.3	
Suspended Solids (residue, Non-filterable)	E160.2	109000			mg/L	298	
Total Dissolved Solids	E160.1	3310			mg/L	2870	
Turbidity	E180.1	1910			NTU	101	
Explosives							
1,3,5-Trinitrobenzene	SW8330			110	ug/L	16.2	U
1,3-Dinitrobenzene	SW8330			0.36	ug/L	16.2	U
2,4,6-Trinitrotoluene	SW8330			2.2	ug/L	8.12	U
2,4-Dinitrotoluene	SW8330			7.3	ug/L	16.2	U
2,6-Dinitrotoluene	SW8330			3.6	ug/L	9.09	U
2-Amino-4,6-Dinitrotoluene	SW8330				ug/L	16.2	U
2-Nitrotoluene	SW8330			0.049	ug/L	8.12	U
3-Nitrotoluene	SW8330			12	ug/L	16.2	U
4-Amino-2,6-Dinitrotoluene	SW8330				ug/L	8.12	U
4-Nitrotoluene	SW8330			0.66	ug/L	16.2	U
HMX	SW8330			180	ug/L	8.12	U
Nitrobenzene	SW8330			0.34	ug/L	8.12	U
RDX	SW8330			0.61	ug/L	8.12	U
Tetryl	SW8330			36	ug/L	24.4	U
Metals							
Aluminum (total)	SW6020	11600	309	3600	ug/L	1290	
Antimony (total)	SW6020	3		1.5	ug/L	**2**	**J**
Arsenic (total)	SW6020	221	7.4	0.045	ug/L	**72.6**	
Barium (total)	SW6020	842	11800	260	ug/L	842	
Beryllium (total)	SW6020	0.76		7.3	ug/L	0.085	J
Cadmium (total)	SW6020	1.4		1.8	ug/L	0.04	U
Calcium (total)	SW6020	743000	316000		ug/L	237000	
Chromium (total)	SW6020	31.7			ug/L	0.38	U
Cobalt (total)	SW6020	9.9	12.1	73	ug/L	2.6	
Copper (total)	SW6020	17.7	19.8	150	ug/L	4	
Iron (total)	SW6020	27300	1550	1100	ug/L	**3590**	
Lead (total)	SW6020	17.9			ug/L	2.9	J
Magnesium (total)	SW6020	263000	217000		ug/L	163000	

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW003-01A 2BG-BED-MW03 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Manganese (total)	SW6020	1020	636	88	ug/L	409	
Nickel (total)	SW6020	36.5	8.6	73	ug/L	11.1	
Potassium (total)	SW6020	56400	116000		ug/L	50100	
Silver (total)	SW6020	0.13		18	ug/L	0.04	U
Sodium (total)	SW6020	785000	1390000		ug/L	706000	
Thallium (total)	SW6020	2.3		0.24	ug/L	0.1	U
Vanadium (total)	SW6020	22.4			ug/L	5.44	U
Zinc (total)	SW6020	47.2	507	1100	ug/L	11.3	J
Polyaromatic Hydrocarbon (PAH) Compounds							
Acenaphthene	SW8310	535		37	ug/L	**535**	**NJ**
Acenaphthylene	SW8310	26.2			ug/L	26.2	NJ
Anthracene	SW8310	3.24		180	ug/L	3.24	NJ
Benzo(a)anthracene	SW8310	0.293		0.092	ug/L	**0.293**	**NJ**
Benzo(a)pyrene	SW8310			0.0092	ug/L	0.509	U
Benzo(b)fluoranthene	SW8310			0.092	ug/L	0.575	U
Benzo(g,h,i)perylene	SW8310				ug/L	3.48	U
Benzo(k)fluoranthene	SW8310			0.92	ug/L	0.184	U
Chrysene	SW8310			9.2	ug/L	0.35	U
Dibenz(a,h)anthracene	SW8310			0.0092	ug/L	1.47	U
Fluoranthene	SW8310	1.65		150	ug/L	1.65	NJ
Fluorene	SW8310			24	ug/L	2.21	UJ
Indeno(1,2,3-cd)pyrene	SW8310			0.092	ug/L	1.64	U
Naphthalene	SW8310	8.87		0.62	ug/L	**8.87**	**NJ**
Phenanthrene	SW8310	1.86			ug/L	1.86	NJ
Pyrene	SW8310	2.34		18	ug/L	2.34	NJ
Polychlorinated Biphenyls (PCBs)							
PCB-1016 (Aroclor 1016)	SW8082			0.96	ug/L	0.647	UJ
PCB-1221 (Aroclor 1221)	SW8082			3.40E-02	ug/L	1.92	UJ
PCB-1232 (Aroclor 1232)	SW8082			3.40E-02	ug/L	0.937	UJ
PCB-1242 (Aroclor 1242)	SW8082			3.40E-02	ug/L	1.42	UJ
PCB-1248 (Aroclor 1248)	SW8082			3.40E-02	ug/L	1.91	UJ
PCB-1254 (Aroclor 1254)	SW8082			0.034	ug/L	0.267	UJ
PCB-1260 (Aroclor 1260)	SW8082			3.40E-02	ug/L	0.29	UJ
Volatile Organic Compounds							
1,1,1-Trichloroethane	SW8260			320	ug/L	17	U
1,1,2,2-Tetrachloroethane	SW8260			0.055	ug/L	24.5	U
1,1,2-Trichloro-1,2,2-Trifluoroethane	SW8260			5900	ug/L		UR
1,1,2-Trichloroethane	SW8260			0.2	ug/L	22	U
1,1-Dichloroethane	SW8260			81	ug/L	20.5	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num Location Date Depth Units	PBOW-05-GW-2BG-BEDMW003-01A 2BG-BED-MW03 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
1,1-Dichloroethene	SW8260			34	ug/L	20.5	U
1,2,3-Trichlorobenzene	SW8260				ug/L	16	U
1,2,4-Trichlorobenzene	SW8260			0.72	ug/L	21	U
1,2-Dibromo-3-chloropropane	SW8260			0.048	ug/L	37.5	U
1,2-Dibromoethane (EDB)	SW8260			0.0056	ug/L	12.5	U
1,2-Dichlorobenzene	SW8260			37	ug/L	18	U
1,2-Dichloroethane	SW8260			0.12	ug/L	14.5	U
1,2-Dichloropropane	SW8260			0.16	ug/L	12.5	U
1,3-Dichlorobenzene	SW8260			18	ug/L	16.5	U
1,4-Dichlorobenzene	SW8260			0.5	ug/L	12.5	U
2-Butanone (Methyl ethyl ketone)	SW8260			700	ug/L	116	UJ
2-Hexanone	SW8260				ug/L	72.5	U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260			200	ug/L	89	U
Acetone	SW8260	518		550	ug/L	518	
Benzene	SW8260	2460	2.4	0.35	ug/L	**1510**	
Bromochloromethane	SW8260				ug/L	25	U
Bromodichloromethane	SW8260			0.18	ug/L	19	U
Bromoform	SW8260			8.5	ug/L	25	U
Bromomethane	SW8260			0.87	ug/L	25	U
Carbon Disulfide	SW8260	234		100	ug/L	**171**	J
Carbon tetrachloride	SW8260			0.17	ug/L	14.5	U
Chlorobenzene	SW8260			11	ug/L	16	U
Chloroethane	SW8260			4.6	ug/L	25	U
Chloroform	SW8260			0.17	ug/L	18	U
Chloromethane	SW8260	54		16	ug/L	25	U
Cyclohexane	SW8260	683		1000	ug/L	627	
Dibromochloromethane	SW8260			0.13	ug/L	14.5	U
Dichlorodifluoromethane	SW8260			39	ug/L	21.5	U
Ethylbenzene	SW8260	137	0.67	130	ug/L	110	
Isopropylbenzene (Cumene)	SW8260	37.1		66	ug/L	34	J
Methyl Acetate	SW8260			610	ug/L	72.5	U
Methylcyclohexane	SW8260	337		520	ug/L	259	
Methylene Chloride	SW8260			4.3	ug/L	95	U
Styrene	SW8260			160	ug/L	12.5	U
Tert-Butyl Methyl Ether (MTBE)	SW8260			11	ug/L	16	U
Tetrachloroethene (PCE)	SW8260			0.1	ug/L	16.5	U
Toluene	SW8260	403	1.7	72	ug/L	**323**	
Trichloroethene (TCE)	SW8260			0.028	ug/L	18	U
Trichlorofluoromethane	SW8260			130	ug/L	25	U

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Tap Water PRG	Samp. Num. Location Date Depth Units	PBOW-05-GW-2BG-BEDMW003-01A 2BG-BED-MW03 01/31/2005 0.0-0.0 ft. WG RESULT / QUAL	VQ
Vinyl chloride	SW8260			0.02	ug/L	27.5	U
Xylenes, Total	SW8260	1610	5.5	21	ug/L	**1390**	
cis-1,2-Dichloroethene	SW8260			6.1	ug/L	15	U
cis-1,3-Dichloropropene	SW8260				ug/L	15	U
m,p-Xylene (sum of isomers)	SW8260	1160			ug/L	968	
o-Xylene (1,2-Dimethylbenzene)	SW8260	454			ug/L	426	
trans-1,2-Dichloroethene	SW8260			12	ug/L	18.5	U
trans-1,3-Dichloropropene	SW8260				ug/L	14.5	U

Plum Brook

Trip Blank Associated with Jan 2005 Groundwater

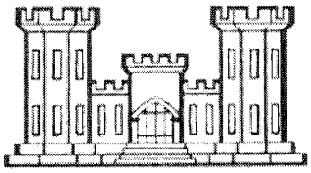
METHOD	ANALYTE	SAMP. NUM DATE UNITS	PBOW-05-TB-012805-02 01/28/2005 RESULT / QUAL	VQ
	Volatile Organic Compounds			
SW8260	1,1,1-Trichloroethane	ug/L	0.34	U
SW8260	1,1,2,2-Tetrachloroethane	ug/L	0.49	U
SW8260	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L		UR
SW8260	1,1,2-Trichloroethane	ug/L	0.44	U
SW8260	1,1-Dichloroethane	ug/L	0.41	U
SW8260	1,1-Dichloroethene	ug/L	0.41	U
SW8260	1,2,3-Trichlorobenzene	ug/L	0.32	U
SW8260	1,2,4-Trichlorobenzene	ug/L	0.42	U
SW8260	1,2-Dibromo-3-chloropropane	ug/L	0.75	U
SW8260	1,2-Dibromoethane (EDB)	ug/L	0.25	U
SW8260	1,2-Dichlorobenzene	ug/L	0.36	U
SW8260	1,2-Dichloroethane	ug/L	0.29	U
SW8260	1,2-Dichloropropane	ug/L	0.25	U
SW8260	1,3-Dichlorobenzene	ug/L	0.33	U
SW8260	1,4-Dichlorobenzene	ug/L	0.25	U
SW5260	2-Butanone (Methyl ethyl ketone)	ug/L	2.31	UJ
SW8260	2-Hexanone	ug/L	1.45	U
SW8260	4-Methyl-2-pentanone (Methyl isobutyl ketone)	ug/L	1.78	U
SW8260	Acetone	ug/L	2.29	U
SW8260	Benzene	ug/L	0.33	U
SW8260	Bromochloromethane	ug/L	0.5	U
SW8260	Bromodichloromethane	ug/L	0.38	U
SW8260	Bromoform	ug/L	0.5	U
SW8260	Bromomethane	ug/L	0.5	U
SW8260	Carbon Disulfide	ug/L	4.8	J
SW8260	Carbon tetrachloride	ug/L	0.29	U
SW8260	Chlorobenzene	ug/L	0.32	U
SW8260	Chloroethane	ug/L	0.5	U
SW8260	Chloroform	ug/L	1.6	
SW8260	Chloromethane	ug/L	0.5	U
SW8260	Cyclohexane	ug/L	0.33	U
SW8260	Dibromochloromethane	ug/L	0.29	U
SW5260	Dichlorodifluoromethane	ug/L	0.43	U
SW8260	Ethylbenzene	ug/L	0.21	U
SW8260	Isopropylbenzene (Cumene)	ug/L	0.29	U
SW8260	Methyl Acetate	ug/L	1.45	U
SW8260	Methylcyclohexane	ug/L	0.34	U
SW8260	Methylene Chloride	ug/L	1.9	U
SW8260	Styrene	ug/L	0.25	U
SW8260	Tert-Butyl Methyl Ether (MTBE)	ug/L	0.32	U
SW8260	Tetrachloroethene (PCE)	ug/L	0.35	U
SW8260	Toluene	ug/L	0.39	U
SW8260	Trichloroethene (TCE)	ug/L	0.36	U
SW8260	Trichlorofluoromethane	ug/L	0.5	U
SW8260	Vinyl chloride	ug/L	0.55	U
SW8260	Xylenes, Total	ug/L	0.25	U
SW8260	cis-1,2-Dichloroethene	ug/L	0.3	U
SW8260	cis-1,3-Dichloropropene	ug/L	0.3	U
SW8260	trans-1,2-Dichloroethene	ug/L	0.37	U
SW8260	trans-1,3-Dichloropropene	ug/L	0.29	U

CHEMICAL DATA QUALITY REPORT

ADDITIONAL SOIL DATA FOR THE REMEDIAL INVESTIGATION, PART 1, RESERVOIR NUMBER 2 BURNING GROUND (2BG)

FORMER PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO

Prepared for:



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0002

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June 2005

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ATTACHMENT 1 SAMPLE INFORMATION TABLES

ATTACHMENT 2 TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Abbreviations and Acronyms

C	Celsius
CDQR	Chemical Data Quality Report
CLP	USEPA Contract Laboratory Program
COC	Chain of Custody
CQAR	Chemical Quality Assurance Report
%D	Percent Difference
DQO	Data Quality Objectives
GC	Gas Chromatograph or Gas Chromatography
HTRW-CX	Hazardous, Toxic, and Radioactive Waste - Center of Expertise
Jacobs	Jacobs Engineering Group Inc
LCS	Laboratory Control Sample
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not Detected
PAH	Polynuclear Aromatic Hydrocarbon Compounds
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl Compounds
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
%R	Percent Recovery
RL	Reporting Level
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SD	Serial Dilution QC sample
SDG	Sample Delivery Group
SW-846	Solid Waste Analytical Protocols
TAL	Target Analyte List
TB	Trip Blank
TCL	Target Compound List
TOC	Total Organic Carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This Chemical Data Quality Report (CDQR) presents an evaluation of the quality and usability of the additional soil sampling analytical data generated in support of the remedial investigation at Reservoir Number 2 Burning Ground (2BG) at the former Plum Brook Ordnance Works (PBOW). Jacobs Engineering (Jacobs) performed this remedial investigation for the United States Army Corps of Engineers (USACE) Nashville District under contract number DACW62-03-D-0004, task order 0002.

Both primary and quality assurance (QA) environmental samples were collected by Jacobs and were submitted to approved laboratories for chemical analyses. Jacobs provided data quality evaluation services for the primary data, and Stratum Engineering, Inc. was subcontracted to evaluate the QA data and prepare the subsequent Chemical Quality Assurance report (CQAR). This CDQR covers Jacobs' evaluation of the primary data.

This evaluation meets and completes the requirement of Step 2 "data verification" of the project data quality assessment (DQA) process. Completion of this step completes Jacob's portion of the requirement in the DQA process. A description of the DQA process is included in Section 8.2.2 of the approved Quality Assurance Project Plan (QAPP). As specified in the QAPP, the findings of this evaluation were discussed in terms of data precision, accuracy, representativeness, sensitivity and completeness.

1.1 REPORT ORGANIZATION

The CDQR has been organized into four sections and two attachments:

- Section 1 - Report organization and data quality program including: analytical laboratory used, analytical samples included in the evaluation, analytical protocols/methods employed, data evaluation procedures followed, and summary of data reporting formats.
- Section 2 - Definitions of qualifiers that may be assigned to data based on this evaluation.
- Section 3 - Statement of the project overall data quality and summary of qualifiers applied to the data as a result of this evaluation.
- Section 4 - Data quality narratives.
- Attachment 1 - Sample information tables including field and laboratory ID cross-reference.
- Attachment 2 - Test result tables with review qualifiers applied.

1.2 DATA QUALITY ASSURANCE PROGRAM

In order to verify compliance with project objectives, it was required that certain measurements of chemical constituents in environmental samples be made that met definitive data quality standards. This CDQR is applicable to those data.

Definitive data standards are specified by the USEPA in *"Data Quality Objectives Process for Superfund,"* EPA540-R-93-071, USEPA Office of Emergency and Remedial Response, September 1993. Definitive data are defined as follows:

> "Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may

be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined."

Specific project data quality objectives (DQOs) and procedures to achieve the DQOs are documented in the approved project Sampling and Analysis Plan Addendum (SAP). Key elements of the quality program relating to this evaluation include:

- Use of approved, USACE-validated laboratories.
- Use of a sampling program designed to meet the project objectives.
- Use of appropriate analytical methods and measurement parameters.
- Evaluation of reported QA/QC to verify compliance with DQOs.
- Use of appropriate analytical data reporting formats.

These elements are discussed in the following paragraphs.

1.2.1 Project Analytical Laboratories

The analytical laboratories employed on this project were evaluated by the USACE Hazardous, Toxic and Radioactive Waste Center of Expertise (HTRW-CX) and hold a current letters of validation from HTRW-CX to perform sample analyses in support of the USACE HTRW Program. This validation confirms their ability to produce reliable and defensible data. The primary analytical laboratory used was:

ELAB of Tennessee (ELAB)
Contact: Marcia McGinnity, Project Manager (PM)
227 French Landing Drive
Suite 550
Nashville, TN 37228
Phone: (615) 345-1115

1.2.2 Sampling Program Design/Project Samples

The sampling program was designed to collect samples representative of site conditions at the time of sampling and to generate data of sufficient quality and quantity to make the intended decisions. Project analytical samples were collected using standardized, USACE approved procedures documented in the sampling and analysis plan (SAP). The SAP was approved by the USACE prior to collection of the associated project samples and included the basis for selecting the sampling locations, sample collection procedures, frequency and type of samples collected, and the analytical parameters for each sample. There were no known deviations to the sample collection procedures presented in the SAP.

Definitive data measurements were required for the samples collected in support of this investigation. The investigation utilized the EPA Target Analyte List/Target Compound List (TAL/TCL) of analytes as the constituents of concern. The rationale for required analytical measurements and resulting data use is specified in the project QAPP.

Project samples included in this evaluation consist of ten soil samples, and the associated field duplicate collected in April of 2005. ELAB reported the analyses in a single sample delivery group (SDG). The SDG included in this evaluation is:

ELAB SDG # PLUMBROOK S001

A listing of specific project samples contained in the SDG, along with a cross reference of sample field ID numbers to laboratory ID numbers, is included with this report as Attachment 1.

1.2.3 Project Analytical Methods and Measurement Parameters

In order to obtain definitive data and promote data comparability, the laboratory was required to perform testing within the guidelines of standardized, USEPA and USACE approved methods and procedures included in the following protocols:

- *"Test Methods for Evaluating Solid Waste,"* SW-846, 3rd Edition, Update III, U.S. EPA, November 1986, (SW-846).
- "*Shell for Analytical Chemistry Requirements*," Appendix I, from EM 200-1-3 "*Requirements for the Preparation of Sampling and Analysis Plans*" USACE HTRW-CX, February 2001.

The project included collection of definitive data for all soil samples for all measurement parameters. Specific analytical methods used in the analysis of each project sample were included in the laboratory case narrative and are summarized below for the additional soil sampling event.

Additional Soil Samples

- Polynuclear aromatic hydrocarbons (PAHs) by 3541/8270C
- Polychlorinated biphenyls (PCBs) by 3541/8082
- Nitroaromatics by SW-846 8330
- Total Lead 3050B/6010B

1.2.3.1 Deviations from Planned Analytical Procedures

The only deviation from the QAPP prescribed analytical methods was for the PAH and PCB soil preparatory method. The QAPP requires soxhlet extraction by SW-846 3540. ELAB requested permission to perform soxtherm extraction by SW-846 3541. This minor modification was approved in advance with Jacobs and the Nashville District Chemist. This modification to the preparatory method for PAHs and PCBs will not adversely affect data comparability with the initial 2BG soil data from the site.

1.2.4 Data Evaluation Procedure

The quality of this data set has been evaluated following the "data verification" procedure included in the QAPP as Step 2 of the five-step USACE DQA process. The procedure was derived from the USACE "*Shell for Analytical Chemistry Requirements*" and considers the project DQOs, QC requirements of the analytical methods, and informed professional judgment of the evaluator. Qualified Jacobs personnel, experienced in the evaluation of analytical data quality, performed data evaluation.

A brief description of the procedure followed in this evaluation is presented below.

Data Verification Procedure

At a minimum, the following data quality issues were addressed in this evaluation with respect to 100% of the sample data.

- Review of chain-of-custody and sample receipt forms to evaluate sample receipt data, damaged sample containers, etc.
- Review of laboratory testing methods, detection limits, holding times, data qualifiers, etc.
- Review of field QC blank data to detect contamination from outside sources.
- Review of field QC duplicates to evaluate data reproducibility.
- Review of laboratory QC including laboratory blanks, spike recoveries, and duplicates.
- Verification of calibrations as summarized by the laboratory on the CLP-like reporting forms and within their case narratives.
- Qualification of unusable data as rejected and attachment of appropriate qualifiers to usable data.
- Presentation of data evaluation findings in terms of the data quality parameters precision, accuracy, representativeness, sensitivity and completeness.

Data quality parameters were evaluated as follows:

- Precision - by evaluation of Matrix Spike/Matrix Spike Duplicate (MS/MSD), laboratory duplicate, and field duplicate relative percent differences (RPD).
- Accuracy - by evaluation of surrogate (SUR), Laboratory Control Sample (LCS), and MS/MSD percent recoveries (%R).
- Representativeness - by evaluation of sample receipt records, technical holding times, and blank sample results (field and laboratory).
- Sensitivity - by evaluation of laboratory detection limits, reporting units, and the overall performance of the chosen methods.
- Completeness - by comparing the number of valid measurements obtained to the number of measurements planned for these samples.

1.2.5 Data Reporting Formats

1.2.5.1 Laboratory Data Packages and Analytical Results

The laboratory reported field sample and supporting QC data in a format consistent with the USEPA Contract Laboratory Program (CLP) data reporting requirements. This "CLP-like" format included most applicable report summary forms and was sufficient to complete Step 2 of the DQA process. In a few cases the raw quantitation reports had to be reviewed to evaluate dilutions, manual integrations, and to check for proper quantitation.

The supplied reports did include chromatograms and other raw data that are necessary to complete a third party validation of the DQA process for all parameters of interest. However, third party validation is not currently planned for 2BG. Jacobs has supplied copies of the complete QA data packages and the associated primary sample data to Stratum Engineering to complete their assessment of the QA data and CQAR report.

The complete analytical data packages received from the project laboratories and evaluated in this review are available from Jacobs upon request from the CELRN.

1.2.5.2 Data Quality Non-Conformances

Data quality non-conformances identified as a result of this review are presented in Section 4.0, Data Quality Narratives. The data quality narratives are detailed explanations of the findings of this evaluation in terms of precision, accuracy, representativeness, sensitivity and completeness. They are intended to present a compilation of laboratory QC results found outside project acceptance criteria and provide an assessment of the potential impact those results had on the analytical data. Typically, the bulk of the project analytical protocol requirements are fulfilled and, therefore, are not summarized in the narratives.

Tabular presentations of the analytical sample results were included in each SDG. The respective laboratory test results tables were compiled into Data Summary Tables from the Electronic Data Deliverable (EDD) and were included with this report as Attachment 2. In addition, the validation qualifiers were applied to sample data to indicate data use limitations based on the findings of this evaluation.

2.0 DATA QUALIFIER DEFINITIONS

The following definitions provide explanations of the data qualifiers that may be assigned to results based on this evaluation. The data qualifier definitions are consistent with those used within the USEPA NFG referenced in Section 1.2.3 of this report.

U- The analyte was analyzed for but not detected (ND). The value preceding the U is the Contract Required Quantitation Limit (CRQL).

J- The identification of the analyte is acceptable, but the quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision (i.e. the quantitative value is considered estimated).

UJ- This flag is a combination of the U and J qualifiers. This indicates that the analyte is not present and the reported value is considered to be an estimated CRQL.

R- Data are considered to be rejected and shall not be used. This flag denotes the failure of quality control criteria such that it cannot be determined if the analyte is present or absent from the sample.

B- The B flag is to be used for both organic and inorganic analyses when the analyte is found in the associated blank as well as the in the sample. The result is considered ND, and the reported value is considered to be an estimated CRQL.

N- There is presumptive evidence that the analyte is present, but it has not been confirmed. The analyte is tentatively identified. There is an indication that the reported analyte is present, however, all quality control requirements necessary for confirmation were not met.

3.0 DATA EVALUATION SUMMARY

3.1 OVERALL ASSESSMENT OF PROJECT DATA QUALITY

In general, QA/QC results associated with this data indicated that the data met "definitive data" standards and were of known quality. QC data demonstrated that the QA mechanisms were effective in ensuring measurement data reliability within expected limits of sampling and analytical error and were considered, as qualified, representative of actual site conditions at the time sampled.

Data reported are acceptable for the uses as intended with the required qualifications and limitations. The data users are urged to review the Data Quality Narratives and associated data qualifications before utilizing this data for decision-making.

Summary of Required Data Qualifications

This section provides a summary of qualifiers applied to the data as a result of this evaluation. Attachment 2 includes tabular presentations of the analytical sample results with data qualifiers applied based on the findings of this evaluation. The data qualifier definitions applied during this review are presented in Section 2.0. Section 4.0, Data Quality Narratives, contains discussion of the evaluation findings along with an assessment of the impact on project data. Data qualified as estimated ("J") due to detection at a level below the laboratory quantitation limit but above the method detection limit were not included in this summary since they were not qualified due to QC non-conformance.

SDG ELAB PLUMBROOK S001

1. For the PAH (method 8270) analysis, three analytes failed marginally low in the LCS associated with all ten samples and the field duplicate. Benzo(g,h,i)perylene, Indeno(1,2,3-cd)pyrene, and Naphthalene were qualified as estimated ("J" for detects and "UJ" for non-detects) in all samples and the field duplicate due to marginally low biased LCS.
2. For the PAH (method 8270) analysis, all analytes in all ten samples and the filed duplicate were qualified as estimated ("J" for detects and "UJ" for non-detects) due to marginally low surrogate recoveries in ten of the samples and marginally low internal standard recoveries in four of the samples.
3. For the Nitroaromatic (method 8330) analysis, the LCS and MS recoveries of Tetryl were marginally low. The non-detect results for Tetryl were qualified as estimated ("UJ") in all ten samples and the filed duplicate due to the potential low bias for the analyte demonstrated by the marginal QC failures.
4. For the Nitroaromatic (method 8330) analysis, the confirmation column CCVs for Tetryl were marginally low. All samples were non-detect for Tetryl and already qualified as estimated due to the low ICS and MS. No further qualification was deemed necessary.
5. For the nitroaromatic (method 8330) analysis of sample PBOW-05-SO-2BG-BH25A, two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
6. For the nitroaromatic (method 8330) analysis of sample PBOW-05-SO-2BG-BH27A, one target analyte was qualified as estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
7. For the nitroaromatic (method 8330) analysis of sample PBOW-05-SO-2BG-BH33A, two target analytes were qualified as estimated detects ("J") due to exceedances to the precision criteria between the original and confirmation results.
8. For the nitroaromatic (method 8330) analysis of sample PBOW-05-SO-2BG-BH34A, one target analyte was qualified as estimated detect ("J") due to an exceedance to the precision

criteria between the original and confirmation results.

9. The PCB surrogate recoveries for one of the two surrogates (DCB) were high for the analysis of four soil samples. The other surrogate was acceptable for all samples. The high DCB recovery is likely attributed to the levels Aroclor 1260 and the irregular or weathered pattern noted by the laboratory present in the samples. The Aroclor 1260 detects in the four samples were qualified as estimated "J".
10. Two CCVs bracketing the PCB samples had low biased mean percent differences greater than 15% for Aroclor 1260. The CCVs that failed the criteria were for the confirmation analysis only. All CCVs for the primary column were acceptable. Since the results were reported from the primary column and the confirmation column was for qualitative purposes only, no qualification was necessary.
11. For the PCB (method 8082) analysis of sample PBOW-05-SO-2BG-BH26A, one target analyte (aroclor 1260) was qualified as estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
12. For the PCB (method 8082) analysis of sample PBOW-05-SO-2BG-BH27A, one target analyte (aroclor 1260) was qualified as estimated detect ("J") due to an exceedance to the precision criteria between the original and confirmation results.
13. For the metals (Lead by 6010B) analysis a low level CCV failed with a low bias for lead. However, the CCV did not bracket the project samples and had no adverse affect on data quality.

4.0 DATA QUALITY NARRATIVES

The findings of this data quality evaluation are presented below in terms of precision, accuracy, representativeness, sensitivity and completeness.

4.1 DATA PRECISION

4.1.1 Field QC Duplicate Precision Review

Project field duplicate precision indicators were found to be in control for each analytical method with no exceptions.

4.1.2 Laboratory Duplicate Precision Review

Project laboratory duplicate precision indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification.

Specific Findings:

1. The second column confirmation of the nitroaromatic results for four samples were found to exceed the RPD criteria of 40% for the several analytes. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analytes to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-05-SO-2BG-BH25A (0-0.5)	1,3-Dinitrobenzene	108%	J
	2-Nitrotoluene	74%	J
PBOW-05-SO-2BG-BH27A (0-0.5)	1,3,5-Trinitrobenzene	43%	J
PBOW-05-SO-2BG-BH33A (0-0.5)	HMX	151%	J
	2-Nitrotoluene	735%	J
PBOW-05-SO-2BG-BH34A (0-0.5)	2-Nitrotoluene	376%	J

2. The second column confirmation of the PCB results for two samples were found to exceed the RPD criteria of 40% for aroclor 1260. The outliers are detailed below in the table. The sample results were qualified as estimated ("J") for the detects of the analyte to indicate the potential imprecise measurement.

Sample ID	Analyte	RPD	Qualifier
PBOW-05-SO-2BG-BH26A (0-0.5)	Aroclor 1260	46.4%	J
PBOW-05-SO-2BG-BH27A (0-0.5)	Aroclor 1260	43.6%	J

4.2 DATA ACCURACY

4.2.1 Data Accuracy Indicators Review

Project accuracy indicators were found to be in control for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine whether it had any impact on data use or resulted in data qualification. Instances where dilutions caused surrogate or spike recoveries to be diluted out (dilutions greater than 4X) are not discussed as findings if qualification was not deemed necessary.

Specific Findings:

1. The PAH analysis for four of the soil samples had marginally low internal standard recovery for IS#6, Perylene-d6. The PAH compounds in samples PBOW-05-SO-2BG-BH25A (0-0.5), PBOW-05-SO-2BG-BH27A (0-0.5), PBOW-05-SO-2BG-BH28A (0-0.5), and PBOW-05-SO-2BG-BH34A (0-0.5) were qualified as estimated ("J" for detects and "UJ" for non-detects).
2. The LCS associated with the PAH analysis of all the soil samples had marginally low biased recoveries for Benzo(g,h,i)perylene (59%), Indeno(1,2,3-cd)pyrene (57%), and Naphthalene (52%). The analytes were qualified as estimated ("J" for detects and "UJ" for non-detects) in all ten soil samples and the field duplicate to indicate the potential low bias demonstrated by the LCS.
3. The MS associated with the PAH analysis of all the soil samples had a marginally low biased recovery for Benzo(g,h,i)perylene (44%). The analyte was already qualified as estimated ("J" for detects and "UJ" for non-detects) in all ten soil samples and the field duplicate due to the low biased LCS. No further qualification necessary.
4. The PAH surrogate recoveries for the analysis of the ten soil samples and the field duplicate had at least one failing surrogate in all samples except one. Most of the samples had two surrogates marginally low biased. The outliers exceeded the USACE limits (60-120) but were within the laboratory's limits. The table below details the surrogate outliers and qualification for each of the samples.

Sample ID	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14	All PAH analytes qualified as:
PBOW-05-SO-2BG-BH26-A	57%	54%		J/UJ
PBOW-05-SO-2BG-BH26-D	52%	50%		J/UJ
PBOW-05-SO-2BG-BH29-A	50%	51%		J/UJ
PBOW-05-SO-2BG-BH30-A	53%	56%		J/UJ
PBOW-05-SO-2BG-BH31-A	53%	51%		J/UJ
PBOW-05-SO-2BG-BH32-A	45%	44%		J/UJ
PBOW-05-SO-2BG-BH33-A	44%	44%	55%	J/UJ
PBOW-05-SO-2BG-BH27-A	57%	56%		J/UJ
PBOW-05-SO-2BG-BH28-A	59%			J/UJ
PBOW-05-SO-2BG-BH34-A	55%	53%		J/UJ

5. The Nitroaromatic LCS and MS recovery for the analyte Tetryl associated with all ten soil samples and the field duplicate had marginally low biased recoveries (LCS 50%, MS 52%). The tetryl non-detect results in all samples were qualified as estimated "UJ".
6. The PCB surrogate recoveries for four samples recovered with a high bias for one of the two PCB surrogate compounds (DCB). The other surrogate (TCMX) was acceptable in all samples. Actually, many of the undiluted samples that were not used because dilutions were required, also had high biased surrogate recoveries for DCB. The high biased recoveries of the DCB surrogate are likely due to the levels of aroclor 1260 detected in the samples. The DCB surrogate recoveries and resulting qualification is detailed in the table below.

Sample ID	DCB Confirmation Column	DCB Primary Column	Used / Not Used?	Qualifier
PBOW-05-SO-2BG-BH25-A- (0-.5) DL	224%-D	273%-D	Used	J detects only
PBOW-05-SO-2BG-BH27-A- (0-.5) DL	144%-D	206%-D	Used	J detects only
PBOW-05-SO-2BG-BH33-A- (0-.5) DL		164%-D	Used	J detects only
PBOW-05-SO-2BG-BH34-A- (0-.5) DL		153%-D	Used	J detects only
PBOW-05-SO-2BG-BH25-A- (0-.5)	166%	192%	Not Used See dilution	None
PBOW-05-SO-2BG-BH27-A- (0-.5)	143%	189%	Not Used See dilution	None
PBOW-05-SO-2BG-BH29-A- (0-.5)		168%	Not Used See dilution	None
PBOW-05-SO-2BG-BH33-A- (0-.5)		165%	Not Used See dilution	None
PBOW-05-SO-2BG-BH34-A- (0-.5)		156%	Not Used See dilution	None

7. Two PCB CCVs bracketing the project samples for the confirmation column for aroclor 1260 failed with the percent difference criteria with a mean percent difference greater than 15%. One of the CCVs was low biased with a mean percent difference of 16.4%, and the other CCV was high biased at 27.5 percent difference. No qualification was assigned based on the confirmation column outliers since the results were reported from the primary column with acceptable QC. The confirmation column was used for confirmation of identity not quantitation; therefore, there is no adverse affect on data quality due to the confirmation column CCV outliers.

4.3 DATA REPRESENTATIVENESS

4.3.1 Sample Custody/Handling Documentation Review

The project samples were received at the laboratory adequately preserved, chilled within the required range of 4 ± 2 degrees Celsius, in good condition, and with required custody documentation in order.

4.3.2 Sample Holding Time Review

QC data indicated requirements for holding times were met for each sample analysis.

4.3.3 Blank Sample Results Review

QC data indicated requirements for blank sample results were met for each analytical method, with the exceptions noted below as Specific Findings. Each exception was evaluated to determine

whether it had any impact on data use or resulted in data qualification.

Specific Finding:

1. The VOC trip blank associated with the three groundwater samples contained a detect of Chloroform at 1.6 ug/L. All three associated samples were non-detect for Chloroform and there was no adverse affect on data quality.
2. The metals method blank had trace level detects of Chromium, Iron, Potassium, Selenium, Sodium, Thallium, and Mercury. Most of the blank detections did not affect the data quality due to the magnitude of the detects of the compounds in the samples. However, the Chromium detect in sample PBOW-05-GW-2BG-BEDMW003-01A and the Mercury detect in sample PBOW-05-GW-2BG-BEDMW003-01A were less than five times the blank value and qualified as undetected ("U").
3. The metals initial calibration and continuing calibration blanks contained trace levels of Antimony, Selenium, Thallium, and Mercury. Most of the blank detections did not affect the data quality due to the magnitude of the detects of the compounds in the samples. However, the Thallium detect in sample PBOW-05-GW-2BG-BEDMW003-01A and the Mercury detect in sample PBOW-05-GW-2BG-BEDMW001-01A were less than five times the blank value and qualified as undetected ("U").

4.4 DATA SENSITIVITY

The samples included in this evaluation did not require initial sample dilutions due to matrix interference or elevated target analyte concentrations. Secondary dilutions to quantitate elevated levels of PCBs were performed for several samples. However, all the samples were analyzed for PCBs initially undiluted, and both the undiluted and diluted results reported. Therefore, there are no instances of elevated reporting levels for non-detect data. The laboratories reported target analytes to the Method Detection Level (MDL) to achieve maximum sensitivity and to meet as many of the Region IX preliminary remediation goals and data quality objectives detailed in the project QAPP as possible. Analytes detected above the MDL but below the Method Reporting Limit (MRL) are "J" qualified to indicate the result is estimated and does have less certainty than a result greater than the MRL.

4.5 DATA COMPLETENESS

Data completeness was found to be 100% for all analyses and all analytes with no exceptions. The project completeness goal of 95% was met for all analytes. The data were found to be complete and acceptable for the intended data usages as qualified.

ATTACHMENT 1

SAMPLE INFORMATION TABLES

Plum Brook Ordnance Works 2BG Additional Soils Cross Reference Table

Sample Date	Sample Time	Matrix	Location	Field Sample ID	Lab Code	Lab Sample_id	Sample Type	SDG	Method(s)
4/22/2005	9:55	SO	BH25	PBOW-05-SO-2BG-BH25-A-(0-0.5)	ELAB	0504201-01DL	N1	plumbrooks001-	SW8082
4/22/2005	9:55	SO	BH25	PBOW-05-SO-2BG-BH25-A-(0-0.5)	ELAB	0504201-01	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	10:00	SO	BH26	PBOW-05-SO-2BG-BH26-A-(0-0.5)	ELAB	0504201-02	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	10:00	SO	BH26	PBOW-05-SO-2BG-BH26-D-(0-0.5)	ELAB	0504201-03	FD1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	10:20	SO	BH27	PBOW-05-SO-2BG-BH27-A-(0-0.5)	ELAB	0504201-04DL	N1	plumbrooks001-	SW8082
4/22/2005	10:20	SO	BH27	PBOW-05-SO-2BG-BH27-A-(0-0.5)	ELAB	0504201-04	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	10:40	SO	BH28	PBOW-05-SO-2BG-BH28-A-(0-0.5)	ELAB	0504201-05	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	10:50	SO	BH29	PBOW-05-SO-2BG-BH29-A-(0-0.5)	ELAB	0504201-06DL	N1	plumbrooks001-	SW8082
4/22/2005	10:50	SO	BH29	PBOW-05-SO-2BG-BH29-A-(0-0.5)	ELAB	0504201-06	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	11:15	SO	BH30	PBOW-05-SO-2BG-BH30-A-(0-0.5)	ELAB	0504201-07	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	11:30	SO	BH31	PBOW-05-SO-2BG-BH31-A-(0-0.5)	ELAB	0504201-08	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	11:45	SO	BH32	PBOW-05-SO-2BG-BH32-A-(0-0.5)	ELAB	0504201-09	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	13:00	SO	BH33	PBOW-05-SO-2BG-BH33-A-(0-0.5)	ELAB	0504201-10DL	N1	plumbrooks001-	SW8082
4/22/2005	13:00	SO	BH33	PBOW-05-SO-2BG-BH33-A-(0-0.5)	ELAB	0504201-10	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330
4/22/2005	13:15	SO	BH34	PBOW-05-SO-2BG-BH34-A-(0-0.5)	ELAB	0504201-11DL	N1	plumbrooks001-	SW8082
4/22/2005	13:15	SO	BH34	PBOW-05-SO-2BG-BH34-A-(0-0.5)	ELAB	0504201-11	N1	plumbrooks001-	SW6010B, SW8082, SW8270, SW8330

ATTACHMENT 2

TEST RESULT TABLES WITH REVIEW QUALIFIERS APPLIED

Plum Brook

2005 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num Location Date Depth Units	PBOW-05-SO-2BG-BH25-A-(0-0.5) BH25 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH26-A-(0-0.5) BH26 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH26-D-(0-0.5) BH26 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL
Explosives										
1,3,5-Trinitrobenzene	SW8330	740		180000	ug/Kg	740		100	U	77
1,3-Dinitrobenzene	SW8330	220		610	ug/Kg	220	J	100	U	77
2,4,6-Trinitrotoluene	SW8330	23000		16000	ug/Kg	**23000**		160	J	77
2,4-Dinitrotoluene	SW8330	4700		12000	ug/Kg	2900		130	U	100
2,6-Dinitrotoluene	SW8330	1300		6100	ug/Kg	1300		130	U	100
2-Amino-4,6-Dinitrotoluene	SW8330	4300			ug/Kg	4300		150	U	120
2-Nitrotoluene	SW8330	130		880	ug/Kg	130	J	100	U	77
3-Nitrotoluene	SW8330			73000	ug/Kg	87	U	100	U	77
4-Amino-2,6-Dinitrotoluene	SW8330	3300			ug/Kg	3300		100	U	77
4-Nitrotoluene	SW8330			12000	ug/Kg	130	U	150	U	120
HMX	SW8330	210		310000	ug/Kg	160	J	100	U	77
Nitrobenzene	SW8330			2000	ug/Kg	96	U	110	U	85
RDX	SW8330	540		4400	ug/Kg	270	J	100	U	77
Tetryl	SW8330			61000	ug/Kg	87	UJ	100	UJ	77
Metals										
Lead	SW6010B	590	48.6	40	mg/Kg	**590**		**55**		**68.3**
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	5.2	U	5.3	U	5.2
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	5.2	U	5.3	U	5.2
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	5.2	U	5.3	U	5.2
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	5.2	U	5.3	U	5.2
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	5.2	U	5.3	U	5.2
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	5.2	U	5.3	J	5.2
PCB-1260 (Aroclor 1260)	SW8082	3500		220	ug/Kg	**3500**	J	210		200
Semivolatile Organic Compounds										
2-Methylnaphthalene	SW8270	110			ug/Kg	110	J	26	UJ	25
Acenaphthene	SW8270			370000	ug/Kg	49	UJ	26	UJ	25
Acenaphthylene	SW8270				ug/Kg	49	UJ	26	UJ	25
Anthracene	SW8270			2200000	ug/Kg	49	UJ	26	UJ	25
Benzo(a)anthracene	SW8270	150		620	ug/Kg	87	J	26	UJ	25
Benzo(a)pyrene	SW8270	360		62	ug/Kg	**310**	J	26	UJ	25
Benzo(b)fluoranthene	SW8270	530		620	ug/Kg	420	J	26	UJ	25
Benzo(g,h,i)perylene	SW8270	270			ug/Kg	260	J	26	UJ	25
Benzo(k)fluoranthene	SW8270	370		6200	ug/Kg	220	J	26	UJ	25
Chrysene	SW8270	290		62000	ug/Kg	170	J	26	UJ	25
Dibenz(a,h)anthracene	SW8270			62	ug/Kg	49	UJ	26	UJ	25
Fluoranthene	SW8270	240		230000	ug/Kg	240	J	26	UJ	41
Fluorene	SW8270			270000	ug/Kg	49	UJ	26	UJ	25

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-05-SO-2BG-BH25-A-(0-0.5) BH25 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH26-A-(0-0.5) BH26 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH26-D-(0-0.5) BH26 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL
Indeno(1,2,3-cd)pyrene	SW8270	230		620	ug/Kg	220	J	26	UJ	25
Naphthalene	SW8270			5600	ug/Kg	49	UJ	26	UJ	25
Phenanthrene	SW8270	190			ug/Kg	190	J	26	UJ	30
Pyrene	SW8270	270		230000	ug/Kg	270	J	26	UJ	32

Plum Brook
2005 Surface Soil Investigation

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-05-SO-2BG-BH27-A-(0-0.5) BH27 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH28-A-(0-0.5) BH28 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Explosives										
1,3,5-Trinitrobenzene	SW8330	740		180000	ug/Kg	U	210	J	87	U
1,3-Dinitrobenzene	SW8330	220		610	ug/Kg	U	87	U	87	U
2,4,6-Trinitrotoluene	SW8330	23000		16000	ug/Kg	U	14000		160	J
2,4-Dinitrotoluene	SW8330	4700		12000	ug/Kg	U	860		110	U
2,6-Dinitrotoluene	SW8330	1300		6100	ug/Kg	U	350	J	110	U
2-Amino-4,6-Dinitrotoluene	SW8330	4300			ug/Kg	U	920		130	U
2-Nitrotoluene	SW8330	130		880	ug/Kg	U	87	U	87	U
3-Nitrotoluene	SW8330			73000	ug/Kg	U	87	U	87	U
4-Amino-2,6-Dinitrotoluene	SW8330	3300			ug/Kg	U	900		87	U
4-Nitrotoluene	SW8330			12000	ug/Kg	U	130	U	130	U
HMX	SW8330	210		310000	ug/Kg	U	87	U	87	U
Nitrobenzene	SW8330			2000	ug/Kg	U	96	U	96	U
RDX	SW8330	540		4400	ug/Kg	U	87	U	87	U
Tetryl	SW8330			61000	ug/Kg	UJ	87	UJ	87	UJ
Metals										
Lead	SW6010B	590	48.6	40	mg/Kg		**203**		**54.4**	
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U	5.2	U	5.2	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U	5.2	U	5.2	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U	5.2	U	5.2	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U	5.2	U	5.2	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U	5.2	U	5.2	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U	5.2	U	5.2	U
PCB-1260 (Aroclor 1260)	SW8082	3500		220	ug/Kg		**1900**	J	150	
Semivolatile Organic Compounds										
2-Methylnaphthalene	SW8270	110			ug/Kg	UJ	51	UJ	50	UJ
Acenaphthene	SW8270			370000	ug/Kg	UJ	51	UJ	50	UJ
Acenaphthylene	SW8270				ug/Kg	UJ	51	UJ	50	UJ
Anthracene	SW8270			2200000	ug/Kg	UJ	51	UJ	50	UJ
Benzo(a)anthracene	SW8270	150		620	ug/Kg	UJ	51	UJ	50	UJ
Benzo(a)pyrene	SW8270	360		62	ug/Kg	UJ	51	UJ	50	UJ
Benzo(b)fluoranthene	SW8270	530		620	ug/Kg	UJ	51	UJ	50	UJ
Benzo(g,h,i)perylene	SW8270	270			ug/Kg	UJ	51	UJ	50	UJ
Benzo(k)fluoranthene	SW8270	370		6200	ug/Kg	UJ	51	UJ	50	UJ
Chrysene	SW8270	290		62000	ug/Kg	UJ	51	UJ	50	UJ
Dibenz(a,h)anthracene	SW8270			62	ug/Kg	UJ	51	UJ	50	UJ
Fluoranthene	SW8270	240		230000	ug/Kg	UJ	53	J	50	UJ
Fluorene	SW8270			270000	ug/Kg	UJ	51	UJ	50	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-05-SO-2BG-BH27-A-(0-0.5) BH27 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH28-A-(0-0.5) BH28 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8270	230		620	ug/Kg	UJ	51	UJ	50	UJ
Naphthalene	SW8270			5600	ug/Kg	UJ	51	UJ	50	UJ
Phenanthrene	SW8270	190			ug/Kg	J	51	UJ	50	UJ
Pyrene	SW8270	270		230000	ug/Kg	J	51	UJ	50	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-05-SO-2BG-BH29-A-(0-0.5) BH29 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH30-A-(0-0.5) BH30 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH31-A-(0-0.5) BH31 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL
Explosives										
1,3,5-Trinitrobenzene	SW8330	740		180000	ug/Kg	91	U	91	U	87
1,3-Dinitrobenzene	SW8330	220		610	ug/Kg	91	U	91	U	87
2,4,6-Trinitrotoluene	SW8330	23000		16000	ug/Kg	4600		91	U	87
2,4-Dinitrotoluene	SW8330	4700		12000	ug/Kg	590		120	U	110
2,6-Dinitrotoluene	SW8330	1300		6100	ug/Kg	190	J	120	U	110
2-Amino-4,6-Dinitrotoluene	SW8330	4300			ug/Kg	1300		140	U	130
2-Nitrotoluene	SW8330	130		880	ug/Kg	91	U	91	U	87
3-Nitrotoluene	SW8330			73000	ug/Kg	91	U	91	U	87
4-Amino-2,6-Dinitrotoluene	SW8330	3300			ug/Kg	990		91	U	87
4-Nitrotoluene	SW8330			12000	ug/Kg	140	U	140	U	130
HMX	SW8330	210		310000	ug/Kg	91	U	91	U	87
Nitrobenzene	SW8330			2000	ug/Kg	100	U	100	U	96
RDX	SW8330	540		4400	ug/Kg	91	U	91	U	87
Tetryl	SW8330			61000	ug/Kg	91	UJ	91	UJ	87
Metals										
Lead	SW6010B	590	48.6	40	mg/Kg	**388**		37.8		25.3
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	5.4	U	5.3	U	5.6
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	5.4	U	5.3	U	5.6
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	5.4	U	5.3	U	5.6
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	5.4	U	5.3	U	5.6
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	5.4	U	5.3	U	5.6
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	5.4	U	5.3	U	5.6
PCB-1260 (Aroclor 1260)	SW8082	3500		220	ug/Kg	**830**		81		30
Semivolatile Organic Compounds										
2-Methylnaphthalene	SW8270	110			ug/Kg	27	UJ	25	UJ	26
Acenaphthene	SW8270			370000	ug/Kg	27	UJ	25	UJ	26
Acenaphthylene	SW8270				ug/Kg	27	UJ	25	UJ	26
Anthracene	SW8270			2200000	ug/Kg	27	UJ	25	UJ	26
Benzo(a)anthracene	SW8270	150		620	ug/Kg	85	J	25	UJ	26
Benzo(a)pyrene	SW8270	360		62	ug/Kg	**110**	J	25	UJ	26
Benzo(b)fluoranthene	SW8270	530		620	ug/Kg	130	J	25	UJ	26
Benzo(g,h,i)perylene	SW8270	270			ug/Kg	60	J	25	UJ	26
Benzo(k)fluoranthene	SW8270	370		6200	ug/Kg	120	J	25	UJ	26
Chrysene	SW8270	290		62000	ug/Kg	140	J	25	UJ	26
Dibenz(a,h)anthracene	SW8270			62	ug/Kg	27	UJ	25	UJ	26
Fluoranthene	SW8270	240		230000	ug/Kg	96	J	25	UJ	26
Fluorene	SW8270			270000	ug/Kg	27	UJ	25	UJ	26

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-05-SO-2BG-BH29-A-(0-0.5) BH29 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH30-A-(0-0.5) BH30 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH31-A-(0-0.5) BH31 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL
Indeno(1,2,3-cd)pyrene	SW8270	230		620	ug/Kg	64	J	25	UJ	26
Naphthalene	SW8270			5600	ug/Kg	27	UJ	25	UJ	26
Phenanthrene	SW8270	190			ug/Kg	38	J	25	UJ	26
Pyrene	SW8270	270		230000	ug/Kg	86	J	25	UJ	26

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-05-SO-2BG-BH32-A-(0-0.5) BH32 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH33-A-(0-0.5) BH33 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Explosives										
1,3,5-Trinitrobenzene	SW8330	740		180000	ug/Kg	U	91	U	300	J
1,3-Dinitrobenzene	SW8330	220		610	ug/Kg	U	91	U	83	U
2,4,6-Trinitrotoluene	SW8330	23000		16000	ug/Kg	U	91	U	4700	
2,4-Dinitrotoluene	SW8330	4700		12000	ug/Kg	U	120	U	4700	
2,6-Dinitrotoluene	SW8330	1300		6100	ug/Kg	U	120	U	860	
2-Amino-4,6-Dinitrotoluene	SW8330	4300			ug/Kg	U	140	U	2200	
2-Nitrotoluene	SW8330	130		880	ug/Kg	U	91	U	110	J
3-Nitrotoluene	SW8330			73000	ug/Kg	U	91	U	83	U
4-Amino-2,6-Dinitrotoluene	SW8330	3300			ug/Kg	U	91	U	1300	
4-Nitrotoluene	SW8330			12000	ug/Kg	U	140	U	120	U
HMX	SW8330	210		310000	ug/Kg	U	91	U	210	J
Nitrobenzene	SW8330			2000	ug/Kg	U	100	U	92	U
RDX	SW8330	540		4400	ug/Kg	U	91	U	540	
Tetryl	SW8330			61000	ug/Kg	UJ	91	UJ	83	UJ
Metals										
Lead	SW6010B	590	48.6	40	mg/Kg		22.9		**128**	
Polychlorinated Biphenyls (PCBs)										
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	U	5.6	U	5.3	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	U	5.8	U	5.3	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	U	5.8	U	5.3	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	U	5.8	U	5.3	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	U	5.8	U	5.3	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	U	5.8	U	5.3	U
PCB-1260 (Aroclor 1260)	SW8082	3500		220	ug/Kg		13		**1500**	J
Semivolatile Organic Compounds										
2-Methylnaphthalene	SW8270	110			ug/Kg	UJ	27	UJ	25	UJ
Acenaphthene	SW8270			370000	ug/Kg	UJ	27	UJ	25	UJ
Acenaphthylene	SW8270				ug/Kg	UJ	27	UJ	25	UJ
Anthracene	SW8270			2200000	ug/Kg	UJ	27	UJ	25	UJ
Benzo(a)anthracene	SW8270	150		620	ug/Kg	UJ	27	UJ	25	UJ
Benzo(a)pyrene	SW8270	360		62	ug/Kg	UJ	27	UJ	25	UJ
Benzo(b)fluoranthene	SW8270	530		620	ug/Kg	UJ	27	UJ	25	UJ
Benzo(g,h,i)perylene	SW8270	270			ug/Kg	UJ	27	UJ	25	UJ
Benzo(k)fluoranthene	SW8270	370		6200	ug/Kg	UJ	27	UJ	25	UJ
Chrysene	SW8270	290		62000	ug/Kg	UJ	27	UJ	25	UJ
Dibenz(a,h)anthracene	SW8270			62	ug/Kg	UJ	27	UJ	25	UJ
Fluoranthene	SW8270	240		230000	ug/Kg	UJ	28	J	25	UJ
Fluorene	SW8270			270000	ug/Kg	UJ	27	UJ	25	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	VQ	PBOW-05-SO-2BG-BH32-A-(0-0.5) BH32 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ	PBOW-05-SO-2BG-BH33-A-(0-0.5) BH33 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8270	330		620	ug/Kg	UJ	27	UJ	25	UJ
Naphthalene	SW8270			5600	ug/Kg	UJ	27	UJ	25	UJ
Phenanthrene	SW8270	190			ug/Kg	UJ	27	UJ	25	UJ
Pyrene	SW8270	270		230000	ug/Kg	UJ	27	UJ	25	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-05-SO-2BG-BH34-A-(0-0.5) BH34 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Explosives							
1,3,5-Trinitrobenzene	SW8330	740		180000	ug/Kg	460	
1,3-Dinitrobenzene	SW8330	220		610	ug/Kg	91	U
2,4,6-Trinitrotoluene	SW8330	23000		16000	ug/Kg	5200	
2,4-Dinitrotoluene	SW8330	4700		12000	ug/Kg	2000	
2,6-Dinitrotoluene	SW8330	1300		6100	ug/Kg	830	
2-Amino-4,6-Dinitrotoluene	SW8330	4300			ug/Kg	1900	
2-Nitrotoluene	SW8330	130		880	ug/Kg	120	J
3-Nitrotoluene	SW8330			73000	ug/Kg	91	U
4-Amino-2,6-Dinitrotoluene	SW8330	3300			ug/Kg	1800	
4-Nitrotoluene	SW8330			12000	ug/Kg	140	U
HMX	SW8330	210		310000	ug/Kg	91	U
Nitrobenzene	SW8330			2000	ug/Kg	100	U
RDX	SW8330	540		4400	ug/Kg	91	U
Tetryl	SW8330			61000	ug/Kg	91	UJ
Metals							
Lead	SW6010B	590	48.6	40	mg/Kg	**341**	
Polychlorinated Biphenyls (PCBs)							
PCB-1016 (Aroclor 1016)	SW8082			390	ug/Kg	5.8	U
PCB-1221 (Aroclor 1221)	SW8082			220	ug/Kg	5.8	U
PCB-1232 (Aroclor 1232)	SW8082			220	ug/Kg	5.8	U
PCB-1242 (Aroclor 1242)	SW8082			220	ug/Kg	5.8	U
PCB-1248 (Aroclor 1248)	SW8082			220	ug/Kg	5.8	U
PCB-1254 (Aroclor 1254)	SW8082			220	ug/Kg	5.8	U
PCB-1260 (Aroclor 1260)	SW8082	3500		220	ug/Kg	**3100**	**J**
Semivolatile Organic Compounds							
2-Methylnaphthalene	SW8270	110			ug/Kg	54	UJ
Acenaphthene	SW8270			370000	ug/Kg	54	UJ
Acenaphthylene	SW8270				ug/Kg	54	UJ
Anthracene	SW8270			2200000	ug/Kg	54	UJ
Benzo(a)anthracene	SW8270	150		620	ug/Kg	150	J
Benzo(a)pyrene	SW8270	360		62	ug/Kg	**360**	**J**
Benzo(b)fluoranthene	SW8270	530		620	ug/Kg	530	J
Benzo(g,h,i)perylene	SW8270	270			ug/Kg	270	J
Benzo(k)fluoranthene	SW8270	370		6200	ug/Kg	370	J
Chrysene	SW8270	290		62000	ug/Kg	290	J
Dibenz(a,h)anthracene	SW8270			62	ug/Kg	54	UJ
Fluoranthene	SW8270	240		230000	ug/Kg	220	J
Fluorene	SW8270			270000	ug/Kg	54	UJ

Analyte	Method	Maximum Detection	Background	Adjusted Region 9 Residential PRG	Samp. Num. Location Date Depth Units	PBOW-05-SO-2BG-BH34-A-(0-0.5) BH34 04/22/2005 0.0-0.5 ft. SO RESULT / QUAL	VQ
Indeno(1,2,3-cd)pyrene	SW8270	230		620	ug/Kg	230	J
Naphthalene	SW8270			5600	ug/Kg	54	UJ
Phenanthrene	SW8270	190			ug/Kg	100	J
Pyrene	SW8270	270		230000	ug/Kg	250	J

Chemical Quality Assurance Report

Reservoir No. 2 Burning Ground
Remedial Investigation, Part 1
Former Plum Brook Ordnance Works
Sandusky, OH

May 2004 Sampling Event

Presented by:

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Abbreviations and Acronyms

ALSI	Analytical Laboratory Services, Incorporated
BFB	4-Bromofluorobenzene
CQAR	Chemical Quality Assurance Report
COC	Chain of Custody
%D	Percent Difference
DBFM	Dibromofluoromethane
DCE-d4	1,2-Dichloroethane
DQO	Data Quality Objective
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
GC	Gas Chromatograph or Gas Chromatography
ICAP	Inductively Coupled Argon Plasma Spectrophotometer
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDP	Laboratory Data Package
LLR	Lowest Level for Reporting
MDL	Method Detection Limit
mg/L	milligram per liter
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
Pace	Pace Analytical Services, Incorporated
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
%R	Percent Recovery
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SUR	Surrogate
SW-846	Solid Waste Analytical Protocols
TAL	Target Analyte List
TCL	Target Compound List
µg/L	Microgram per liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

INTRODUCTION

This Chemical Quality Assurance Report (CQAR) presents an evaluation of the quality and usability of the Quality Assurance (QA) analytical data generated in support of the soil and sediment sampling event performed by Jacobs Engineering, Inc. at the Reservoir Number 2 Burning Ground at the Former Plum Brook Ordnance Works in Sandusky, Ohio in mid-May 2004. The findings of this evaluation are presented in terms of data precision, accuracy, representativeness, sensitivity, and completeness.

Analytical samples evaluated in this report consisted of QA samples that were collected in conjunction with the project QC samples (i.e., primary and duplicate) at a frequency of approximately ten percent of the QC samples. The project samples are summarized in Atttachment I, Table I-1 Primary/QC/QA Sample Number Correlation. The QA data is presented in tables in Attachment II – QA Data Summary.

Analytical Methods

Analyses for this project were performed in strict accordance with the following protocol:

- *Test Methods for Evaluating Solid Waste*, SW-846, 3rd Edition, USEPA, November 1986, (SW-846)

Specific analytical methods used included the following:

- SW-846 8260B – volatile organic compounds (VOCs);
- SW-846 8082 – polychlorinated biphenyls (PCBs);
- SW-846 8330 – nitroaromatic compounds (referred to as explosives herein);
- SW-846 8290 – dioxins/furans;
- SW-846 8310 – polynuclear aromatic hydrocarbons (PAHs);
- SW-846 6010B – total metals by Inductively Coupled Argon Plasma Spectrophotometer (ICAP); and
- SW-846 7471A – total mercury.

Analytical Laboratories

The analytical laboratories contracted to analyze the QA samples on this project included the following:

GPL Laboratories, LLLP (GPL)
Contact: Deborah Griffiths, Project Manager
7210A Corporate Court
Frederick, Maryland 21703
Phone: (301) 694-5310; Fax: (301) 620-0731

Pace Analytical Services, Incorporated (Pace)
Contact: Scott C. Unze, Project Manager
1700 Elm Street, Suite 200

Minneapolis, Minnesota 55414
Phone: (612) 607-1700; Fax: (612) 607-6444

Analytical Laboratory Services, Incorporated (ALSI)
Contact: Raymond J. Martrano, Laboratory Manager
34 Dogwood Lane
Middletown, Pennsylvania 17057
Phone: (717) 944-5341; Fax: (717) 944-1430

GPL performed the VOCs, PCBs, and metals analyses; ALSI performed the PAHs analyses; and PACE performed the dioxins/furans analyses. All of these laboratories have been validated by the US Army Corps of Engineers (USACE).

Data Evaluation Procedures

The quality of these data has been evaluated following procedures consistent with those included in Engineering Manual (EM) 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997, as well as *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-99/008, October 1999 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540/R-94/013, February 1994 (*Functional Guidelines*). Data evaluations were also based on the QC requirements of the individual analytical methods.

The following data quality issues were addressed in this evaluation:

- Review of chain-of-custody and sample receipt forms to evaluate sample receipt data, damaged sample containers, etc.;
- Review of laboratory testing methods, detection limits, holding times, data qualifiers, etc.;
- Review of field QC blank data to detect contamination from outside sources;
- Review of QC data to evaluate data reproducibility;
- Review of laboratory QC including verification of calibration, instrument performance checks, laboratory blanks, spike recovery, and duplicates;
- Assign appropriate qualifiers to usable data and qualify unusable data as rejected, if necessary; and
- Data evaluation findings presented in term of the PARCC (precision, accuracy, representativeness, comparability, and completeness) data quality parameters.

Data Qualifier Definitions

The following definitions provide explanations of the data qualifiers that were assigned to results in the data review process. The data qualifier definitions are consistent with those used within the *Functional Guidelines* referenced above.

U – The analyte was analyzed for but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified. However, the associated numerical value is an estimate of the concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is an estimate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

I. QC DATA EVALUATION

A. Accuracy:

1) Volatile Organic Compounds

- Four matrix spike %Rs and three matrix spike duplicate %Rs were all below the criteria limits for samples from SDGs # 113558 and 113697. This was due to matrix interference and the results were qualified as estimated.
- The internal standard area responses were below the criteria limits for samples PBOW-04-SO-2BG-SD02-A and PBOW-04-SO-2BG-SD02-D.
- The internal standard area responses were below the criteria limits for sample PBOW-04-SO-2BG-BH20-A.
- The internal standard area response for 1,4-Dichlorobenzene was above the criteria limits for sample PBOW-04-SO-2BG-TR05-1-D.

2) Polynuclear Aromatic Hydrocarbons

- Sample PBOW-04-SO-2BG-TR05-1-A had a dilution factor of 10.
- Sample PBOW-04-SO-2BG-TR05-1-D had a dilution factor of 10.
- Sample PBOW-04-SO-2BG-BH15-A-(0'-1') had a dilution factor of 5.
- Sample PBOW-04-SO-2BG-BH15-D-(0'-1') had a dilution factor of 5.
- Sample PBOW-04-SD-2BG-SD02-D had a dilution factor of 5.
- The MS/MSD %Rs were diluted out due to sample matrix interference on samples from SDG # 0405288.
- PBOW-04-SO-2BG-BH21-A-(0'-1') had a high surrogate recovery due to sample matrix interferences.
- Samples PBOW-04-SO-2BG-SD02-A and PBOW-04-SO-2BG-SD02-A had high surrogate recoveries due to sample matrix interferences.

3) Explosives

- The MS %Rs of 4-amino-2,6-dinitrotoluene and 2-amino-4,6-dinitrotoluene were above the criteria limits for samples associated with SDG # 113513. The MSD %Rs for 2,4,6-trinitrotoluene and 2-amino-4,6-dinitrotoluene were well above the criteria limits in the same SDG. The results are qualified as estimated.
- Samples PBOW-04-SO-2BG-TR05-1-A and PBOW-04-SO-2BG-TR05-1-D had surrogate recoveries outside the criteria limits due to high concentrations of 2,4,6-trinitrotoluene found in the samples.
- The MS and MSD %Rs from SDG # 113353 were diluted out due to high concentration of 2,4,6-trinitrotolunene. All of the %Rs were outside the criteria limits.
- Sample PBOW-04-SO-2BG-TR05-1-A had a dilution factor of 20.
- Sample PBOW-04-SO-2BG-TR05-1-D had a dilution factor of 40.
- Sample PBOW-04-SO-2BG-BH15-A-(0'-1') had a dilution factor of 2.

- Sample PBOW-04-SO-2BG-BH15-D-(0'-1') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH15-A-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH15-D-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH20-A-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH20-D-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SD-2BG-SD02-A had a dilution factor of 2.
- Sample PBOW-04-SD-2BG-SD02-D had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH13-A-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH13-D-(3'-5') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH21-A-(0'-1') had a dilution factor of 2.
- Sample PBOW-04-SO-2BG-BH21-D-(0'-1') had a dilution factor of 2.

4) Polychlorinated Biphenyls

- Surrogate recoveries for decachlorobiphenyl and tetrachloro-m-xylene were diluted out on sample PBOW-04-SO-2BG-TR05-1-A due to matrix interference. Sample results are estimated.
- The surrogate recovery for tetrachloro-m-xylene was above the QC limits for sample PBOW-04-SO-2BG-TR05-1-D. The %R was elevated due to matrix interference. The sample was diluted and reanalyzed but the surrogate compounds were diluted out and no %Rs were detected.
- The MS/MSD %Rs were diluted out due to sample matrix interference on samples from SDG # 0405288.
- The LCS %R for Aroclor 1016 in SDGs # 0405290 and # 0405318 was above the criteria limits.
- The MSD %Rs were just above the criteria limits for sample PBOW-04-SO-2BG-BH20-A-(3'-5').
- Sample PBOW-04-SO-2BG-TR05-1-A had a dilution factor of 100.
- Sample PBOW-04-SO-2BG-TR05-1-D had a dilution factor of 10.
- Sample PBOW-04-SO-2BG-BH15-A-(0'-1') had a dilution factor of 5.
- Sample PBOW-04-SO-2BG-BH15-D-(0'-1') had a dilution factor of 5.
- Sample PBOW-04-SD-2BG-SD02-A had a dilution factor of 5.
- Sample PBOW-04-SD-2BG-SD02-D had a dilution factor of 5.

5) Dioxins/Furans

- All QC recoveries were within the criteria limits.

6) Metals

- The %Rs for the matrix spikes and matrix spike duplicates of antimony, barium, and potassium were outside the QC criteria limits for samples from SDG # 113697.

- The %Rs for the matrix spikes and matrix spike duplicates of antimony, barium, copper, lead, magnesium, potassium, tin, and zinc were outside the QC criteria limits for samples from SDG # 113513.
- The %Rs for the matrix spikes and matrix spike duplicates of antimony, barium, copper, manganese, mercury, potassium, sodium, and zinc were outside the QC criteria limits for samples from SDG # 113353.

B. Precision

1) Volatile Organic Compounds

- The MSD RPD for trichloroethylene and toluene were above the criteria limits for samples associated with SDG # 113353.

2) Polynuclear Aromatic Hydrocarbons

- The MS/MSD RPDs were diluted out due to sample matrix interference on samples from SDG # 0405288.

3) Explosives

- The RPD for 2,4,6-trinitroltoluene was above the criteria limit from SDG # 113513.

4) Polychlorinated Biphenyls

- The MS/MSD RPDs were diluted out due to sample matrix interference on samples from SDG # 0405288.

5) Dioxins/Furans

- All QC RPDs were within the criteria limits.

6) Metals

- Arsenic, copper, lead, manganese, and selenium had high RPDs in the duplicate analysis of SDG # 113697.
- Arsenic, barium, calcium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, and zinc had high RPDs in the duplicate analysis of SDG # 113513.
- Aluminum, arsenic, cobalt, iron, mercury, sodium, and zinc had high RPDs in the duplicate analysis of SDG # 113353.
- Aluminum, barium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, sodium, and vanadium were outside the serial dilution criteria limit for samples from SDG # 113697.

- Aluminum, calcium, and mercury were outside the serial dilution criteria limit for samples from SDG # 113353.

C. Laboratory Contamination

1) Volatile Organic Compounds

- Acetone was detected in the trip blank accompanying the samples from SDG # 113353 at 4.5 ug/L.

2) Polynuclear Aromatic Hydrocarbons

- No contamination was found in any of the associated blanks.

3) Explosives

- No contamination was found in any of the associated blanks.

4) Polychlorinated Biphenyls

- No contamination was found in any of the associated blanks.

5) Dioxins/Furans

- No contamination was found in any of the associated blanks.

6) Metals

- The initial calibration, continuing calibration, and preparation blanks were found to contain antimony, arsenic, calcium, iron, lead, magnesium, selenium, sodium, and zinc at very low levels for samples from SDG # 113697.
- The initial calibration, continuing calibration, and preparation blanks were found to contain aluminum, antimony, calcium, iron, magnesium, selenium, and zinc at very low levels for samples from SDG # 113353.
- The initial calibration, continuing calibration, and preparation blanks were found to contain antimony, arsenic, calcium, magnesium, mercury, potassium, selenium, sodium, and zinc at low levels for samples from SDG # 113558.
- The initial calibration, continuing calibration, and preparation blanks were found to contain arsenic, calcium, magnesium, and selenium from SDG #113513.

II. QA DATA EVALUATION

a. Accuracy

1) Volatile Organic Compounds

- Some laboratory control samples had %Rs outside the QC criteria limits for samples from SDGs # 405178, # 405163, and # 405129.
- Sample PBOW-04-SO-2BG-TR05-1-B had a low surrogate recovery of dichlorobenzene.

2) Polynuclear Aromatic Hydrocarbons

- All QC recoveries were within the criteria limits.

3) Explosives

- Some laboratory control samples had %Rs outside the QC criteria limits for samples from SDGs # 405178, #405170, # 405163, and # 405129.
- Some matrix spike and matrix spike duplicate %Rs and RPDs were outside the QC criteria limits from SDG # 405163.
- 2,4,6-Trinitrotoluene from PBOW-04-SO-2BG-BH15-B-(0'-1') had a dilution factor of 10.
- Sample PBOW-04-SO-2BG-TR05-1-B had a dilution factor of 100.

4) Polychlorinated Biphenyls

- Surrogate recoveries for decachlorobiphenyl and tetrachloro-m-xylene were outside the QC limits for samples from SDGs # 405178, # 405170, # 405163, and # 405129.

5) Dioxins/Furans

- All QC recoveries were within the criteria limits.

6) Metals

- The %Rs for the matrix spikes of antimony, magnesium, potassium, and vanadium were outside the QC criteria limits for samples from SDG # 405178.
- The %Rs for the matrix spikes and matrix spike duplicates of aluminum, antimony, barium, calcium, iron, magnesium, manganese, and potassium were outside the QC criteria limits for samples from SDG # 405129.
- The %Rs for the matrix spikes of antimony and potassium were outside the QC criteria limits for samples from SDGs # 405170 and # 405163.
- The %Rs for the post digestion spike results of barium and manganese were outside the QC criteria limits for samples from SDG # 405129.
- Vanadium had a low post-digestion spike %R from SDG # 405178.

B. Precision

1) Volatile Organic Compounds

- All QC sample relative percent differences (RPDs) were within the criteria limits.

2) Polynuclear Aromatic Hydrocarbons

- All QC sample relative percent differences (RPDs) were within the criteria limits.

3) Explosives

- Some matrix spike and matrix spike duplicate RPDs were outside the QC criteria limits from SDG # 405163.

4) Polychlorinated Biphenyls

- The matrix spike duplicate (MSD) RPDs were outside the criteria limits for samples PBOW-04-SO-2BG-TR05-1-B and PBOW-04-SO-2BG-BH15-B-(0'-1').

5) Dioxins/Furans

- All QC RPDs were within the criteria limits.

6) Metals

- Antimony and selenium had high RPDs in the duplicate analysis of SDG # 405178.
- Aluminum, barium, beryllium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc had high RPDs in the duplicate analysis of both SDGs # 405170 and # 405163.
- Beryllium had serial dilution results outside QC criteria limits in SDG # 405129.
- Copper was outside the serial dilution criteria limit for samples from SDGs # 405178, # 405170, and # 405163.

C. Laboratory Contamination

1) Volatile Organic Compounds

- Methylene chloride was detected in one of the method blanks associated with SDGs # 405178 and 405129.
- Methylene chloride was detected in the trip blanks accompanying the samples from SDGs # 405178, # 405170, and # 405129.

2) Polynuclear Aromatic Hydrocarbons

- No contamination was found in any of the associated blanks.

3) Explosives

- No contamination was found in any of the associated blanks.

4) Polychlorinated Biphenyls

- No contamination was found in any of the associated blanks.

5) Dioxins/Furans

- OCDD was detected at a low level in the method blank for samples from SDG # 405129.

6) Metals

- The initial calibration and preparation blanks were found to contain aluminum, barium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, and sodium at low levels for samples from SDG # 405178.
- The initial calibration and preparation blanks were found to contain aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, sodium, thallium, and vanadium at low levels for samples from SDGs # 405178 and # 405129.

III. QA/QC DATA COMPARISON

In accordance with EM 200-1-6, a QA/QC data comparison was performed based on the agreement criteria summarized in the table below:

Criteria for Comparing Field QC and QA Sample Data

Matrix	Parameter	Disagreement	Major Disagreement
Soil	All	> 5x difference when one result is <DL	>10x difference when one result is <DL
Soil	All	>3x difference when one result is <RL	>5x difference when one result is <RL
Soil	VOCs only	> 5x difference	> 10x difference
Soil	Metals only	> 2x difference	> 3x difference
Soil	All except VOCs and metals	> 4x difference	> 5x difference

Attachment III presents tables that show a side-by-side comparison of the analytical results of the QC and QA samples.

Data found out of control were examined to determine if the disagreements were extreme, isolated occurrences, or if negative trends existed. Samples found in disagreement do not necessarily indicate an error has been made or inappropriate procedures used. Factors including the natural variability of the sample matrix, high or low analyte concentrations, or the presence of compounds that interfere with analysis can contribute to duplicate disagreement. Negative trends may indicate systemic errors made in sampling, handling, or analytical procedures; or may indicate the selection of an inappropriate protocol. If negative trends or extreme non-conformances exist, associated data were evaluated carefully to determine their validity.

The results of this comparison are presented below:

A. Volatile Organic Compounds

Sample PBOW-04-SD-2BG-SD02 had a major disagreement between the acetone results of the primary, QC duplicate, and QA sample. Acetone was detected at 197 ug/kg, 175 ug/kg, and 14 ug/kg, respectively. 2-Butanone had a disagreement in the same set of samples where it was detected in the primary and QC samples but not in the QA sample. Cyclohexane was detected in the QC sample only but not in the primary or QA sample.

Sample PBOW-04-SO-2BG-BH13-(3'-5') had 1,1-dichloroethane and tetrachloroethene detected at low levels in the primary and QC samples, but not in the QA sample.

Sample PBOW-04-SO-2BG-BH15-(0'-1') had 1,1-dichloroethane detected in the primary sample but not in the QC or QA sample. Tetrachloroethene was detected at a low level in the QC sample, but not in the primary or QA samples.

B. Polynuclear Aromatic Hydrocarbons

The detected compounds in the primary and QC samples of PBOW-04-SO-2BG-BH20-(3'-5'), PBOW-04-SO-2BG-TR05-1, PBOW-04-SO-2BG-BH15-(0'-1'), PBOW-04-SO-2BG-BH15-(3'-5'), PBOW-04-SO-2BG-BH21-(0'-1'), PBOW-04-SO-2BG-BH13-(3'-5'), and PBOW-04-SD-2BG-SD02 were in major disagreement from the corresponding QA samples as all of the QA results were reported as not detected.

C. Explosives

Sample PBOW-04-SO-2BG-BH21-(0'-1') had a disagreement with 2,4,6-trinitrotoluene, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene as the compounds were detected in the QA sample at either above what was found in the primary sample or it was not detected in the primary or QC samples.

Sample PBOW-04-SO-2BG-TR05 had a disagreement with 4-amino-2,6-dinitrotoluene as it was detected in the QA sample at 80,000 ug/kg but it was not detected in the primary or QC samples.

Sample PBOW-04-SO-2BG-BH15-(0'-1') had a disagreement with 2,4,6-trinitrotoluene, 1,3,5-trinitrobenzene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, 2,4-dinitrotoluene, and 2,6-dinitrotoluene. The QA sample reported the highest results.

D. Polychlorinated Biphenyls

Samples PBOW-04-SO-2BG-BH15-(0'-1') and PBOW-04-SO-2BG-BH21-(0'-1') had a disagreement on Aroclor 1260 between the primary, QC, and QA samples where it was detected in the QA samples only at 130 ug/kg and 27 ug/kg, respectively.

E. Dioxins/Furans

Sample PBOW-04-SO-2BG-TR05 had a major disagreement between the 2,3,7,8-TCDD results of the primary, QC, and QA samples. 2,3,7,8-TCDD was detected at 0.717 ng/kg, 1.13 ng/kg, and 0.26 ng/kg, respectively.

F. Metals

Sample PBOW-04-SO-2BG-TR05 had disagreements for cadmium and mercury and major disagreements for chromium and selenium between the primary, QC, and QA samples. Sample PBOW-04-SO-2BG-BH13-(3'-5') had major disagreements for cadmium and manganese between the primary, QC, and QA samples. Sample PBOW-04-SO-2BG-SD02 had a major disagreement for cadmium and PBOW-04-SO-2BG-BH15-(3'-5') had a minor disagreement for cadmium between the primary, QC, and QA samples. Sample PBOW-04-SO-2BG-BH20-(3'-5') had a minor disagreement for nickel and major disagreements for cadmium, copper, and manganese between the primary, QC, and QA samples.

IV. PROBLEMS

No major problems were found with the quality and usability of the analytical data generated for this project. QC results were unreliable in some cases due to high analyte content which resulted in matrix interference. All of the results were considered usable as no results were rejected due to laboratory error.

There were several major disagreements between some of the samples especially with the polynuclear aromatic hydrocarbons (PAHs). The QC samples had numerous detected compounds but not at elevated levels as that might make the reporting limits higher than normal. The QA sample results were essentially reported as undetected and the reporting limits for those samples were not elevated. This would not indicate a strong discrepancy between the analytical laboratories as there were no other standout patterns of discrepancies between all of the other sample results.

V. SUMMARY AND CONCLUSIONS

In general, the QC and QA sample results indicated that the data met "definitive data" standards and were of known quality. The data reported are acceptable with the required qualifications. No results were found to unusable due to data QC deficiencies. QC data demonstrated that the QA mechanisms were effective in ensuring measurement data reliability within expected limits of sampling and analytical error and were considered, as qualified, representative of actual site and sample conditions at the time sampled.

ATTACHMENT 1 – SAMPLE CORRELATION

Primary Field Sample ID	Primary Lab Sample ID	QA Field Sample ID	QA Lab Sample ID	Date & Time	Requested Analyses
PBOW-04-SO--2BG-TR05-1-A	113353-001, 113353-002	PBOW-04-SO--2BG-TR05-1-B	405129-001-001-1/3	5/19/04 0850	8260B VOCs
PBOW-04-SO--2BG-TR05-1-A	113353-001, 113353-002	PBOW-04-SO--2BG-TR05-1-B	405129-001-004-1/1	5/19/04 0850	8082 PCBs
PBOW-04-SO--2BG-TR05-1-A	0405288-01A, 0405288-02A E&E	PBOW-04-SO--2BG-TR05-1-B	405129-001-004-1/1	5/19/04 0850	8330 Nitros
PBOW-04-SO--2BG-TR05-1-A	113353-001, 113353-002	PBOW-04-SO--2BG-TR05-1-B	405129-001-005-1/1	5/19/04 0850	6010B/7471A Metals
PBOW-04-SO--2BG-TR05-1-A	G341-177-1, G341-177-2 Paradigm	PBOW-04-SO--2BG-TR05-1-B	405129-001-006-1/1 (105665079)	5/19/04 0850	8290 D/F (sub to PACE)
PBOW-04-SO--2BG-TR05-1-A	0405288-01A, 0405288-02A E&E	PBOW-04-SO--2BG-TR05-1-B		5/19/04 0850	8310 PAHs (sub to ALSI)
PBOW-04-SO--2BG-TR09-1-A	G341-177-15, G341-177-16 Paradigm	PBOW-04-SO--2BG-TR09-1-B	405129-002-007-1/1 (105665087)	5/19/04 1635	8290 D/F (sub to PACE)
PBOW-04-SO--2BG-BH15-A-(0'-1')	113513-006, 113513-007	PBOW-04-SO--2BG-BH15-B-(0'-1')	405163-001-001-1/3	5/21/04 1410	8260B VOCs
PBOW-04-SO--2BG-BH15-A-(0'-1')	0405290-06A, 0405290-07A E&E	PBOW-04-SO--2BG-BH15-B-(0'-1')	405163-001-007-1/1	5/21/04 1410	8082 PCBs
PBOW-04-SO--2BG-BH15-A-(0'-1')	113513-006, 113513-007	PBOW-04-SO--2BG-BH15-B-(0'-1')	405163-001-007-1/1	5/21/04 1410	8330 Nitros
PBOW-04-SO--2BG-BH15-A-(0'-1')	113513-006, 113513-007	PBOW-04-SO--2BG-BH15-B-(0'-1')	405163-001-009-1/1	5/21/04 1410	6010B/7471A Metals
PBOW-04-SO--2BG-BH15-A-(0'-1')	0405290-06A, 0405290-07A E&E	PBOW-04-SO--2BG-BH15-B-(0'-1')		5/21/04 1410	8310 PAHs (sub to ALSI)
PBOW-04-SO--2BG-BH21-A-(0'-1')	113513-008, 113513-009	PBOW-04-SO--2BG-BH21-B-(0'-1')	405163-002-004-1/3	5/21/04 1500	8260B VOCs
PBOW-04-SO--2BG-BH21-A-(0'-1')	0405290-08A, 0405290-09A E&E	PBOW-04-SO--2BG-BH21-B-(0'-1')	405163-002-008-1/1	5/21/04 1500	8082 PCBs
PBOW-04-SO--2BG-BH21-A-(0'-1')	113513-008, 113513-009	PBOW-04-SO--2BG-BH21-B-(0'-1')	405163-002-008-1/1	5/21/04 1500	8330 Nitros
PBOW-04-SO--2BG-BH21-A-(0'-1')	113513-008, 113513-009	PBOW-04-SO--2BG-BH21-B-(0'-1')	405163-002-010-1/1	5/21/04 1500	6010B/7471A Metals
PBOW-04-SO--2BG-BH21-A-(0'-1')	0405290-08A, 0405290-09A E&E	PBOW-04-SO--2BG-BH21-B-(0'-1')		5/21/04 1500	8310 PAHs (sub to ALSI)
PBOW-04-SD--2BG-SD02-A	113558-011, 113558-012	PBOW-04-SD--2BG-SD02-B	405170-001-001-1/3	5/23/04 1300	8260B VOCs
PBOW-04-SD--2BG-SD02-A	0405318-02A, 0405318-03A E&E	PBOW-04-SD--2BG-SD02-B	405170-001-007-1/1	5/23/04 1300	8082 PCBs
PBOW-04-SD--2BG-SD02-A	113558-011, 113558-012	PBOW-04-SD--2BG-SD02-B	405170-001-007-1/1	5/23/04 1300	8330 Nitros
PBOW-04-SD--2BG-SD02-A	113558-011, 113558-012	PBOW-04-SD--2BG-SD02-B	405170-001-009-1/1	5/23/04 1300	6010B/7471A Metals
PBOW-04-SD--2BG-SD02-A	G341-179-4, G341-179-5 Paradigm	PBOW-04-SD--2BG-SD02-B	405170-001-011-1/1 (105670640)	5/23/04 1300	8290 D/F (sub to PACE)
PBOW-04-SD--2BG-SD02-A	0405318-02A, 0405318-03A E&E	PBOW-04-SD--2BG-SD02-B		5/23/04 1300	8310 PAHs (sub to ALSI)
PBOW-04-SO--2BG-BH13-A-(3'-5')	113558-005, 113558-002	PBOW-04-SO--2BG-BH13-B-(3'-5')	405170-003-004-1/3	5/24/04 1056	8260B VOCs
PBOW-04-SO--2BG-BH13-A-(3'-5')	0405318-09A, 0405318-06A E&E	PBOW-04-SO--2BG-BH13-B-(3'-5')	405170-003-008-1/1	5/24/04 1056	8082 PCBs
PBOW-04-SO--2BG-BH13-A-(3'-5')	113558-005, 113558-002	PBOW-04-SO--2BG-BH13-B-(3'-5')	405170-003-008-1/1	5/24/04 1056	8330 Nitros
PBOW-04-SO--2BG-BH13-A-(3'-5')	113558-005, 113558-002	PBOW-04-SO--2BG-BH13-B-(3'-5')	405170-003010-1/1	5/24/04 1056	6010B/7471A Metals
PBOW-04-SO--2BG-BH13-A-(3'-5')	0405318-09A, 0405318-06A E&E	PBOW-04-SO--2BG-BH13-B-(3'-5')		5/24/04 1056	8310 PAHs (sub to ALSI)
PBOW-04-SO--2BG-BH15-A-(3'-5')	113697-002, 113697-003	PBOW-04-SO--2BG-BH15-B-(3'-5')	405178-001-003-1/3	5/25/04 0950	8260B VOCs
PBOW-04-SO--2BG-BH15-A-(3'-5')	0405318-11A, 0405318-12A E&E	PBOW-04-SO--2BG-BH15-B-(3'-5')	405178-001-009-1/1	5/25/04 0950	8082 PCBs
PBOW-04-SO--2BG-BH15-A-(3'-5')	113697-002, 113697-003	PBOW-04-SO--2BG-BH15-B-(3'-5')	405178-001-009-1/1	5/25/04 0950	8330 Nitros
PBOW-04-SO--2BG-BH15-A-(3'-5')	113697-002, 113697-003	PBOW-04-SO--2BG-BH15-B-(3'-5')	405178-001-011-1/1	5/25/04 0950	6010B/7471A Metals
PBOW-04-SO--2BG-BH15-A-(3'-5')	0405318-11A, 0405318-12A E&E	PBOW-04-SO--2BG-BH15-B-(3'-5')		5/25/04 0950	8310 PAHs (sub to ALSI)
PBOW-04-SO--2BG-BH20-A-(3'-5')	113697-004, 113697-005	PBOW-04-SO--2BG-BH20-B-(3'-5')	405178-002-006-1/3	5/25/04 1131	8260B VOCs
PBOW-04-SO--2BG-BH20-A-(3'-5')	0405318-13A E&E	PBOW-04-SO--2BG-BH20-B-(3'-5')	405178-002-010-1/1	5/25/04 1131	8082 PCBs
PBOW-04-SO--2BG-BH20-A-(3'-5')	113697-004, 113697-005	PBOW-04-SO--2BG-BH20-B-(3'-5')	405178-002-010-1/1	5/25/04 1131	8330 Nitros
PBOW-04-SO--2BG-BH20-A-(3'-5')	113697-004, 113697-005	PBOW-04-SO--2BG-BH20-B-(3'-5')	405178-002-012-1/1	5/25/04 1131	6010B/7471A Metals
PBOW-04-SO--2BG-BH20-A-(3'-5')	0405318-13A E&E	PBOW-04-SO--2BG-BH20-B-(3'-5')		5/25/04 1131	8310 PAHs (sub to ALSI)

ATTACHMENT II – QA DATA SUMMARIES

VOLATILE ORGANIC COMPOUNDS

Field Sample ID:	**2BG-BH13-B(3-5)**
Date Collected:	24-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-003-004
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	**4.5**	**= 1.5**	TRANS-1,2-DICHLOROETHENE	ND	< 1.6
1,1,2,2-TETRACHLOROETHANE	ND	< 2.1	TRANS-1,3-DICHLOROPROPENE	ND	< 1.9
1,1,2-TRICHLOROETHANE	ND	< 2.1	TRICHLOROETHENE(TCE)	ND	< 1.9
1,1-DICHLOROETHANE	ND	< 1.7	TRICHLOROFLUOROMETHANE	ND	< 1.5
1,1-DICHLOROETHENE	ND	< 1.5	VINYL CHLORIDE	ND	< 1.6
1,2,4-TRICHLOROBENZENE	ND	< 3.9			
1,2-DIBROMO-3-CHLOROPROP	ND	< 2.1			
1,2-DICHLOROBENZENE	ND	< 1.9			
1,2-DICHLOROETHANE	ND	< 1.6			
1,2-DICHLOROPROPANE	ND	< 1.6			
1,3-DICHLOROBENZENE	ND	< 2.3			
1,4-DICHLOROBENZENE	ND	< 2			
2-BUTANONE	ND	< 4			
2-HEXANONE	ND	< 2.5			
4-METHYL-2-PENTANONE	ND	< 2.3			
ACETONE	**5.2**	**= 4.6**			
BENZENE	ND	< 1.9			
BROMODICHLOROMETHANE	ND	< 1.5			
BROMOFORM	ND	< 1.7			
BROMOMETHANE	ND	< 1.8			
CARBON DISULFIDE	ND	< 1			
CARBON TETRACHLORIDE	ND	< 1.3			
CHLOROBENZENE	ND	< 1.9			
CHLOROETHANE	ND	< 1.7			
CHLOROFORM	ND	< 1.7			
CHLOROMETHANE	ND	< 1.6			
CIS-1,2-DICHLOROETHENE	ND	< 1.6			
CIS-1,3-DICHLOROPROPENE	ND	< 1.3			
CYCLOHEXANE	ND	< 1.6			
DIBROMOCHLOROMETHANE	ND	< 1.5			
DICHLORODIFLUOROMETHANE	ND	< 1.5			
ETHYLBENZENE	ND	< 2.1			
1,2-DIBROMOETHANE (EDB)	ND	< 1.9			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.6			
ISOPROPYLBENZENE	ND	< 2.2			
M,P-XYLENES	ND	< 4			
METHYL ACETATE	ND	< 4.6			
METHYLCYCLOHEXANE	ND	< 1.7			
METHYLENE CHLORIDE	ND	< 1.9			
O-XYLENE	ND	< 1			
STYRENE	ND	< 2.2			
MTBE	ND	< 1.8			
TETRACHLOROETHENE(PCE)	ND	< 2.2			
TOLUENE	ND	< 1.9			

Field Sample ID:	**2BG-BH15-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-001-001
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	ND	< 1.0 UJ	TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	TRANS-1,3-DICHLOROPROPENE	ND	< 1.2 UJ
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	TRICHLOROETHENE(TCE)	ND	< 1.2 UJ
1,1-DICHLOROETHANE	ND	< 1.1 UJ	TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ
1,1-DICHLOROETHENE	ND	< 1.0 UJ	VINYL CHLORIDE	ND	< 1.1 UJ
1,2,4-TRICHLOROBENZENE	ND	< 2.6 UJ			
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.4 UJ			
1,2-DICHLOROBENZENE	ND	< 1.2 UJ			
1,2-DICHLOROETHANE	ND	< 1.1 UJ			
1,2-DICHLOROPROPANE	ND	< 1.1 UJ			
1,3-DICHLOROBENZENE	ND	< 1.5 UJ			
1,4-DICHLOROBENZENE	ND	< 1.3 UJ			
2-BUTANONE	ND	< 2.6 UJ			
2-HEXANONE	ND	< 1.6 UJ			
4-METHYL-2-PENTANONE	ND	< 1.5 UJ			
ACETONE	ND	< 3.1 UJ			
BENZENE	ND	< 1.2 UJ			
BROMODICHLOROMETHANE	ND	< 0.97 UJ			
BROMOFORM	ND	< 1.1 UJ			
BROMOMETHANE	ND	< 1.2 UJ			
CARBON DISULFIDE	ND	< 0.68 UJ			
CARBON TETRACHLORIDE	ND	< 0.88 UJ			
CHLOROBENZENE	ND	< 1.2 UJ			
CHLOROETHANE	ND	< 1.1 UJ			
CHLOROFORM	ND	< 1.1 UJ			
CHLOROMETHANE	ND	< 1.1 UJ			
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ			
CIS-1,3-DICHLOROPROPENE	ND	< 0.84 UJ			
CYCLOHEXANE	ND	< 1.1 UJ			
DIBROMOCHLOROMETHANE	ND	< 1.0 UJ			
DICHLORODIFLUOROMETHANE	ND	< 0.98 UJ			
ETHYLBENZENE	ND	< 1.4 UJ			
1,2-DIBROMOETHANE (EDB)	ND	< 1.2 UJ			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ			
ISOPROPYLBENZENE	ND	< 1.5 UJ			
M,P-XYLENE	ND	< 2.7 UJ			
METHYL ACETATE	ND	< 3.0 UJ			
METHYLCYCLOHEXANE	ND	< 1.1 UJ			
METHYLENE CHLORIDE	**4.3 J**	= 1.3			
O-XYLENE	ND	< 0.67 UJ			
STYRENE	ND	< 1.4 UJ			
MTBE	ND	< 1.2 UJ			
TETRACHLOROETHENE(PCE)	ND	< 1.5 UJ			
TOLUENE	ND	< 1.2 UJ			

Field Sample ID:	**2BG-BH15B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-001-003
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	**7.1 J**	= 1.0	TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	TRANS-1,3-DICHLOROPROPENE	ND	< 1.3 UJ
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	TRICHLOROETHENE(TCE)	ND	< 1.3 UJ
1,1-DICHLOROETHANE	ND	< 1.1 UJ	TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ
1,1-DICHLOROETHENE	ND	< 1.0 UJ	VINYL CHLORIDE	ND	< 1.1 UJ
1,2,4-TRICHLOROBENZENE	ND	< 2.6 UJ			
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.5 UJ			
1,2-DICHLOROBENZENE	ND	< 1.3 UJ			
1,2-DICHLOROETHANE	ND	< 1.1 UJ			
1,2-DICHLOROPROPANE	ND	< 1.1 UJ			
1,3-DICHLOROBENZENE	ND	< 1.5 UJ			
1,4-DICHLOROBENZENE	ND	< 1.3 UJ			
2-BUTANONE	ND	< 2.7 UJ			
2-HEXANONE	ND	< 1.7 UJ			
4-METHYL-2-PENTANONE	ND	< 1.6 UJ			
ACETONE	ND	< 3.1 UJ			
BENZENE	ND	< 1.3 UJ			
BROMODICHLOROMETHANE	ND	< 0.99 UJ			
BROMOFORM	ND	< 1.1 UJ			
BROMOMETHANE	ND	< 1.2 UJ			
CARBON DISULFIDE	**2.3 J**	= 0.70			
CARBON TETRACHLORIDE	ND	< 0.90 UJ			
CHLOROBENZENE	ND	< 1.3 UJ			
CHLOROETHANE	ND	< 1.2 UJ			
CHLOROFORM	ND	< 1.2 UJ			
CHLOROMETHANE	ND	< 1.1 UJ			
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ			
CIS-1,3-DICHLOROPROPENE	ND	< 0.87 UJ			
CYCLOHEXANE	ND	< 1.1 UJ			
DIBROMOCHLOROMETHANE	ND	< 1.1 UJ			
DICHLORODIFLUOROMETHANE	ND	< 1.0 UJ			
ETHYLBENZENE	ND	< 1.5 UJ			
1,2-DIBROMOETHANE (EDB)	ND	< 1.3 UJ			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ			
ISOPROPYLBENZENE	ND	< 1.5 UJ			
M,P-XYLENES	ND	< 2.8 UJ			
METHYL ACETATE	ND	< 3.1 UJ			
METHYLCYCLOHEXANE	ND	< 1.1 UJ			
METHYLENE CHLORIDE	4.0 U	= 1.3			
O-XYLENE	ND	< 0.68 UJ			
STYRENE	ND	< 1.5 UJ			
MTBE	ND	< 1.2 UJ			
TETRACHLOROETHENE(PCE)	**1.9**	= 1.5 UJ			
TOLUENE	ND	< 1.3 UJ			

Field Sample ID:	2BG-BH20B(3-5)
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-002-006
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	ND	< 1.1 UJ	TRANS-1,2-DICHLOROETHENE	ND	< 1.2 UJ
1,1,2,2-TETRACHLOROETHANE	ND	< 1.5 UJ	TRANS-1,3-DICHLOROPROPENE	ND	< 1.4 UJ
1,1,2-TRICHLOROETHANE	ND	< 1.5 UJ	TRICHLOROETHENE(TCE)	ND	< 1.3 UJ
1,1-DICHLOROETHANE	ND	< 1.2 UJ	TRICHLOROFLUOROMETHANE	ND	< 1.1 UJ
1,1-DICHLOROETHENE	ND	< 1.1 UJ	VINYL CHLORIDE	ND	< 1.2 UJ
1,2,4-TRICHLOROBENZENE	ND	< 2.8 UJ			
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.5 UJ			
1,2-DICHLOROBENZENE	ND	< 1.4 UJ			
1,2-DICHLOROETHANE	ND	< 1.2 UJ			
1,2-DICHLOROPROPANE	ND	< 1.2 UJ			
1,3-DICHLOROBENZENE	ND	< 1.6 UJ			
1,4-DICHLOROBENZENE	ND	< 1.4 UJ			
2-BUTANONE	ND	< 2.8 UJ			
2-HEXANONE	ND	< 1.8 UJ			
4-METHYL-2-PENTANONE	ND	< 1.6 UJ			
ACETONE	ND	< 3.3 UJ			
BENZENE	ND	< 1.4 UJ			
BROMODICHLOROMETHANE	ND	< 1.1 UJ			
BROMOFORM	ND	< 1.2 UJ			
BROMOMETHANE	ND	< 1.3 UJ			
CARBON DISULFIDE	ND	< 0.73 UJ			
CARBON TETRACHLORIDE	ND	< 0.95 UJ			
CHLOROBENZENE	ND	< 1.3 UJ			
CHLOROETHANE	ND	< 1.2 UJ			
CHLOROFORM	ND	< 1.2 UJ			
CHLOROMETHANE	ND	< 1.2 UJ			
CIS-1,2-DICHLOROETHENE	ND	< 1.2 UJ			
CIS-1,3-DICHLOROPROPENE	ND	< 0.92 UJ			
CYCLOHEXANE	ND	< 1.2 UJ			
DIBROMOCHLOROMETHANE	ND	< 1.1 UJ			
DICHLORODIFLUOROMETHANE	ND	< 1.1 UJ			
ETHYLBENZENE	ND	< 1.5 UJ			
1,2-DIBROMOETHANE (EDB)	ND	< 1.4 UJ			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.2 UJ			
ISOPROPYLBENZENE	ND	< 1.6 UJ			
M,P-XYLENES	ND	< 2.9 UJ			
METHYL ACETATE	ND	< 3.3 UJ			
METHYLCYCLOHEXANE	ND	< 1.2 UJ			
METHYLENE CHLORIDE	4.4 U	= 1.4			
O-XYLENE	ND	< 0.72 UJ			
STYRENE	ND	< 1.6 UJ			
MTBE	ND	< 1.3 UJ			
TETRACHLOROETHENE(PCE)	ND	< 1.6 UJ			
TOLUENE	ND	< 1.3 UJ			

Field Sample ID:	**2BG-BH21-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-002-004
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	ND	< 1.0 UJ	TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	TRANS-1,3-DICHLOROPROPENE	ND	< 1.2 UJ
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	TRICHLOROETHENE(TCE)	ND	< 1.2 UJ
1,1-DICHLOROETHANE	ND	< 1.1 UJ	TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ
1,1-DICHLOROETHENE	ND	< 0.99 UJ	VINYL CHLORIDE	ND	< 1.1 UJ
1,2,4-TRICHLOROBENZENE	ND	< 2.5 UJ			
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.4 UJ			
1,2-DICHLOROBENZENE	ND	< 1.2 UJ			
1,2-DICHLOROETHANE	ND	< 1.1 UJ			
1,2-DICHLOROPROPANE	ND	< 1.1 UJ			
1,3-DICHLOROBENZENE	ND	< 1.5 UJ			
1,4-DICHLOROBENZENE	ND	< 1.3 UJ			
2-BUTANONE	ND	< 2.6 UJ			
2-HEXANONE	ND	< 1.6 UJ			
4-METHYL-2-PENTANONE	ND	< 1.5 UJ			
ACETONE	ND	< 3.0 UJ			
BENZENE	ND	< 1.2 UJ			
BROMODICHLOROMETHANE	ND	< 0.95 UJ			
BROMOFORM	ND	< 1.1 UJ			
BROMOMETHANE	ND	< 1.2 UJ			
CARBON DISULFIDE	ND	< 0.67 UJ			
CARBON TETRACHLORIDE	ND	< 0.87 UJ			
CHLOROBENZENE	ND	< 1.2 UJ			
CHLOROETHANE	ND	< 1.1 UJ			
CHLOROFORM	ND	< 1.1 UJ			
CHLOROMETHANE	ND	< 1.1 UJ			
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ			
CIS-1,3-DICHLOROPROPENE	ND	< 0.83 UJ			
CYCLOHEXANE	ND	< 1.1 UJ			
DIBROMOCHLOROMETHANE	ND	< 1.0 UJ			
DICHLORODIFLUOROMETHANE	ND	< 0.96 UJ			
ETHYLBENZENE	ND	< 1.4 UJ			
1,2-DIBROMOETHANE (EDB)	ND	< 1.2 UJ			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ			
ISOPROPYLBENZENE	ND	< 1.4 UJ			
XYLMP	ND	< 2.6 UJ			
METHYL ACETATE	ND	< 3.0 UJ			
METHYLCYCLOHEXANE	ND	< 1.1 UJ			
METHYLENE CHLORIDE	ND	< 1.2 UJ			
XYLENES, TOTAL	ND	< 0.66 UJ			
STYRENE	ND	< 1.4 UJ			
MTBE	ND	< 1.2 UJ			
TETRACHLOROETHENE(PCE)	ND	< 1.5 UJ			
TOLUENE	ND	< 1.2 UJ			

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-001-001
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	ND	< 2.6	TRANS-1,2-DICHLOROETHENE	ND	< 2.8
1,1,2,2-TETRACHLOROETHANE	ND	< 3.6	TRANS-1,3-DICHLOROPROPENE	ND	< 3.2
1,1,2-TRICHLOROETHANE	ND	< 3.6	TRICHLOROETHENE(TCE)	ND	< 3.2
1,1-DICHLOROETHANE	ND	< 2.9	TRICHLOROFLUOROMETHANE	ND	< 2.6
1,1-DICHLOROETHENE	ND	< 2.6	VINYL CHLORIDE	ND	< 2.8
1,2,4-TRICHLOROBENZENE	ND	< 6.7			
1,2-DIBROMO-3-CHLOROPROP	ND	< 3.7			
1,2-DICHLOROBENZENE	ND	< 3.2			
1,2-DICHLOROETHANE	ND	< 2.8			
1,2-DICHLOROPROPANE	ND	< 2.8			
1,3-DICHLOROBENZENE	ND	< 3.9			
1,4-DICHLOROBENZENE	ND	< 3.4			
2-BUTANONE	ND	< 6.8			
2-HEXANONE	ND	< 4.2			
4-METHYL-2-PENTANONE	ND	< 3.9			
ACETONE	**14**	= **8**			
BENZENE	ND	< 3.2			
BROMODICHLOROMETHANE	ND	< 2.5			
BROMOFORM	ND	< 2.9			
BROMOMETHANE	ND	< 3.1			
CARBON DISULFIDE	ND	< 1.8			
CARBON TETRACHLORIDE	ND	< 2.3			
CHLOROBENZENE	ND	< 3.2			
CHLOROETHANE	ND	< 3			
CHLOROFORM	ND	< 3			
CHLOROMETHANE	ND	< 2.8			
CIS-1,2-DICHLOROETHENE	ND	< 2.8			
CIS-1,3-DICHLOROPROPENE	ND	< 2.2			
CYCLOHEXANE	ND	< 2.8			
DIBROMOCHLOROMETHANE	ND	< 2.7			
DICHLORODIFLUOROMETHANE	ND	< 2.5			
ETHYLBENZENE	ND	< 3.7			
1,2-DIBROMOETHANE (EDB)	ND	< 3.2			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 2.8			
ISOPROPYLBENZENE	ND	< 3.8			
M,P-XYLENES	ND	< 7			
METHYL ACETATE	ND	< 7.9			
METHYLCYCLOHEXANE	ND	< 2.9			
METHYLENE CHLORIDE	7.5 U	= 3.3			
O-XYLENE	ND	< 1.7			
STYRENE	ND	< 3.8			
MTBE	ND	< 3.1			
TETRACHLOROETHENE(PCE)	ND	< 3.8			
TOLUENE	ND	< 3.2			

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	GPL
Lab Sample ID:	405129-001-001
Sample Matrix	Soil
Analysis:	Volatile Organic Compounds
Test Method:	SW8260
Units:	UG/KG

1,1,1-TRICHLOROETHANE	**61 J**	= 3	TRANS-1,2-DICHLOROETHENE	ND	< 3.1 UJ
1,1,2,2-TETRACHLOROETHANE	ND	< 4 UJ	TRANS-1,3-DICHLOROPROPENE	ND	< 3.6 UJ
1,1,2-TRICHLOROETHANE	ND	< 4.1 UJ	TRICHLOROETHENE(TCE)	ND	< 3.6 UJ
1,1-DICHLOROETHANE	**6.1 J**	= 3.3	TRICHLOROFLUOROMETHANE	ND	< 3 UJ
1,1-DICHLOROETHENE	ND	< 2.9 UJ	VINYL CHLORIDE	ND	< 3.1 UJ
1,2,4-TRICHLOROBENZENE	ND	< 7.3 UJ			
1,2-DIBROMO-3-CHLOROPROP	ND	< 4.1 UJ			
1,2-DICHLOROBENZENE	ND	< 3.6 UJ			
1,2-DICHLOROETHANE	ND	< 3.1 UJ			
1,2-DICHLOROPROPANE	ND	< 3.2 UJ			
1,3-DICHLOROBENZENE	ND	< 4.4 UJ			
1,4-DICHLOROBENZENE	ND	< 3.8 UJ			
2-BUTANONE	ND	< 7.7 UJ			
2-HEXANONE	ND	< 4.8 UJ			
4-METHYL-2-PENTANONE	ND	< 4.4 UJ			
ACETONE	ND	< 8.9 UJ			
BENZENE	**11 J**	= 3.6			
BROMODICHLOROMETHANE	ND	< 2.8 UJ			
BROMOFORM	ND	< 3.2 UJ			
BROMOMETHANE	ND	< 3.5 UJ			
CARBON DISULFIDE	ND	< 2 UJ			
CARBON TETRACHLORIDE	ND	< 2.6 UJ			
CHLOROBENZENE	ND	< 3.6 UJ			
CHLOROETHANE	ND	< 3.4 UJ			
CHLOROFORM	ND	< 3.3 UJ			
CHLOROMETHANE	ND	< 3.2 UJ			
CIS-1,2-DICHLOROETHENE	ND	< 3.2 UJ			
CIS-1,3-DICHLOROPROPENE	ND	< 2.5 UJ			
CYCLOHEXANE	ND	< 3.2 UJ			
DIBROMOCHLOROMETHANE	ND	< 3 UJ			
DICHLORODIFLUOROMETHANE	ND	< 2.9 UJ			
ETHYLBENZENE	ND	< 4.1 UJ			
1,2-DIBROMOETHANE (EDB)	ND	< 3.6 UJ			
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 3.1 UJ			
ISOPROPYLBENZENE	ND	< 4.3 UJ			
M,P-XYLENE	ND	< 7.8 UJ			
METHYL ACETATE	ND	< 8.9 UJ			
METHYLCYCLOHEXANE	ND	< 3.3 UJ			
METHYLENE CHLORIDE	12 U	= 3.7			
O-XYLENE	ND	< 2 UJ			
STYRENE	ND	< 4.2 UJ			
MTBE	ND	< 3.5 UJ			
TETRACHLOROETHENE(PCE)	ND	< 4.3 UJ			
TOLUENE	ND	< 3.6 UJ			

PAHs

Field Sample ID:	**2BG-BH13-B(3-5)**
Date Collected:	24-May-04
Date Received:	25-May-04
Laboratory:	ALS
Lab Sample ID:	405170-001-270263006
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.17
ACENAPHTHYLENE	ND	< 0.2
ANTHRACENE	ND	< 0.003
BENZO(A)ANTHRACENE	ND	< 0.007
BENZO(A)PYRENE	ND	< 0.01
BENZO(B)FLUORANTHENE	ND	< 0.007
BENZO(G,H,I)PERYLENE	ND	< 0.01
BENZO(K)FLUORANTHENE	ND	< 0.007
CHRYSENE	ND	< 0.003
DIBENZ(A,H)ANTHRACENE	ND	< 0.02
FLUORANTHENE	ND	< 0.02
FLUORENE	ND	< 0.02
INDENO(1,2,3-C,D)PYRENE	ND	< 0.007
NAPHTHALENE	ND	< 0.033
PHENANTHRENE	ND	< 0.003
PYRENE	ND	< 0.01

Field Sample ID:	**2BG-BH15-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-001-270263002
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.21
ACENAPHTHYLENE	ND	< 0.247
ANTHRACENE	ND	< 0.0037
BENZO(A)ANTHRACENE	ND	< 0.0086
BENZO(A)PYRENE	**7.52**	= 0.0123
BENZO(B)FLUORANTHENE	ND	< 0.0086
BENZO(G,H,I)PERYLENE	ND	< 0.0123
BENZO(K)FLUORANTHENE	ND	< 0.0086
CHRYSENE	ND	< 0.0037
DIBENZ(A,H)ANTHRACENE	ND	< 0.0247
FLUORANTHENE	ND	< 0.0247
FLUORENE	ND	< 0.0247
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0086
NAPHTHALENE	ND	< 0.0407
PHENANTHRENE	ND	< 0.0037
PYRENE	ND	< 0.0123

Field Sample ID:	**2BG-BH15B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	ALSI
Lab Sample ID:	405178-001-270263008
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.213
ACENAPHTHYLENE	ND	< 0.25
ANTHRACENE	ND	< 0.0038
BENZO(A)ANTHRACENE	ND	< 0.0088
BENZO(A)PYRENE	ND	< 0.0125
BENZO(B)FLUORANTHENE	ND	< 0.0088
BENZO(G,H,I)PERYLENE	ND	< 0.0125
BENZO(K)FLUORANTHENE	ND	< 0.0038
CHRYSENE	ND	< 0.0038
DIBENZ(A,H)ANTHRACENE	ND	< 0.025
FLUORANTHENE	ND	< 0.025
FLUORENE	ND	< 0.025
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0088
NAPHTHALENE	ND	< 0.0413
PHENANTHRENE	ND	< 0.0038
PYRENE	ND	< 0.0125

Field Sample ID:	**2BG-BH20B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	ALSI
Lab Sample ID:	405178-002-270263009
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.21
ACENAPHTHYLENE	ND	< 0.247
ANTHRACENE	ND	< 0.0037
BENZO(A)ANTHRACENE	ND	< 0.0086
BENZO(A)PYRENE	ND	< 0.0123
BENZO(B)FLUORANTHENE	ND	< 0.0086
BENZO(G,H,I)PERYLENE	ND	< 0.0123
BENZO(K)FLUORANTHENE	ND	< 0.0086
CHRYSENE	ND	< 0.0037
DIBENZ(A,H)ANTHRACENE	ND	< 0.0247
FLUORANTHENE	ND	< 0.0247
FLUORENE	ND	< 0.0247
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0086
NAPHTHALENE	ND	< 0.0407
PHENANTHRENE	ND	< 0.0037
PYRENE	ND	< 0.0123

Field Sample ID:	**2BG-BH21-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	ALSI
Lab Sample ID:	405163-002-270263005
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.213
ACENAPHTHYLENE	ND	< 0.25
ANTHRACENE	ND	< 0.0038
BENZO(A)ANTHRACENE	ND	< 0.0088
BENZO(A)PYRENE	ND	< 0.0125
BENZO(B)FLUORANTHENE	ND	< 0.0088
BENZO(G,H,I)PERYLENE	ND	< 0.0125
BENZO(K)FLUORANTHENE	ND	< 0.0088
CHRYSENE	ND	< 0.0038
DIBENZ(A,H)ANTHRACENE	ND	< 0.025
FLUORANTHENE	ND	< 0.025
FLUORENE	ND	< 0.025
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0088
NAPHTHALENE	ND	< 0.0413
PHENANTHRENE	ND	< 0.0038
PYRENE	ND	< 0.0125

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	ALSI
Lab Sample ID:	405170-001-270263006
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.395
ACENAPHTHYLENE	ND	< 0.465
ANTHRACENE	ND	< 0.007
BENZO(A)ANTHRACENE	ND	< 0.0163
BENZO(A)PYRENE	**25.6**	= 0.0233
BENZO(B)FLUORANTHENE	**39.5**	= 0.0163
BENZO(G,H,I)PERYLENE	ND	< 0.0233
BENZO(K)FLUORANTHENE	ND	< 0.0163
CHRYSENE	ND	< 0.007
DIBENZ(A,H)ANTHRACENE	ND	< 0.0465
FLUORANTHENE	**59.3**	= 0.0465
FLUORENE	ND	< 0.0465
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0163
NAPHTHALENE	ND	< 0.0767
PHENANTHRENE	ND	< 0.007
PYRENE	**45.1**	= 0.0233

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	ALSI
Lab Sample ID:	405129-001-270263001
Sample Matrix	Soil
Analysis:	PAHs
Test Method:	SW8310
Units:	UG/KG

ACENAPHTHENE	ND	< 0.254
ACENAPHTHYLENE	ND	< 0.299
ANTHRACENE	ND	< 0.0045
BENZO(A)ANTHRACENE	ND	< 0.0104
BENZO(A)PYRENE	ND	< 0.0149
BENZO(B)FLUORANTHENE	ND	< 0.0104
BENZO(G,H,I)PERYLENE	ND	< 0.0149
BENZO(K)FLUORANTHENE	ND	< 0.0104
CHRYSENE	ND	< 0.0045
DIBENZ(A,H)ANTHRACENE	ND	< 0.0299
FLUORANTHENE	**71.5**	= 0.0299
FLUORENE	ND	< 0.0299
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0104
NAPHTHALENE	**2537**	= 0.0493
PHENANTHRENE	**92.7**	= 0.0045
PYRENE	**90.9**	= 0.0149

EXPLOSIVE COMPOUNDS

Field Sample ID:	**2BG-BH13-B(3-5)**
Date Collected:	24-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-003-008
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	ND	< 25 UJ
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	ND	< 26 UJ
2,4-DNT	ND	< 30 UJ
2,6-DNT	ND	< 55 UJ
2-amino-4,6-DNT	ND	< 19 UJ
4-amino-2,6-DNT	ND	< 36 UJ
HMX	ND	< 21 UJ
3-Nitrotoluene	ND	< 75 UJ
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	ND	< 150 UJ
4-Nitrotoluene	ND	< 74 UJ
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**2BG-BH15-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-001-007
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	**1300 J**	= 25
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	**170000 J**	= 26
2,4-DNT	**1500 J**	= 30
2,6-DNT	**600 J**	= 55
2-amino-4,6-DNT	**4100 J**	= 19
4-amino-2,6-DNT	**5400 J**	= 36
HMX	ND	< 51 UJ
3-Nitrotoluene	ND	< 75 UJ
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	ND	< 150 UJ
4-Nitrotoluene	ND	< 74 UJ
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**2BG-BH15B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-001-009
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	ND	< 25 UJ
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	**570 J**	= 26
2,4-DNT	**1300 J**	= 30
2,6-DNT	**860 J**	= 55
2-amino-4,6-DNT	**500 J**	= 19
4-amino-2,6-DNT	**460 J**	= 36
HMX	ND	< 51 UJ
3-Nitrotoluene	**290 J**	= 75
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	**2800 J**	= 150
4-Nitrotoluene	**1700 J**	= 74
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**2BG-BH20B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-002-010
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	ND	< 25 UJ
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	ND	< 26 UJ
2,4-DNT	**540 J**	= 30
2,6-DNT	**960 J**	= 55
2-amino-4,6-DNT	ND	< 19 UJ
4-amino-2,6-DNT	ND	< 36 UJ
HMX	ND	< 51 UJ
3-Nitrotoluene	**260 J**	= 75
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	**1600 J**	= 150
4-Nitrotoluene	**1500 J**	= 74
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**2BG-BH21-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-002-008
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	ND	< 25 UJ
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	**630 J**	= 26
2,4-DNT	**63 J**	= 30 UJ
2,6-DNT	ND	< 55 UJ
2-amino-4,6-DNT	**190 J**	= 19
4-amino-2,6-DNT	**190 J**	= 36
HMX	ND	< 51 UJ
3-Nitrotoluene	ND	< 75 UJ
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	ND	< 150 UJ
4-Nitrotoluene	ND	< 74 UJ
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-001-007
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	ND	< 25 UJ
1,3-Dinitrobenzene	ND	< 10 UJ
2,4,6-TNT	ND	< 26 UJ
2,4-DNT	ND	< 30 UJ
2,6-DNT	ND	< 55 UJ
2-amino-4,6-DNT	ND	< 19 UJ
4-amino-2,6-DNT	ND	< 36 UJ
HMX	ND	< 51 UJ
3-Nitrotoluene	ND	< 75 UJ
Nitrobenzene	ND	< 32 UJ
2-Nitrotoluene	ND	< 150 UJ
4-Nitrotoluene	ND	< 74 UJ
RDX	ND	< 76 UJ
Tetryl	ND	< 170 UJ

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	GPL
Lab Sample ID:	405129-001-004
Sample Matrix	Soil
Analysis:	Explosive Compounds
Test Method:	SW8330
Units:	UG/KG

1,3,5-Trinitrobenzene	**50,000 J**	=	2
1,3-Dinitrobenzene	**3,100 J**	=	10
2,4,6-TNT	**1,700,000 J**	=	2
2,4-DNT	**220,000 J**	=	2
2,6-DNT	**310,000 J**	=	2
2-amino-4,6-DNT	**170,000 J**	=	2
4-amino-2,6-DNT	**80,000 J**	=	2
HMX	ND	<	51 UJ
3-Nitrotoluene	**1,900 J**	=	75
Nitrobenzene	ND	<	32 UJ
2-Nitrotoluene	**13,000 J**	=	150
4-Nitrotoluene	**1,100 J**	=	74
RDX	**10,000 J**	=	76
Tetryl	ND	<	170 UJ

PCBs

Field Sample ID:	**2BG-BH13-B(3-5)**
Date Collected:	24-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-003-008
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 4.6 UJ
PCB 1221	ND	< 0.04 UJ
PCB 1232	ND	< 12 UJ
PCB 1242	ND	< 5.6 UJ
PCB 1248	ND	< 8.5 UJ
PCB 1254	ND	< 8.8 UJ
PCB 1260	ND	< 3.5 UJ

Field Sample ID:	**2BG-BH15-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-001-007
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 4.6 UJ
PCB 1221	ND	< 0.040 UJ
PCB 1232	ND	< 12 UJ
PCB 1242	ND	< 5.7 UJ
PCB 1248	ND	< 8.6 UJ
PCB 1254	ND	< 8.9 UJ
PCB 1260	**130 J**	= 3.6

Field Sample ID:	**2BG-BH15B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-001-009
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 4.7 UJ
PCB 1221	ND	< 0.040 UJ
PCB 1232	ND	< 12 UJ
PCB 1242	ND	< 5.7 UJ
PCB 1248	ND	< 8.7 UJ
PCB 1254	ND	< 9.0 UJ
PCB 1260	ND	< 3.6 UJ

Field Sample ID:	**2BG-BH20B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-002-010
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 4.6 UJ
PCB 1221	ND	< 0.040 UJ
PCB 1232	ND	< 12 UJ
PCB 1242	ND	< 5.7 UJ
PCB 1248	ND	< 8.6 UJ
PCB 1254	ND	< 8.9 UJ
PCB 1260	ND	< 3.6 UJ

Field Sample ID:	**2BG-BH21-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-002-008
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 4.7 UJ
PCB 1221	ND	< 0.040 UJ
PCB 1232	ND	< 12 UJ
PCB 1242	ND	< 5.7 UJ
PCB 1248	ND	< 8.7 UJ
PCB 1254	ND	< 9.0 UJ
PCB 1260	27 J	= 3.6

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-001-007
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 8.7 UJ
PCB 1221	ND	< 0.08 UJ
PCB 1232	ND	< 23 UJ
PCB 1242	ND	< 11 UJ
PCB 1248	ND	< 16 UJ
PCB 1254	ND	< 17 UJ
PCB 1260	ND	< 6.7 UJ

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	GPL
Lab Sample ID:	405129-001-004
Sample Matrix	Soil
Analysis:	PCBs
Test Method:	SW8082
Units:	UG/KG

PCB 1016	ND	< 5.6 UJ
PCB 1221	ND	< 0.05 UJ
PCB 1232	ND	< 15 UJ
PCB 1242	ND	< 6.9 UJ
PCB 1248	ND	< 11 UJ
PCB 1254	ND	< 11 UJ
PCB 1260	ND	< 4.4 UJ

METALS

Field Sample ID:	**2BG-BH13-B(3-5)**
Date Collected:	24-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-003-010
Sample Matrix	Soil
Analysis:	TAL Metals
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**12300**	**J**	= 0.92
Antimony	**0.4**	J	= 0.24
Arsenic	**14.3**		= 0.27
Barium	**88.9**	J	= 0.011
Beryllium	**0.8**	J	= 0.0093
Cadmium	ND		< 0.025
Calcium	**3620**		= 5.5
Chromium	**20.5**	**J**	= 0.033
Cobalt	**13.7**	**J**	= 0.062
Copper	**27.9**	**J**	= 0.063
Iron	**30700**	**J**	= 2.3
Lead	**15.4**	**J**	= 0.093
Magnesium	**3920**	**J**	= 0.67
Manganese	**486**	**J**	= 0.011
Nickel	**30.6**	**J**	= 0.044
Potassium	**1270**	**J**	= 2.1
Selenium	**0.53**		= 0.46
Silver	ND		< 0.093
Sodium	**116**		= 23.3
Thallium	**0.92**		= 0.28
Vanadium	**33.3**	**J**	= 0.059
Zinc	**72.3**	J	= 0.41
Mercury	**0.027**		= 0.015

Field Sample ID:	**2BG-BH15-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-001-009
Sample Matrix	Soil
Analysis:	TAL Metals
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**9180 J**	= 1.3
Antimony	**0.70 J**	= 0.32
Arsenic	**8.0**	= 0.37
Barium	**106 J**	= 0.016
Beryllium	**0.68 J**	= 0.013
Cadmium	**0.16**	= 0.034
Calcium	**5390 J**	= 7.6
Chromium	**13.8**	= 0.045
Cobalt	**7.9**	= 0.086
Copper	**33.9**	= 0.087
Iron	**16,400 J**	= 3.2
Lead	**126**	= 0.13
Magnesium	**2580 J**	= 0.92
Manganese	**367 J**	= 0.016
Nickel	**19.8**	= 0.06
Potassium	**961 J**	= 2.9
Selenium	**0.75**	= 0.63
Silver	**0.17**	= 0.13
Sodium	**158**	= 32.0
Thallium	**0.70**	= 0.38
Vanadium	**21.4**	= 0.081
Zinc	**120**	= 0.56
Mercury	**0.092**	= 0.016

Field Sample ID:	**2BG-BH15B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-001-011
Sample Matrix	Soil
Analysis:	TAL
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**9,490**		= 1.1
Antimony	**0.49**	J	= 0.27
Arsenic	**12.9**		= 0.31
Barium	**72.5**		= 0.013
Beryllium	**0.59**		= 0.011
Cadmium	**0.15**		= 0.029
Calcium	**4,090**		= 6.2
Chromium	**15.2**		= 0.038
Cobalt	**9.7**		= 0.072
Copper	**26.3**	J	= 0.073
Iron	**24,500**		= 2.7
Lead	**14.3**		= 0.11
Magnesium	**3,050**	J	= 0.77
Manganese	**523**		= 0.013
Nickel	**26.4**		= 0.050
Potassium	**1,070**	J	= 2.5
Selenium	ND		< 0.53 UJ
Silver	ND		< 0.11
Sodium	**149**		= 26.8
Thallium	ND		< 0.32
Vanadium	**27.7**	J	= 0.068
Zinc	**53.7**		= 0.47
Mercury	**0.029**		= 0.013

Field Sample ID:	**2BG-BH20B(3-5)**
Date Collected:	25-May-04
Date Received:	26-May-04
Laboratory:	GPL
Lab Sample ID:	405178-002-012
Sample Matrix	Soil
Analysis:	TAL
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**14400**		= 1.1
Antimony	**0.71**	**J**	= 0.28
Arsenic	**18.2**		= 0.32
Barium	**99.4**		= 0.014
Beryllium	**0.93**		= 0.011
Cadmium	**0.39**		= 0.030
Calcium	**3280**		= 0.5
Chromium	**22.5**		= 0.078
Cobalt	**18.5**		= 0.073
Copper	**32.2**	**J**	= 0.074
Iron	**39100**		= 2.7
Lead	**17.4**		= 0.22
Magnesium	**4410**	**J**	= 1.6
Manganese	**1100**		= 0.027
Nickel	**41**		= 0.052
Potassium	**1860**	**J**	= 2.5
Selenium	ND		< 1.1 UJ
Silver	ND		< 0.22
Sodium	**138**		= 27.4
Thallium	ND		< 0.66
Vanadium	**38.4**	**J**	= 0.069
Zinc	**68.1**		= 0.48
Mercury	**0.022**		= 0.017

Field Sample ID:	**2BG-BH21-B(0-1)**
Date Collected:	21-May-04
Date Received:	22-May-04
Laboratory:	GPL
Lab Sample ID:	405163-002-010
Sample Matrix	Soil
Analysis:	TAL Metals
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**10200 J**	= 1.1
Antimony	**0.94 J**	= 0.30
Arsenic	**6.5**	= 0.34
Barium	**72.3 J**	= 0.014
Beryllium	**0.65 J**	= 0.012
Cadmium	**0.060**	= 0.031
Calcium	**4230 J**	= 6.9
Chromium	**15.6**	= 0.041
Cobalt	**5.1**	= 0.078
Copper	**19.7**	= 0.079
Iron	**17200 J**	= 2.9
Lead	**47**	= 0.12
Magnesium	**2590 J**	= 0.83
Manganese	**173 J**	= 0.014
Nickel	**16.8**	= 0.055
Potassium	**1030 J**	= 2.7
Selenium	**0.68**	= 0.57
Silver	ND	< 0.12
Sodium	**161**	= 29.1
Thallium	ND	< 0.35
Vanadium	**24.6**	= 0.073
Zinc	**59.9**	= 0.51
Mercury	**0.049**	= 0.017

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	GPL
Lab Sample ID:	405170-001-009
Sample Matrix	Soil
Analysis:	TAL Metals
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**14800**	**J**	= 1.6
Antimony	**1.2**	**J**	= 0.42
Arsenic	**10.2**		= 0.48
Barium	**115**	**J**	= 0.02
Beryllium	**0.94**	**J**	= 0.016
Cadmium	**0.55**		= 0.044
Calcium	**8850**		= 9.7
Chromium	**24.1**	**J**	= 0.058
Cobalt	**12.4**	**J**	= 0.11
Copper	**35**	**J**	= 0.11
Iron	**32500**	**J**	= 4.1
Lead	**29.3**	**J**	= 0.16
Magnesium	**5050**	**J**	= 1.2
Manganese	**190**	**J**	= 0.02
Nickel	**34.5**	**J**	= 0.077
Potassium	**1980**	**J**	= 3.8
Selenium	**2**		= 0.81
Silver	ND		< 0.16
Sodium	**200**		= 41.2
Thallium	**1**		= 0.49
Vanadium	**36**	**J**	= 0.1
Zinc	**129**	**J**	= 0.72
Mercury	**0.086**		= 0.025

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	GPL
Lab Sample ID:	405129-001-005
Sample Matrix	Soil
Analysis:	TAL Metals
Test Method:	SW6010 / SW7471A (Hg only)
Units:	MG/KG

Aluminum	**6190 J**	= 1.7
Antimony	**4.9 J**	= 0.43
Arsenic	**11.6**	= 0.49
Barium	**3060 J**	= 0.1
Beryllium	**0.49 J**	= 0.017
Cadmium	**1.9**	= 0.045
Calcium	**6780 J**	= 3.9
Chromium	**42.4**	= 0.059
Cobalt	**11.3**	= 0.56
Copper	**1820**	= 0.57
Iron	**36700 J**	= 4.2
Lead	**8440**	= 0.84
Magnesium	**7600 J**	= 1.2
Manganese	**348 J**	= 0.021
Nickel	**88**	= 0.079
Potassium	**1350 J**	= 3.8
Selenium	**1**	= 0.83
Silver	**1.1**	= 0.17
Sodium	**1210**	= 210
Thallium	**ND**	= 0.5
Vanadium	**17.7**	= 0.11
Zinc	**784**	= 3.7
Mercury	**0.11**	= 0.021

DIOXINS/FURANS

Field Sample ID:	**2BG-SD02-B**
Date Collected:	23-May-04
Date Received:	25-May-04
Laboratory:	Paradigm
Lab Sample ID:	105670640
Sample Matrix	Soil
Analysis:	Dioxins/Furans
Test Method:	SW8290
Units:	NG/KG

2,3,7,8-TCDF	**310**	= 0.21
2,3,7,8-TCDD	**16**	= 0.36
1,2,3,7,8-PeCDF	**160**	= 0.58
2,3,4,7,8-PeCDF	**280**	= 0.4
1,2,3,7,8-PeCDD	**69**	= 0.23
1,2,3,4,7,8-HxCDF	**130**	= 0.43
1,2,3,6,7,8-HxCDF	**110**	= 0.44
2,3,4,6,7,8-HxCDF	**150**	= 0.15
1,2,3,7,8,9-HxCDF	**36**	= 0.4
1,2,3,4,7,8-HxCDD	**45**	= 0.44
1,2,3,6,7,8-HxCDD	**120**	= 0.27
1,2,3,7,8,9-HxCDD	**67**	= 0.18
1,2,3,4,6,7,8-HpCDF	**480**	= 0.54
1,2,3,4,7,8,9-HpCDF	**40**	= 0.41
1,2,3,4,6,7,8-HpCDD	**1800**	= 0.24
OCDF	**710**	= 0.26
OCDD	**18000**	= 0.3
Total TCDF	**3200**	= 0.21
Total TCDD	**480**	= 0.36
Total PeCDF	**2300**	= 0.49
Total PeCDD	**810**	= 0.23
Total HxCDF	**1100**	= 0.43
Total HxCDD	**1600**	= 0.3
Total HpCDF	**920**	= 0.48
Total HpCDD	**5000**	= 0.24

Field Sample ID:	**TR05-1-B**
Date Collected:	19-May-04
Date Received:	20-May-04
Laboratory:	Paradigm
Lab Sample ID:	105665079
Sample Matrix	Soil
Analysis:	Dioxins/Furans
Test Method:	SW8290
Units:	UG/KG

2,3,7,8-TCDF	**70**	= 0.14
2,3,7,8-TCDD	**0.26 J**	= 0.19
1,2,3,7,8-PeCDF	**20**	= 0.18
2,3,4,7,8-PeCDF	**67**	= 0.16
1,2,3,7,8-PeCDD	ND	< 0.15
1,2,3,4,7,8-HxCDF	**28**	= 0.15
1,2,3,6,7,8-HxCDF	**11**	= 0.17
2,3,4,6,7,8-HxCDF	**17**	= 0.23
1,2,3,7,8,9-HxCDF	**2.7 J**	= 0.21
1,2,3,4,7,8-HxCDD	ND	< 0.33
1,2,3,6,7,8-HxCDD	ND	< 0.22
1,2,3,7,8,9-HxCDD	ND	< 0.23
1,2,3,4,6,7,8-HpCDF	**12**	= 0.2
1,2,3,4,7,8,9-HpCDF	**1.5 J**	= 0.28
1,2,3,4,6,7,8-HpCDD	**9**	= 0.19
OCDF	**4.4 J**	= 0.37
OCDD	**52**	= 0.36
Total TCDF	**430**	= 0.14
Total TCDD	**0.71**	= 0.19
Total PeCDF	**350**	= 0.17
Total PeCDD	ND	< 0.15
Total HxCDF	**130**	= 0.19
Total HxCDD	ND	< 0.26
Total HpCDF	**17**	= 0.24
Total HpCDD	**17**	= 0.19

Field Sample ID:	**2BG-TR-09-1-A**
Date Collected:	19-May-04
Date Received:	21-May-04
Laboratory:	Paradigm
Lab Sample ID:	105665087
Sample Matrix	Soil
Analysis:	Dioxins/Furans
Test Method:	SW8290
Units:	UG/KG

2,3,7,8-TCDF	**250**	= 0.23
2,3,7,8-TCDD	**1.1**	= 0.18
1,2,3,7,8-PeCDF	**76**	= 0.24
2,3,4,7,8-PeCDF	**270**	= 0.22
1,2,3,7,8-PeCDD	**3.1**	= 0.26
1,2,3,4,7,8-HxCDF	**110**	= 0.26
1,2,3,6,7,8-HxCDF	**43**	= 0.33
2,3,4,6,7,8-HxCDF	**71**	= 0.28
1,2,3,7,8,9-HxCDF	**12**	= 0.67
1,2,3,4,7,8-HxCDD	**2.1**	= 0.41
1,2,3,6,7,8-HxCDD	**5.8**	= 0.37
1,2,3,7,8,9-HxCDD	**4.7**	= 0.22
1,2,3,4,6,7,8-HpCDF	**47**	= 0.54
1,2,3,4,7,8,9-HpCDF	**6.6**	= 0.31
1,2,3,4,6,7,8-HpCDD	**67**	= 0.23
OCDF	**16**	= 0.28
OCDD	**310**	= 0.45
Total TCDF	**1500**	= 0.23
Total TCDD	**7.5**	= 0.18
Total PeCDF	**1300**	= 0.23
Total PeCDD	**14**	= 0.26
Total HxCDF	**500**	= 0.38
Total HxCDD	**17**	= 0.34
Total HpCDF	**79**	= 0.43
Total HpCDD	**120**	= 0.23

ATTACHMENT III – QA/QC DATA COMPARISON

TAL Metals	QA Results 2BG-SD02-B			QC Results 2BG-SD02-A			
Aluminum	14800	J	= 1.6	11310		= 1.57	MG/KG
Antimony	1.2	J	= 0.42	ND		< 0.681 UJ	MG/KG
Arsenic	10.2		= 0.48	5.55		= 0.41	MG/KG
Barium	115	J	= 0.02	77.3		= 0.132	MG/KG
Beryllium	0.94	J	= 0.016	0.648	J	= 0.0992	MG/KG
Cadmium	0.55		= 0.044	0.93	J	= 0.0948	MG/KG
Calcium	8850		= 9.7	9150		= 2.59	MG/KG
Chromium	24.1	J	= 0.058	17.2		= 0.32	MG/KG
Cobalt	12.4	J	= 0.11	6.86		= 0.158	MG/KG
Copper	35	J	= 0.11	26.6		= 0.403	MG/KG
Iron	32500	J	= 4.1	18510		= 3.11	MG/KG
Lead	29.3	J	= 0.16	28.1		= 0.563	MG/KG
Magnesium	5050	J	= 1.2	3770		= 1.16	MG/KG
Manganese	190	J	= 0.02	114		= 0.26	MG/KG
Nickel	34.5	J	= 0.077	21.2		= 0.0019	MG/KG
Potassium	1980	J	= 3.8	2280		= 0.169	MG/KG
Selenium	2		= 0.81	2.82		= 7.1	MG/KG
Silver	ND		< 0.16	ND		= 0.322	MG/KG
Sodium	200		= 41.2	89.9		= 0.179	MG/KG
Thallium	1		= 0.49	ND		= 7.21	MG/KG
Vanadium	36	J	= 0.1	27.5		= 1.98	MG/KG
Zinc	129	J	= 0.72	98.6		= 0.18	MG/KG
Mercury	0.086		= 0.025	0.0711		= 0.334	MG/KG

TAL Metals	QA Results 2BG-BH13-B(3-5)			QC Results 2BG-BH13-A(3-5)			
Aluminum	12300	J	= 0.92	13140		0.941	MG/KG
Antimony	0.4	J	= 0.24	ND		0.407 UJ	MG/KG
Arsenic	14.3		= 0.27	12.8		0.245	MG/KG
Barium	88.9	J	= 0.011	112		0.0791	MG/KG
Beryllium	0.8	J	= 0.00932	0.793		0.0593	MG/KG
Cadmium	ND		< 0.025	0.299	J	0.0567	MG/KG
Calcium	3620		= 5.5	3420		1.55	MG/KG
Chromium	20.5	J	= 0.033	20.6		0.191	MG/KG
Cobalt	13.7	J	= 0.062	16.2		0.0946	MG/KG
Copper	27.9	J	= 0.063	25.7		0.241	MG/KG
Iron	30700	J	= 2.3	24350		1.86	MG/KG
Lead	15.4	J	= 0.093	14		0.336	MG/KG
Magnesium	3920	J	= 0.67	3590		0.694	MG/KG
Manganese	486	J	= 0.011	1070		0.155	MG/KG
Nickel	30.6	J	= 0.044	34.6		0.101	MG/KG
Potassium	1270	J	= 2.1	2060		4.24	MG/KG
Selenium	0.53		= 0.46	0.755	B	0.192	MG/KG
Silver	ND		< 0.093	ND		< 0.107	MG/KG
Sodium	116		= 23.3	82.1		4.31	MG/KG
Thallium	0.92		= 0.28	ND		< 1.19	MG/KG
Vanadium	33.3	J	= 0.059	35.9		0.108	MG/KG
Zinc	72.3	J	= 0.41	54.7		0.2	MG/KG
Mercury	0.027		= 0.015	0.027		0.00117	MG/KG

TAL Metals	QA Results 2BG-BH15-B(3-5)		QC Results 2BG-BH15-A(3-5)		
Aluminum	9,490	= 1.1	9690 J	= 0.992	MG/KG
Antimony	0.49 J	= 0.27	ND	< 0.43	MG/KG
Arsenic	12.9	= 0.31	13.6 J	= 0.258	MG/KG
Barium	72.5	= 0.013	48.7 J	= 0.0835	MG/KG
Beryllium	0.59	= 0.011	0.584 J	= 0.0626	MG/KG
Cadmium	0.15	= 0.029	0.121 J	= 0.0598	MG/KG
Calcium	4,090	= 6.3	9000 J	= 1.63	MG/KG
Chromium	16.2	= 0.038	15.7 J	= 0.202	MG/KG
Cobalt	9.7	= 0.072	7.54 J	= 0.0999	MG/KG
Copper	26.3 J	= 0.073	23 J	= 0.254	MG/KG
Iron	24,500	= 2.7	22780 J	= 1.96	MG/KG
Lead	14.3	= 0.11	10.8 J	= 0.355	MG/KG
Magnesium	3050 J	= 0.77	4450 J	= 0.732	MG/KG
Manganese	523	= 0.013	283 J	= 0.164	MG/KG
Nickel	26.4	= 0.050	21.7 J	= 0.107	MG/KG
Potassium	1,070 J	= 2.5	1420 J	= 4.48	MG/KG
Selenium	ND	< 0.53 UJ	1.89 J	= 0.203	MG/KG
Silver	ND	< 0.11	0.154 J	= 0.113	MG/KG
Sodium	149	= 26.8	103 J	= 4.54	MG/KG
Thallium	ND	< 0.32	ND	< 1.25	MG/KG
Vanadium	27.7 J	= 0.068	28.1 J	= 0.114	MG/KG
Zinc	53.7	= 0.47	49.1	= 0.211	MG/KG
Mercury	0.029	= 0.013	0.0252	= 0.00116	MG/KG

TAL Metals	QA Results 2BG-BH20-B(3-5)		QC Results 2BG-BH20-A(3-5)		
Aluminum	14400	= 1.1	11000 J	= 0.933	MG/KG
Antimony	0.71 J	= 0.28	ND	< 0.404	MG/KG
Arsenic	18.2	= 0.32	9.89 J	= 0.243	MG/KG
Barium	99.4	= 0.014	63.3 J	= 0.0785	MG/KG
Beryllium	0.93	= 0.011	0.604	= 0.0588	MG/KG
Cadmium	0.39	= 0.030	0.0941 J	= 0.0562	MG/KG
Calcium	3280	= 6.5	3080 J	= 1.53	MG/KG
Chromium	22.5	= 0.078	17 J	= 0.19	MG/KG
Cobalt	18.5	= 0.073	7.42 J	= 0.0939	MG/KG
Copper	32.2 J	= 0.074	9.98 J	= 0.239	MG/KG
Iron	39100	= 2.7	23370 J	= 1.84	MG/KG
Lead	17.4	= 0.22	9.39 J	= 0.334	MG/KG
Magnesium	4410 J	= 1.6	3000 J	= 0.688	MG/KG
Manganese	1100	= 0.027	344 J	= 0.154	MG/KG
Nickel	41	= 0.052	19.3 J	= 0.1	MG/KG
Potassium	1860 J	= 2.5	1490 J	= 4.21	MG/KG
Selenium	ND	< 1.1 UJ	1.62 J	= 0.191	MG/KG
Silver	ND	< 0.22	0.165 J	= 0.106	MG/KG
Sodium	138	= 27.4	74.7 J	= 4.27	MG/KG
Thallium	ND	< 0.66	ND	< 1.18	MG/KG
Vanadium	38.4 J	= 0.069	31.6 J	= 0.107	MG/KG
Zinc	68.1	= 0.48	51.4	= 0.198	MG/KG
Mercury	0.022	= 0.017	0.0205	= 0.00116	MG/KG

TAL Metals	QA Results 2BG-BH15-B(0-1)		QC Results 2BG-BH15-A(0-1)		
Aluminum	9180 J	= 1.3	12320	= 0.991	MG/KG
Antimony	0.70 J	= 0.32	ND	< 0.429 UJ	MG/KG
Arsenic	8.0	= 0.37	14.2 J	= 0.258	MG/KG
Barium	106 J	= 0.016	128 J	= 0.0834	MG/KG
Beryllium	0.68 J	= 0.013	0.989	= 0.0625	MG/KG
Cadmium	0.16	= 0.034	0.191 J	= 0.0597	MG/KG
Calcium	5390 J	= 7.6	3090 J	= 1.63	MG/KG
Chromium	13.8	= 0.045	15.2	= 0.201	MG/KG
Cobalt	7.9	= 0.086	13.1 J	= 0.0997	MG/KG
Copper	33.9	= 0.087	38.9 J	= 0.254	MG/KG
Iron	16,400 J	= 3.2	24280 J	= 1.96	MG/KG
Lead	126	= 0.13	89.6 J	= 0.355	MG/KG
Magnesium	2580 J	= 0.92	2190 J	= 0.731	MG/KG
Manganese	367 J	= 0.016	511 J	= 0.163	MG/KG
Nickel	19.8	= 0.06	27.5	= 0.107	MG/KG
Potassium	961 J	= 2.9	1580 J	= 4.47	MG/KG
Selenium	0.75	= 0.63	0.638 J	= 0.203	MG/KG
Silver	0.17	= 0.13	0.185 J	= 0.113	MG/KG
Sodium	158	= 32.0	59.7 J	= 4.54	MG/KG
Thallium	0.70	= 0.38	ND	< 1.25	MG/KG
Vanadium	21.4	= 0.081	27.9	= 0.113	MG/KG
Zinc	120	= 0.56	70.3 J	= 0.21	MG/KG
Mercury	0.092	= 0.016	0.0555	= 0.00117	MG/KG

TAL Metals	QA Results 2BG-BH21-B(0-1)		QC Results 2BG-BH21-A(0-1)		
Aluminum	10200 J	= 1.1	13050	0.986	MG/KG
Antimony	0.94 J	= 0.30	ND	< 0.427 UJ	MG/KG
Arsenic	6.5	= 0.34	6.78	0.257	MG/KG
Barium	72.3 J	= 0.014	79.1 J	0.0829	MG/KG
Beryllium	0.65 J	= 0.012	0.685	0.0622	MG/KG
Cadmium	0.060	= 0.031	0.204 J	0.0594	MG/KG
Calcium	4230 J	= 6.9	4290 J	1.62	MG/KG
Chromium	15.6	= 0.041	17.6	0.2	MG/KG
Cobalt	5.1	= 0.078	4.72	0.0992	MG/KG
Copper	19.7	= 0.079	21 J	0.252	MG/KG
Iron	17200 J	= 2.9	17550	1.95	MG/KG
Lead	47	= 0.12	41.1 J	0.353	MG/KG
Magnesium	2590 J	= 0.83	3030 J	0.727	MG/KG
Manganese	173 J	= 0.014	164	0.163	MG/KG
Nickel	16.8	= 0.055	16.8	0.106	MG/KG
Potassium	1030 J	= 2.7	1640 J	4.45	MG/KG
Selenium	0.68	= 0.57	1.2 J	0.202	MG/KG
Silver	ND	< 0.12	ND	< 0.112	MG/KG
Sodium	161	= 29.1	61.9 J	4.52	MG/KG
Thallium	ND	< 0.35	1.44 J	1.24	MG/KG
Vanadium	24.6	= 0.073	29.3	0.113	MG/KG
Zinc	59.9	= 0.51	58.8 J	0.209	MG/KG
Mercury	0.049	= 0.017	0.0588	0.00122	MG/KG

TAL Metals	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
Aluminum	**6190 J**	= 1.7	**6000 J**	= 0.963	MG/I
Antimony	**4.9 J**	= 0.43	**4.08 J**	= 0.417	MG/I
Arsenic	**11.6**	= 0.49	**14.6 J**	= 0.251	MG/I
Barium	**3060 J**	= 0.1	**2730 J**	= 0.405	MG/I
Beryllium	**0.49 J**	= 0.017	**0.541 J**	= 0.0607	MG/I
Cadmium	**1.9**	= 0.045	**0.658**	= 0.0581	MG/I
Calcium	**8780 J**	= 9.9	**11140 J**	= 1.58	MG/I
Chromium	**42.4**	= 0.059	**114**	= 0.196	MG/I
Cobalt	**11.3**	= 0.56	**10.7 J**	= 0.0969	MG/I
Copper	**1820**	= 0.57	**1320 J**	= 0.247	MG/I
Iron	**36,700 J**	= 4.2	**27690 J**	= 1.9	MG/I
Lead	**8440**	= 0.84	**4510**	= 0.345	MG/I
Magnesium	**7600 J**	= 1.2	**6300**	= 0.71	MG/I
Manganese	**342 J**	= 0.021	**213 J**	= 0.159	MG/I
Nickel	**88**	= 0.079	**89.9**	= 0.104	MG/I
Potassium	**1350 J**	= 3.8	**1580 J**	= 4.34	MG/I
Selenium	**1**	= 0.83	**3.39 J**	= 0.197	MG/I
Silver	**1.1**	= 0.17	**1.14**	= 0.11	MG/I
Sodium	**1210**	= 210	**730 J**	= 22.1	MG/I
Thallium	**ND**	= 0.5	**2.21**	= 1.21	MG/I
Vanadium	**17.7**	= 0.11	**15.2**	= 0.11	MG/I
Zinc	**784**	= 3.7	**482 J**	= 0.204	MG/I
Mercury	**0.11**	= 0.021	**0.0371 J**	= 0.00116	MG/I

Volatile Organic Compounds	QA Results 2BG-SD02-B		QC Results 2BG-SD02-A		
1,1,1-TRICHLOROETHANE	ND	< 2.6	ND	< 1.35	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 3.6		R	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 3.6	ND	< 1.37	UG/KG
1,1-DICHLOROETHANE	ND	< 2.9	ND	< 1.2	UG/KG
1,1-DICHLOROETHENE	ND	< 2.6	**1.8 J**	= 1.27	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 6.7		R	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 3.7		R	UG/KG
1,2-DICHLOROBENZENE	ND	< 3.2		R	UG/KG
1,2-DICHLOROETHANE	ND	< 2.8	ND	< 1.09	UG/KG
1,2-DICHLOROPROPANE	ND	< 2.8	ND	< 1.22	UG/KG
1,3-DICHLOROBENZENE	ND	< 3.9		R	UG/KG
1,4-DICHLOROBENZENE	ND	< 3.4		R	UG/KG
2-BUTANONE	ND	< 6.8	**39.7**	= 9.51	UG/KG
2-HEXANONE	ND	< 4.2	ND	< 9.59	UG/KG
4-METHYL-2-PENTANONE	ND	< 3.9		R	UG/KG
ACETONE	**14**	**= 8**	**197**	= 8.95	UG/KG
BENZENE	ND	< 3.2	ND	< 1.14	UG/KG
BROMODICHLOROMETHANE	ND	< 2.5	ND	< 1.25	UG/KG
BROMOFORM	ND	< 2.9	ND	< 1.25	UG/KG
BROMOMETHANE	ND	< 3.1	ND	< 1.27	UG/KG
CARBON DISULFIDE	ND	< 1.8	ND	< 6	UG/KG
CARBON TETRACHLORIDE	ND	< 2.3	ND	< 1.25	UG/KG
CHLOROBENZENE	ND	< 3.2	ND	< 1.04	UG
CHLOROETHANE	ND	< 3	ND	< 2.06	UG/KG
CHLOROFORM	ND	< 3	ND	< 1.32	UG/KG
CHLOROMETHANE	ND	< 2.8	ND	< 0.941	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 2.8	ND	< 1.2	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 2.2	ND	< 1.09	UG/KG
CYCLOHEXANE	ND	< 2.8	ND	< 1.22 UJ	UG/KG
DIBROMOCHLOROMETHANE	ND	< 2.7	ND	< 1.27	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 2.5		R	UG/KG
ETHYLBENZENE	ND	< 3.7	ND	< 0.967	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 3.2	ND	< 1.07	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 2.8	ND	< 6.36	UG/KG
ISOPROPYLBENZENE	ND	< 3.8		R	UG/KG
XYLENES, TOTAL	ND	< 7	ND	< 0.992	UG/KG
METHYL ACETATE	ND	< 7.9	ND	< 8.39 UJ	UG/KG
METHYLCYCLOHEXANE	ND	< 2.9		R	UG/KG
METHYLENE CHLORIDE	7.5 U	**= 3.3**	ND	< 3.43	UG/KG
STYRENE	ND	< 3.8	ND	< 0.992	UG/KG
MTBE	ND	< 3.1	ND	< 1.35	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 3.8	ND	< 0.967	UG/KG
TOLUENE	ND	< 3.2	ND	< 0.865	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 2.8	ND	< 1.35	UG/KG
TRANS-1,3-DICHLOROPROPEN	ND	< 3.2	ND	< 0.636	UG/KG
TRICHLOROETHENE(TCE)	ND	< 3.2	ND	< 1.14	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 2.6	ND	< 1.27	UG/KG
VINYL CHLORIDE	ND	< 2.8	ND	< 1.42	UG/K

Volatile Organic Compounds	QA Results 2BG-BH13-B(3-5)		QC Results 2BG-BH13-A(3-5)		
1,1,1-TRICHLOROETHANE	**4.5**	**= 1.5**	**7.9 J**	= 0.437	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 2.1	ND	< 0.751 UJ	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 2.1	ND	< 0.446	UG/KG
1,1-DICHLOROETHANE	ND	< 1.7	**0.64 J**	= 0.388	UG/KG
1,1-DICHLOROETHENE	ND	< 1.5	**0.59 J**	= 0.413	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 3.9	ND	< 0.297 UJ	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 2.1	ND	< 0.619	UG/KG
1,2-DICHLOROBENZENE	ND	< 1.9	ND	< 0.371	UG/KG
1,2-DICHLOROETHANE	ND	< 1.6	ND	< 0.355	UG/KG
1,2-DICHLOROPROPANE	ND	< 1.6	ND	< 0.396	UG/KG
1,3-DICHLOROBENZENE	ND	< 2.3	ND	< 0.256	UG/KG
1,4-DICHLOROBENZENE	ND	< 2	ND	< 0.305	UG/KG
2-BUTANONE	ND	< 4	ND	< 3.09 UJ	UG/KG
2-HEXANONE	ND	< 2.5	ND	< 3.11 UJ	UG/KG
4-METHYL-2-PENTANONE	ND	< 2.3	ND	< 3.33 UJ	UG/KG
ACETONE	**5.2**	**= 4.6**	ND	< 2.91	UG/KG
BENZENE	ND	< 1.9	ND	< 0.371	UG/KG
BROMODICHLOROMETHANE	ND	< 1.5	ND	< 0.404	UG/KG
BROMOFORM	ND	< 1.7	ND	< 0.404	UG/KG
BROMOMETHANE	ND	< 1.8	ND	< 0.413	UG/KG
CARBON DISULFIDE	ND	< 1	ND	< 1.95	UG/KG
CARBON TETRACHLORIDE	ND	< 1.3	ND	< 0.404	UG/KG
CHLOROBENZENE	ND	< 1.9	ND	< 0.338	UG/KG
CHLOROETHANE	ND	< 1.7	ND	< 0.669	UG/KG
CHLOROFORM	ND	< 1.7	ND	< 0.429	UG/KG
CHLOROMETHANE	ND	< 1.6	ND	< 0.305	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 1.6	ND	< 0.388	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 1.3	ND	< 0.355	UG/KG
CYCLOHEXANE	ND	< 1.6	ND	< 0.396	UG/KG
DIBROMOCHLOROMETHANE	ND	< 1.5	ND	< 0.413 UJ	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 1.5	R		UG/KG
ETHYLBENZENE	ND	< 2.1	ND	< 0.314	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 1.9	ND	< 0.347	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.6	ND	< 2.06	UG/KG
ISOPROPYLBENZENE	ND	< 2.2	ND	< 0.371	UG/KG
M,P-XYLENES	ND	< 4	ND	< 0.322	UG/KG
METHYL ACETATE	ND	< 4.6	ND	< 2.72 UJ	UG/KG
METHYLCYCLOHEXANE	ND	< 1.7	ND	< 0.421	UG/KG
METHYLENE CHLORIDE	ND	< 1.9	ND	< 1.11	UG/KG
STYRENE	ND	< 1	ND	< 0.322	UG/KG
MTBE	ND	< 1.8	ND	< 0.437	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 2.2	**2.2 J**	= 0.314	UG/KG
TOLUENE	ND	< 1.9	ND	< 0.281	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 1.6	ND	< 0.437	UG/KG
TRANS-1,3-DICHLOROPROPEN	ND	< 1.9	ND	< 0.206	UG/KG
TRICHLOROETHENE(TCE)	ND	< 1.9	ND	< 0.371	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 1.5	ND	< 0.413 UJ	UG/KG
VINYL CHLORIDE	ND	< 1.6	ND	< 0.462	UG/KG

Volatile Organic Compounds	QA Results 2BG-BH15-B(3-5)		QC Results 2BG-BH15-A(3-5)		
1,1,1-TRICHLOROETHANE	7.1 J	= 1.0	**12.3**	= 0.498	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	ND	< 0.855	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	ND	< 0.507	UG/KG
1,1-DICHLOROETHANE	ND	< 1.1 UJ	**0.67 J**	0.442	UG/KG
1,1-DICHLOROETHENE	ND	< 1.0 UJ	**0.62 J**	0.47	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 2.6 UJ	ND	< 0.338	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.5 UJ	ND	< 0.705	UG/KG
1,2-DICHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.423	UG/KG
1,2-DICHLOROETHANE	ND	< 1.1 UJ	ND	< 0.404	UG/KG
1,2-DICHLOROPROPANE	ND	< 1.1 UJ	ND	< 0.451	UG/KG
1,3-DICHLOROBENZENE	ND	< 1.5 UJ	ND	< 0.291	UG/KG
1,4-DICHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.348	UG/KG
2-BUTANONE	ND	< 2.7 UJ	ND	< 3.51	UG/KG
2-HEXANONE	ND	< 1.7 UJ	ND	< 3.54	UG/KG
4-METHYL-2-PENTANONE	ND	< 1.6 UJ	ND	< 3.79	UG/KG
ACETONE	ND	< 3.1 UJ	ND	< 3.31	UG/KG
BENZENE	ND	< 1.3 UJ	ND	< 0.423	UG/KG
BROMODICHLOROMETHANE	ND	< 0.99 UJ	ND	< 0.46	UG/KG
BROMOFORM	ND	< 1.1 UJ	ND	< 0.46	UG/KG
BROMOMETHANE	ND	< 1.2 UJ	ND	< 0.47	UG/KG
CARBON DISULFIDE	**2.3 J**	= 0.70	ND	< 2.22	UG/KG
CARBON TETRACHLORIDE	ND	< 0.90 UJ	ND	< 0.46	UG/KG
CHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.385	UG/KG
CHLOROETHANE	ND	< 1.2 UJ	ND	< 0.761	UG/KG
CHLOROFORM	ND	< 1.2 UJ	ND	< 0.489	UG/KG
CHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.348	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.442	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 0.87 UJ	ND	< 0.404	UG/KG
CYCLOHEXANE	ND	< 1.1 UJ	ND	< 0.451	UG/KG
DIBROMOCHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.47	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 1.0 UJ	ND	< 0.78	UG/KG
ETHYLBENZENE	ND	< 1.5 UJ	ND	< 0.357	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 1.3 UJ	ND	< 0.395	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ	ND	< 2.35	UG/KG
ISOPROPYLBENZENE	ND	< 1.5 UJ	ND	< 0.423	UG/KG
M,P-XYLENES	ND	< 2.8 UJ	ND	< 0.366	UG/KG
METHYL ACETATE	ND	< 3.1 UJ	ND	< 3.1	UG/KG
METHYLCYCLOHEXANE	ND	< 1.1 UJ	ND	< 0.479	UG/KG
METHYLENE CHLORIDE	4.0 U	= 1.3	ND	< 1.27	UG/KG
STYRENE	ND	< 1.5 UJ	ND	< 0.366	UG/KG
MTBE	ND	< 1.2 UJ	ND	< 0.498	UG/KG
TETRACHLOROETHENE(PCE)	**1.9**	= 1.5 UJ	**2.9**	= 0.357	UG/KG
TOLUENE	ND	< 1.3 UJ	ND	< 0.319	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.498	UG/KG
TRANS-1,3-DICHLOROPROPENI	ND	< 1.3 UJ	ND	< 0.235	UG/KG
TRICHLOROETHENE(TCE)	ND	< 1.3 UJ	ND	< 0.423	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ	ND	< 0.47	UG/KG
VINYL CHLORIDE	ND	< 1.1 UJ	ND	< 0.526	UG/KG

Volatile Organic Compounds	QA Results 2BG-BH20-B(3-5)		QC Results 2BG-BH20-A(3-5)		
1,1,1-TRICHLOROETHANE	ND	< 1.1 UJ	0.67 J	= 0.483	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 1.5 UJ	ND	< 0.829	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 1.5 UJ	ND	< 0.492	UG/KG
1,1-DICHLOROETHANE	ND	< 1.2 UJ	ND	< 0.428	UG/KG
1,1-DICHLOROETHENE	ND	< 1.1 UJ	0.62 J	= 0.455	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 2.8 UJ	ND	< 0.328	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.5 UJ	ND	< 0.683	UG/KG
1,2-DICHLOROBENZENE	ND	< 1.4 UJ	ND	< 0.41	UG/KG
1,2-DICHLOROETHANE	ND	< 1.2 UJ	ND	< 0.392	UG/KG
1,2-DICHLOROPROPANE	ND	< 1.2 UJ	ND	< 0.437	UG/KG
1,3-DICHLOROBENZENE	ND	< 1.6 UJ	ND	< 0.282	UG/KG
1,4-DICHLOROBENZENE	ND	< 1.4 UJ	ND	< 0.337	UG/KG
2-BUTANONE	ND	< 2.8 UJ	ND	< 3.41	UG/KG
2-HEXANONE	ND	< 1.8 UJ	ND	< 3.43	UG/KG
4-METHYL-2-PENTANONE	ND	< 1.6 UJ	ND	< 3.67	UG/KG
ACETONE	ND	< 3.3 UJ	ND	< 3.21	UG/KG
BENZENE	ND	< 1.4 UJ	ND	< 0.41	UG/KG
BROMODICHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.446	UG/KG
BROMOFORM	ND	< 1.2 UJ	ND	< 0.446	UG/KG
BROMOMETHANE	ND	< 1.3 UJ	ND	< 0.455	UG/KG
CARBON DISULFIDE	ND	< 0.73 UJ	ND	< 2.15	UG/KG
CARBON TETRACHLORIDE	ND	< 0.95 UJ	ND	< 0.446	UG/KG
CHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.373	UG/KG
CHLOROETHANE	ND	< 1.2 UJ	ND	< 0.738	UG/KG
CHLOROFORM	ND	< 1.2 UJ	ND	< 0.474	UG/KG
CHLOROMETHANE	ND	< 1.2 UJ	ND	< 0.337	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 1.2 UJ	ND	< 0.428	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 0.92 UJ	ND	< 0.392	UG/KG
CYCLOHEXANE	ND	< 1.2 UJ	2.9	= 0.437	UG/KG
DIBROMOCHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.455	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 1.1 UJ	ND	< 0.756	UG/KG
ETHYLBENZENE	ND	< 1.5 UJ	ND	< 0.346	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 1.4 UJ	ND	< 0.383	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.2 UJ	ND	< 2.28	UG/KG
ISOPROPYLBENZENE	ND	< 1.6 UJ	ND	< 0.41	UG/KG
XYLENES, TOTAL	ND	< 2.9 UJ	ND	< 0.355	UG/KG
METHYL ACETATE	ND	< 3.3 UJ	ND	< 3.01	UG/KG
METHYLCYCLOHEXANE	ND	< 1.2 UJ	ND	< 0.465	UG/KG
METHYLENE CHLORIDE	4.4 U	= 1.4	ND	< 1.23	UG/KG
STYRENE	ND	< 1.6 UJ	ND	< 0.355	UG/KG
MTBE	ND	< 1.3 UJ	ND	< 0.483	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 1.6 UJ	ND	< 0.346	UG/KG
TOLUENE	ND	< 1.3 UJ	ND	< 0.31	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 1.2 UJ	ND	< 0.483	UG/KG
TRANS-1,3-DICHLOROPROPENI	ND	< 1.4 UJ	ND	< 0.228	UG/KG
TRICHLOROETHENE(TCE)	ND	< 1.3 UJ	ND	< 0.41	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 1.1 UJ	ND	< 0.455	UG/KG
VINYL CHLORIDE	ND	< 1.2 UJ	ND	< 0.51	UG/KG

VOCs	QA Results 2BG-BH15-B(0-1)		QC Results 2BG-BH15-A(0-1)		
1,1,1-TRICHLOROETHANE	ND	< 1.0 UJ	ND	< 0.524 UJ	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	ND	< 0.899 UJ	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	ND	< 0.534	UG/KG
1,1-DICHLOROETHANE	ND	< 1.1 UJ	ND	< 0.464	UG/KG
1,1-DICHLOROETHENE	ND	< 1.0 UJ	0.62 J	0.494	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 2.6 UJ	ND	< 0.356 UJ	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.4 UJ	ND	< 0.741	UG/KG
1,2-DICHLOROBENZENE	ND	< 1.2 UJ	ND	< 0.445	UG/KG
1,2-DICHLOROETHANE	ND	< 1.1 UJ	ND	< 0.425	UG/KG
1,2-DICHLOROPROPANE	ND	< 1.1 UJ	ND	< 0.474	UG/KG
1,3-DICHLOROBENZENE	ND	< 1.5 UJ	ND	< 0.306	UG/KG
1,4-DICHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.366	UG/KG
2-BUTANONE	ND	< 2.6 UJ	ND	< 3.7 UJ	UG/KG
2-HEXANONE	ND	< 1.6 UJ	ND	< 3.72 UJ	UG/KG
4-METHYL-2-PENTANONE	ND	< 1.5 UJ	ND	< 3.98 UJ	UG/KG
ACETONE	ND	< 3.1 UJ	ND	< 3.48	UG/KG
BENZENE	ND	< 1.2 UJ	ND	< 0.445	UG/KG
BROMODICHLOROMETHANE	ND	< 0.97 UJ	ND	< 0.484 UJ	UG/KG
BROMOFORM	ND	< 1.1 UJ	ND	< 0.484	UG/KG
BROMOMETHANE	ND	< 1.2 UJ	ND	< 0.494 UJ	UG/KG
CARBON DISULFIDE	ND	< 0.68 UJ	ND	< 2.33	UG/KG
CARBON TETRACHLORIDE	ND	< 0.88 UJ	ND	< 0.484 UJ	UG/KG
CHLOROBENZENE	ND	< 1.2 UJ	ND	< 0.405	UG/KG
CHLOROETHANE	ND	< 1.1 UJ	ND	< 0.8	UG/KG
CHLOROFORM	ND	< 1.1 UJ	ND	< 0.514	UG/KG
CHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.366	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.464	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 0.84 UJ	ND	< 0.425	UG/KG
CYCLOHEXANE	ND	< 1.1 UJ	ND	< 0.474	UG/KG
DIBROMOCHLOROMETHANE	ND	< 1.0 UJ	ND	< 0.494 UJ	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 0.98 UJ	ND	< 0.82 UJ	UG/KG
ETHYLBENZENE	ND	< 1.4 UJ	ND	< 0.375	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 1.2 UJ	ND	< 0.415	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ	ND	< 2.47	UG/KG
ISOPROPYLBENZENE	ND	< 1.5 UJ	ND	< 0.445	UG/KG
XYLENES, TOTAL	ND	< 2.7 UJ	ND	< 0.385	UG/KG
METHYL ACETATE	ND	< 3.0 UJ	ND	< 3.26 UJ	UG/KG
METHYLCYCLOHEXANE	ND	< 1.1 UJ	ND	< 0.504	UG/KG
METHYLENE CHLORIDE	4.3 J	= 1.3	ND	< 1.33	UG/KG
STYRENE	ND	< 1.4 UJ	ND	< 0.385	UG/KG
MTBE	ND	< 1.2 UJ	ND	< 0.524	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 1.5 UJ	ND	< 0.375 UJ	UG/KG
TOLUENE	ND	< 1.2 UJ	ND	< 0.336	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.524	UG/KG
TRANS-1,3-DICHLOROPROPENE	ND	< 1.2 UJ	ND	< 0.247	UG/KG
TRICHLOROETHENE(TCE)	ND	< 1.2 UJ	ND	< 0.445	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ	ND	< 0.494 UJ	UG/KG
VINYL CHLORIDE	ND	< 1.1 UJ	ND	< 0.553	UG/KG

VOCs	QA Results 2BG-BH21-B(0-1)		QC Results 2BG-BH21-A(0-1)		
1,1,1-TRICHLOROETHANE	ND	< 1.0 UJ	ND	< 0.563	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 1.4 UJ	ND	< 0.967	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 1.4 UJ	ND	< 0.574	UG/KG
1,1-DICHLOROETHANE	ND	< 1.1 UJ	ND	< 0.499	UG/KG
1,1-DICHLOROETHENE	ND	< 0.99 UJ	ND	< 0.531	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 2.5 UJ	ND	< 0.382	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 1.4 UJ	ND	< 0.797	UG/KG
1,2-DICHLOROBENZENE	ND	< 1.2 UJ	ND	< 0.478	UG/KG
1,2-DICHLOROETHANE	ND	< 1.1 UJ	ND	< 0.457	UG/KG
1,2-DICHLOROPROPANE	ND	< 1.1 UJ	ND	< 0.51	UG/KG
1,3-DICHLOROBENZENE	ND	< 1.5 UJ	ND	< 0.329	UG/KG
1,4-DICHLOROBENZENE	ND	< 1.3 UJ	ND	< 0.393	UG/KG
2-BUTANONE	ND	< 2.6 UJ	ND	< 3.97	UG/KG
2-HEXANONE	ND	< 1.6 UJ	ND	< 4	UG/KG
4-METHYL-2-PENTANONE	ND	< 1.5 UJ	ND	< 4.28	UG/KG
ACETONE	ND	< 3.0 UJ	ND	< 3.74	UG/KG
BENZENE	ND	< 1.2 UJ	ND	< 0.478	UG/KG
BROMODICHLOROMETHANE	ND	< 0.95 UJ	ND	< 0.521	UG/KG
BROMOFORM	ND	< 1.1 UJ	ND	< 0.521	UG/KG
BROMOMETHANE	ND	< 1.2 UJ	ND	< 0.531	UG/KG
CARBON DISULFIDE	ND	< 0.67 UJ	ND	< 2.51	UG/KG
CARBON TETRACHLORIDE	ND	< 0.87 UJ	ND	< 0.521	UG/KG
CHLOROBENZENE	ND	< 1.2 UJ	ND	< 0.436	UG/KG
CHLOROETHANE	ND	< 1.1 UJ	ND	< 0.86	UG/KG
CHLOROFORM	ND	< 1.1 UJ	ND	< 0.552	UG/KG
CHLOROMETHANE	ND	< 1.1 UJ	ND	< 0.393	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.499	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 0.83 UJ	ND	< 0.457	UG/KG
CYCLOHEXANE	ND	< 1.1 UJ	ND	< 0.51 UJ	UG/KG
DIBROMOCHLOROMETHANE	ND	< 1.0 UJ	ND	< 0.531	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 0.96 UJ		R	UG/KG
ETHYLBENZENE	ND	< 1.4 UJ	ND	< 0.404	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 1.2 UJ	ND	< 0.446	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 1.1 UJ	ND	< 2.66	UG/KG
ISOPROPYLBENZENE	ND	< 1.4 UJ	ND	< 0.478	UG/KG
XYLENES, TOTAL	ND	< 2.6 UJ	ND	< 0.414	UG/KG
METHYL ACETATE	ND	< 3.0 UJ	ND	< 3.51 UJ	UG/KG
METHYLCYCLOHEXANE	ND	< 1.1 UJ		R	UG/KG
METHYLENE CHLORIDE	ND	< 1.2 UJ	ND	< 1.43	UG/KG
STYRENE	ND	< 1.4 UJ	ND	< 0.414	UG/KG
MTBE	ND	< 1.2 UJ	ND	< 0.563	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 1.5 UJ	ND	< 0.404	UG/KG
TOLUENE	ND	< 1.2 UJ	ND	< 0.361	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 1.1 UJ	ND	< 0.563	UG/KG
TRANS-1,3-DICHLOROPROPENE	ND	< 1.2 UJ	ND	< 0.266	UG/KG
TRICHLOROETHENE(TCE)	ND	< 1.2 UJ	ND	< 0.478	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 1.0 UJ	ND	< 0.531	UG/KG
VINYL CHLORIDE	ND	< 1.1 UJ	ND	< 0.595	UG/KG

VOCs	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
1,1,1-TRICHLOROETHANE	**61 J**	= 3	**106 J**	= 1.31	UG/KG
1,1,2,2-TETRACHLOROETHANE	ND	< 4 UJ	ND	< 2.25	UG/KG
1,1,2-TRICHLOROETHANE	ND	< 4.1 UJ	ND	< 1.34	UG/KG
1,1-DICHLOROETHANE	**6.1 J**	= 3.3	**8.8**	= 1.16	UG/KG
1,1-DICHLOROETHENE	ND	< 2.9 UJ	**2.6**	= 1.24	UG/KG
1,2,4-TRICHLOROBENZENE	ND	< 7.5 UJ	ND	< 0.892	UG/KG
1,2-DIBROMO-3-CHLOROPROP	ND	< 4.1 UJ	ND	< 1.86	UG/KG
1,2-DICHLOROBENZENE	ND	< 3.6 UJ	ND	< 1.11	UG/KG
1,2-DICHLOROETHANE	ND	< 3.1 UJ	ND	< 1.07	UG/KG
1,2-DICHLOROPROPANE	ND	< 3.2 UJ	ND	< 1.19	UG/KG
1,3-DICHLOROBENZENE	ND	< 4.4 UJ	ND	< 0.768	UG/KG
1,4-DICHLOROBENZENE	ND	< 3.8 UJ	ND	< 0.917	UG/KG
2-BUTANONE	ND	< 7.7 UJ	ND	< 9.27	UG/KG
2-HEXANONE	ND	< 4.8 UJ	ND	< 9.34	UG/KG
4-METHYL-2-PENTANONE	ND	< 4.4 UJ	ND	< 9.99	UG/KG
ACETONE	ND	< 8.9 UJ	ND	< 8.72	UG/KG
BENZENE	**11 J**	= 3.6	**2.8 J**	= 1.11	UG/KG
BROMODICHLOROMETHANE	ND	< 2.8 UJ	ND	< 1.21	UG/KG
BROMOFORM	ND	< 3.2 UJ	ND	< 1.21	UG/KG
BROMOMETHANE	ND	< 3.5 UJ	ND	< 1.24	UG/KG
CARBON DISULFIDE	ND	< 2 UJ	ND	< 5.85	UG/KG
CARBON TETRACHLORIDE	ND	< 2.6 UJ	ND	< 1.21	UG/KG
CHLOROBENZENE	ND	< 3.6 UJ	ND	< 1.02	UG/KG
CHLOROETHANE	ND	< 3.4 UJ	ND	< 2.01	UG/KG
CHLOROFORM	ND	< 3.3 UJ	ND	< 1.29	UG/KG
CHLOROMETHANE	ND	< 3.2 UJ	ND	< 0.917	UG/KG
CIS-1,2-DICHLOROETHENE	ND	< 3.2 UJ	ND	< 1.16	UG/KG
CIS-1,3-DICHLOROPROPENE	ND	< 2.5 UJ	ND	< 1.07	UG/KG
CYCLOHEXANE	ND	< 3.2 UJ	**24.9 J**	= 1.19	UG/KG
DIBROMOCHLOROMETHANE	ND	< 3 UJ	ND	< 1.24	UG/KG
DICHLORODIFLUOROMETHANE	ND	< 2.9 UJ	ND	< 2.06 UJ	UG/KG
ETHYLBENZENE	ND	< 4.1 UJ	ND	< 0.942	UG/KG
1,2-DIBROMOETHANE (EDB)	ND	< 3.6 UJ	ND	< 1.04	UG/KG
1,1,2-TRICHLORO-1,2,2-TRF	ND	< 3.1 UJ	ND	< 6.19	UG/KG
ISOPROPYLBENZENE	ND	< 4.3 UJ	ND	< 1.11	UG/KG
XYLENES, TOTAL	ND	< 7.8 UJ	ND	< 0.966	UG/KG
METHYL ACETATE	ND	< 8.9 UJ	ND	< 8.18	UG/KG
METHYLCYCLOHEXANE	ND	< 3.3 UJ	**1.4 J**	= 1.26	UG/KG
METHYLENE CHLORIDE	12 U	= 3.7	ND	< 3.34	UG/KG
STYRENE	ND	< 4.2	ND	< 0.966	UG/KG
MTBE	ND	< 3.5	ND	< 1.31	UG/KG
TETRACHLOROETHENE(PCE)	ND	< 4.3	ND	< 0.942	UG/KG
TOLUENE	ND	< 3.6	**0.99 J**	= 0.842	UG/KG
TRANS-1,2-DICHLOROETHENE	ND	< 3.1	ND	< 1.31	UG/KG
TRANS-1,3-DICHLOROPROPEN	ND	< 3.6	ND	< 0.619	UG/KG
TRICHLOROETHENE(TCE)	ND	< 3.6	ND	< 1.11	UG/KG
TRICHLOROFLUOROMETHANE	ND	< 3	ND	< 1.24	UG/KG
VINYL CHLORIDE	ND	< 3.1	ND	< 1.39	UG/KG

PAHs	QA Results 2BG-SD02-B		QC Results 2BG-SD02-A		
ACENAPHTHENE	ND	< 0.395	ND	< 46.9	UG/KG
ACENAPHTHYLENE	ND	< 0.465	**53 J**	= 25.6	UG/KG
ANTHRACENE	ND	< 0.00698	**9.78 J**	= 2.92	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.0163	**26.9 J**	= 5.16	UG/KG
BENZO(A)PYRENE	**25.6**	= 0.0233	**178 J**	= 6.36	UG/KG
BENZO(B)FLUORANTHENE	**39.5**	= 0.0163	**49.5 J**	= 2.52	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0233	**56.5 J**	= 9.15	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.0163	**40.3 J**	= 2.39	UG/KG
CHRYSENE	ND	< 0.00698	**45.5 J**	= 3.74	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.0465	**16.5 J**	= 5.52	UG/KG
FLUORANTHENE	**59.3**	= 0.0465	**138 J**	= 14.8	UG/KG
FLUORENE	ND	< 0.0465	ND	< 15.9	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0163	**36 J**	= 2.26	UG/KG
NAPHTHALENE	ND	< 0.0767	**195 J**	= 17.1	UG/KG
PHENANTHRENE	ND	< 0.00698	**382 J**	= 12.3	UG/KG
PYRENE	**45.1**	= 0.0233	**54.5 J**	= 17.6	UG/KG

PAHs	QA Results 2BG-BH13-B(3-5)		QC Results 2BG-BH13-A(3-5)		
ACENAPHTHENE	ND	< 0.17	ND	< 79.3	UG/KG
ACENAPHTHYLENE	ND	< 0.2	ND	< 43.2 UJ	UG/KG
ANTHRACENE	ND	< 0.003	ND	< 4.93 UJ	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.007	ND	< 8.72	UG/KG
BENZO(A)PYRENE	ND	< 0.01	**12.5 J**	10.8	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.007	ND	< 4.25	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.01	ND	< 15.5	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.007	**120 J**	4.04	UG/KG
CHRYSENE	ND	< 0.003	ND	< 6.32	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.02	ND	< 9.32	UG/KG
FLUORANTHENE	ND	< 0.02	ND	< 25	UG/KG
FLUORENE	ND	< 0.02	ND	< 26.8	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.007	ND	< 3.82	UG/KG
NAPHTHALENE	ND	< 0.033	ND	< 29	UG/KG
PHENANTHRENE	ND	< 0.003	ND	< 20.8	UG/KG
PYRENE	ND	< 0.01	ND	< 29.7	UG/KG

PAHs	QA Results 2BG-BH15-B(3-5)		QC Results 2BG-BH15-A(3-5)		
ACENAPHTHENE	ND	< 0.213	ND	< 81.9	UG/KG
ACENAPHTHYLENE	ND	< 0.25	**66.5 J**	= 44.6	UG/KG
ANTHRACENE	ND	< 0.00375	ND	< 5.09 UJ	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.00875	ND	< 9	UG/KG
BENZO(A)PYRENE	ND	< 0.0125	**13.1 J**	= 11.1	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.00875	**5.4 J**	= 4.39	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0125	ND	< 16	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.00875	**42.7 J**	= 4.17	UG/KG
CHRYSENE	ND	< 0.00375	ND	< 6.53	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.025	ND	< 9.63	UG/KG
FLUORANTHENE	ND	< 0.025	ND	< 25.9	UG/KG
FLUORENE	ND	< 0.025	ND	< 27.7	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.00875	ND	< 3.95	UG/KG
NAPHTHALENE	ND	< 0.0413	ND	< 29.5	UG/KG
PHENANTHRENE	ND	< 0.00375	ND	< 21.5	UG/KG
PYRENE	ND	< 0.0125	ND	< 30.7	UG/KG

PAHs	QA Results 2BG-BH20-B(3-5)		QC Results 2BG-BH20-A(3-5)		
ACENAPHTHENE	ND	< 0.21	**90.9 J**	= 78.8	UG/KG
ACENAPHTHYLENE	ND	< 0.247	**78.6 J**	= 42.9	UG/KG
ANTHRACENE	ND	< 0.0037	ND	< 4.9 UJ	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.00864	**11.2 J**	= 8.66	UG/KG
BENZO(A)PYRENE	ND	< 0.0123	ND	< 10.7 UJ	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.00864	ND	< 4.22	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0123	ND	< 15.4	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.00864	**59.2 J**	= 4.01	UG/KG
CHRYSENE	ND	< 0.0037	ND	< 6.28	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.0247	**16.1 J**	= 9.26	UG/KG
FLUORANTHENE	ND	< 0.0247	ND	< 24.9	UG/KG
FLUORENE	ND	< 0.0247	ND	< 26.6	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.00864	**151 J**	= 3.8	UG/KG
NAPHTHALENE	ND	< 0.0407	ND	< 28.8	UG/KG
PHENANTHRENE	ND	< 0.0037	ND	< 20.6	UG/KG
PYRENE	ND	< 0.0123	ND	< 29.5	UG/KG

PAHs	QA Results 2BG-BH15-B(0-1)		QC Results 2BG-BH15-A(0-1)		
ACENAPHTHENE	ND	< 0.21	**213 J**	145	UG/KG
ACENAPHTHYLENE	ND	< 0.247	**724 J**	78.8	UG/KG
ANTHRACENE	ND	< 0.0037	ND	< 8.99 UJ	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.00864	ND	< 15.9	UG/KG
BENZO(A)PYRENE	**7.52**	= 0.0123	**32.3 J**	19.6	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.00864	**29.2 J**	7.75	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0123	ND	< 28.2	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.00864	**44.1 J**	7.36	UG/KG
CHRYSENE	ND	< 0.0037	**35.2 J**	11.5	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.0247	ND	< 17	UG/KG
FLUORANTHENE	ND	< 0.0247	**50.5 J**	45.7	UG/KG
FLUORENE	ND	< 0.0247	ND	< 48.9	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.00864	**9.62 J**	6.97	UG/KG
NAPHTHALENE	ND	< 0.0407	**2680 J**	52.8	UG/KG
PHENANTHRENE	ND	< 0.0037	**39.5 J**	37.9	UG/KG
PYRENE	ND	< 0.0123	ND	< 54.1	UG/KG

PAHs	QA Results 2BG-BH21-B(0-1)		QC Results 2BG-BH21-A(0-1)		
ACENAPHTHENE	ND	< 0.213	ND	< 29.8	UG/KG
ACENAPHTHYLENE	ND	< 0.25	**41.6 J**	16.2	UG/KG
ANTHRACENE	ND	< 0.00375	**3.35 J**	1.85	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.00875	**18.1 J**	3.27	UG/KG
BENZO(A)PYRENE	ND	< 0.0125	**30.3 J**	4.03	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.00875	**23.9 J**	1.59	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0125	**14.4 J**	5.8	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.00875	**90.4 J**	1.51	UG/KG
CHRYSENE	ND	< 0.00375	**22.2 J**	2.37	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.025	ND	< 3.5	UG/KG
FLUORANTHENE	ND	< 0.025	**26 J**	9.39	UG/KG
FLUORENE	ND	< 0.025	ND	< 10.1	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.00875	**14.9 J**	1.43	UG/KG
NAPHTHALENE	ND	< 0.0413	**30.1 J**	10.9	UG/KG
PHENANTHRENE	ND	< 0.00375	**13.1 J**	7.8	UG/KG
PYRENE	ND	< 0.0125	**30.9 J**	11.1	UG/KG

PAHs	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
ACENAPHTHENE	ND	< 0.254	**4550 J**	271	UG/KG
ACENAPHTHYLENE	ND	< 0.299	**4550 J**	148	UG/KG
ANTHRACENE	ND	< 0.00448	ND	< 16.9	UG/KG
BENZO(A)ANTHRACENE	ND	< 0.0104	**44.5 J**	29.8	UG/KG
BENZO(A)PYRENE	ND	< 0.0149	ND	< 36.8 UJ	UG/KG
BENZO(B)FLUORANTHENE	ND	< 0.0104	**24.8 J**	14.5	UG/KG
BENZO(G,H,I)PERYLENE	ND	< 0.0149	ND	< 52.9	UG/KG
BENZO(K)FLUORANTHENE	ND	< 0.0104	ND	< 13.8	UG/KG
CHRYSENE	ND	< 0.00448	**113 J**	21.6	UG/KG
DIBENZ(A,H)ANTHRACENE	ND	< 0.0299	ND	< 31.9	UG/KG
FLUORANTHENE	**71.5**	= 0.0299	**140 J**	85.7	UG/KG
FLUORENE	ND	< 0.0299	**306 J**	91.6	UG/KG
INDENO(1,2,3-C,D)PYRENE	ND	< 0.0104	ND	< 13.1	UG/KG
NAPHTHALENE	**2537**	= 0.0493	**15900 J**	99.1	UG/KG
PHENANTHRENE	**92.7**	= 0.00448	**163 J**	71.1	UG/KG
PYRENE	**90.9**	= 0.0149	ND	< 102	UG/KG

Explosive Compounds	QA Results 2BG-SD02-B		QC Results 2BG-SD02-A		
1,3,5-Trinitrobenzene	ND	< 25 UJ	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	ND	< 26 UJ	ND	< 125	UG/KG
2,4-DNT	ND	< 30 UJ	ND	< 125	UG/KG
2,6-DNT	ND	< 55 UJ	ND	< 125	UG/KG
2-amino-4,6-DNT	ND	< 19 UJ	ND	< 125	UG/KG
4-amino-2,6-DNT	ND	< 36 UJ	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	ND	< 75 UJ	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	ND	< 150 UJ	ND	< 125	UG/KG
4-Nitrotoluene	ND	< 74 UJ	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-BH13-B(3-5)		QC Results 2BG-BH13-A(3-5)		
1,3,5-Trinitrobenzene	ND	< 25 UJ	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	ND	< 26 UJ	ND	< 125	UG/KG
2,4-DNT	ND	< 30 UJ	ND	< 125	UG/KG
2,6-DNT	ND	< 55 UJ	ND	< 125	UG/KG
2-amino-4,6-DNT	ND	< 19 UJ	ND	< 125	UG/KG
4-amino-2,6-DNT	ND	< 36 UJ	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	ND	< 75 UJ	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	ND	< 150 UJ	ND	< 125	UG/KG
4-Nitrotoluene	ND	< 74 UJ	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-BH15-B(3-5)		QC Results 2BG-BH15-A(3-5)		
1,3,5-Trinitrobenzene	ND	< 25 UJ	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	**570 J**	= 26	**950 J**	= 125	UG/KG
2,4-DNT	**1300 J**	= 30	**700 J**	= 125	UG/KG
2,6-DNT	**860 J**	= 55	ND	< 125	UG/KG
2-amino-4,6-DNT	**500 J**	= 19	ND	< 125	UG/KG
4-amino-2,6-DNT	**460 J**	= 36	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	**290 J**	= 75	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	**2800 J**	= 150	ND	< 125	UG/KG
4-Nitrotoluene	**1700 J**	= 74	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-BH20-B(3-5)		QC Results 2BG-BH20-A(3-5)		
1,3,5-Trinitrobenzene	ND	< 25 UJ	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	ND	< 26 UJ	**249 J**	= 125	UG/KG
2,4-DNT	**540 J**	= 30	**370 J**	= 125	UG/KG
2,6-DNT	**960 J**	= 55	ND	< 125	UG/KG
2-amino-4,6-DNT	ND	< 19 UJ	ND	< 125	UG/K
4-amino-2,6-DNT	ND	< 36 UJ	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	**260 J**	= 75	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	**1600 J**	= 150	ND	< 125	UG/KG
4-Nitrotoluene	**1500 J**	= 74	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-BH15-B(0-1)		QC Results 2BG-BH15-A(0-1)		
1,3,5-Trinitrobenzene	**1300 J**	= 25	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	**170000 J**	= 26	**13600 J**	125	UG/KG
2,4-DNT	**1500 J**	= 30	**341 J**	125	UG/KG
2,6-DNT	**600 J**	= 55	ND	< 125	UG/KG
2-amino-4,6-DNT	**4100 J**	= 19	ND	< 125	UG/KG
4-amino-2,6-DNT	**5400 J**	= 36	**1920 J**	125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	ND	< 75 UJ	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	ND	< 150 UJ	ND	< 125	UG/KG
4-Nitrotoluene	ND	< 74 UJ	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-BH21-B(0-1)		QC Results 2BG-BH21-A(0-1)		
1,3,5-Trinitrobenzene	ND	< 25 UJ	ND	< 125	UG/KG
1,3-Dinitrobenzene	ND	< 10 UJ	ND	< 125	UG/KG
2,4,6-TNT	**630 J**	= 26	ND	< 125	UG/KG
2,4-DNT	**63 J**	= 30 UJ	ND	< 125	UG/KG
2,6-DNT	ND	< 55 UJ	ND	< 125	UG/KG
2-amino-4,6-DNT	**190 J**	= 19	ND	< 125	UG/KG
4-amino-2,6-DNT	**190 J**	= 36	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	ND	< 75 UJ	ND	< 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	ND	< 150 UJ	ND	< 125	UG/KG
4-Nitrotoluene	ND	< 74 UJ	ND	< 125	UG/KG
RDX	ND	< 76 UJ	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

Explosive Compounds	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
1,3,5-Trinitrobenzene	**50,000 J**	= 2	**53,600 J**	**= 125**	UG/KG
1,3-Dinitrobenzene	**3,100 J**	= 10	**4,320**	= 125	UG/KG
2,4,6-TNT	**1,700,000 J**	= 2	**847,000**	**= 125**	UG/KG
2,4-DNT	**220,000 J**	= 2	**105,000**	**= 125**	UG/KG
2,6-DNT	**310,000 J**	= 2	**115,000**	**= 125**	UG/KG
2-amino-4,6-DNT	**170,000 J**	= 2	**49,800**	= 125	UG/KG
4-amino-2,6-DNT	**80,000 J**	= 2	ND	< 125	UG/KG
HMX	ND	< 51 UJ	ND	< 125	UG/KG
3-Nitrotoluene	**1,900 J**	= 75	**612**	= 125	UG/KG
Nitrobenzene	ND	< 32 UJ	ND	< 125	UG/KG
2-Nitrotoluene	**13,000 J**	= 150	**4,500**	= 125	UG/KG
4-Nitrotoluene	**1,100 J**	= 74	**29,600**	= 1250	UG/KG
RDX	**10,000 J**	= 76	ND	< 125	UG/KG
Tetryl	ND	< 170 UJ	ND	< 125	UG/KG

PCBs	QA Results 2BG-SD02-B		QC Results 2BG-SD02-A		
PCB 1016	ND	< 8.7 UJ	ND	< 1570	UG/KG
PCB 1221	ND	< 0.08 UJ	ND	< 9340	UG/KG
PCB 1232	ND	< 23 UJ	ND	< 1090	UG/KG
PCB 1242	ND	< 11 UJ	ND	< 1280	UG/KG
PCB 1248	ND	< 16 UJ	ND	< 1860	UG/KG
PCB 1254	ND	< 17 UJ	ND	< 3440	UG/KG
PCB 1260	ND	< 6.7 UJ	ND	< 2090	UG/KG

PCBs	QA Results 2BG-BH13-B(3-5)		QC Results 2BG-BH13-A(3-5)		
PCB 1016	ND	< 4.6 UJ	ND	< 178	UG/KG
PCB 1221	ND	< 0.04 UJ	ND	< 1060	UG/KG
PCB 1232	ND	< 12 UJ	ND	< 124	UG/KG
PCB 1242	ND	< 5.6 UJ	ND	< 145	UG/KG
PCB 1248	ND	< 8.5 UJ	ND	< 211	UG/KG
PCB 1254	ND	< 8.8 UJ	ND	< 390	UG/KG
PCB 1260	ND	< 3.5 UJ	ND	< 237	UG/KG

PCBs	QA Results 2BG-BH15-B(3-5)		QC Results 2BG-BH15-A(3-5)		
PCB 1016	ND	< 4.7 UJ	ND	< 195	UG/KG
PCB 1221	ND	< 0.040 UJ	ND	< 1150	UG/KG
PCB 1232	ND	< 12 UJ	ND	< 135	UG/KG
PCB 1242	ND	< 5.7 UJ	ND	< 158	UG/KG
PCB 1248	ND	< 8.7 UJ	ND	< 231	UG/KG
PCB 1254	ND	< 9.0 UJ	ND	< 426	UG/KG
PCB 1260	ND	< 3.6 UJ	ND	< 259	UG/KG

PCBs	QA Results 2BG-BH20-B(3-5)		QC Results 2BG-BH20-A(3-5)		
PCB 1016	ND	< 4.6 UJ	ND	< 175	UG/KG
PCB 1221	ND	< 0.040 UJ	ND	< 1040	UG/KG
PCB 1232	ND	< 12 UJ	ND	< 122	UG/KG
PCB 1242	ND	< 5.7 UJ	ND	< 142	UG/KG
PCB 1248	ND	< 8.6 UJ	ND	< 207	UG/KG
PCB 1254	ND	< 8.9 UJ	ND	< 383	UG/KG
PCB 1260	ND	< 3.6 UJ	ND	< 232	UG/KG

PCBs	QA Results 2BG-BH15-B(0-1)		QC Results 2BG-BH15-A(0-1)		
PCB 1016	ND	< 4.6 UJ	ND	< 1020	UG/KG
PCB 1221	ND	< 0.040 UJ	ND	< 6060	UG/KG
PCB 1232	ND	< 12 UJ	ND	< 710	UG/KG
PCB 1242	ND	< 5.7 UJ	ND	< 830	UG/KG
PCB 1248	ND	< 8.6 UJ	ND	< 1210	UG/KG
PCB 1254	ND	< 8.9 UJ	ND	< 2240	UG/KG
PCB 1260	130 J	= 3.6	ND	< 1360	UG/KG

PCBs	QA Results 2BG-BH21-B(0-1)		QC Results 2BG-BH21-A(0-1)		
PCB 1016	ND	< 4.7 UJ	ND	< 207	UG/KG
PCB 1221	ND	< 0.040 UJ	ND	< 1230	UG/KG
PCB 1232	ND	< 12 UJ	ND	< 144	UG/KG
PCB 1242	ND	< 5.7 UJ	ND	< 168	UG/KG
PCB 1248	ND	< 8.7 UJ	ND	< 245	UG/KG
PCB 1254	ND	< 9.0 UJ	ND	< 453	UG/KG
PCB 1260	27 J	= 3.6	ND	< 275	UG/KG

PCBs	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
PCB 1016	ND	< 5.6 UJ	ND	< 6490	UG/KG
PCB 1221	ND	< 0.05 UJ	ND	< 38500	UG/KG
PCB 1232	ND	< 15 UJ	ND	< 4510	UG/KG
PCB 1242	ND	< 6.9 UJ	ND	< 5270	UG/KG
PCB 1248	ND	< 11 UJ	ND	< 7680	UG/KG
PCB 1254	ND	< 11 UJ	ND	< 14200	UG/KG
PCB 1260	ND	< 4.4 UJ	ND	< 8620	UG/KG

Dioxins/Furans	QA Results 2BG-SD02-B		QC Results 2BG-SD02-A		
2,3,7,8-TCDF	**310**	= 0.21	**1.2 J**	0.268	NG/KG
2,3,7,8-TCDD	**16**	= 0.36	**0.711 J**	0.283	NG/KG
1,2,3,7,8-PeCDF	**160**	= 0.58	**0.369 J**	0.57	NG/KG
2,3,4,7,8-PeCDF	**280**	= 0.4	**0.853 J**	0.57	NG/KG
1,2,3,7,8-PeCDD	**69**	= 0.23	**0.41 J**	0.57	NG/KG
1,2,3,4,7,8-HxCDF	**130**	= 0.43	**0.652 J**	0.57	NG/KG
1,2,3,6,7,8-HxCDF	**110**	= 0.44	**0.552 J**	0.57	NG/KG
2,3,4,6,7,8-HxCDF	**150**	= 0.45	**0.597 J**	0.57	NG/KG
1,2,3,7,8,9-HxCDF	**36**	= 0.4	**0.182 J**	0.57	NG/KG
1,2,3,4,7,8-HxCDD	**45**	= 0.44	**0.397 J**	0.57	NG/KG
1,2,3,6,7,8-HxCDD	**120**	= 0.27	**1.03 J**	0.57	NG/KG
1,2,3,7,8,9-HxCDD	**67**	= 0.18	**0.985 J**	0.57	NG/KG
1,2,3,4,6,7,8-HpCDF	**480**	= 0.54	**3.91 J**	0.57	NG/KG
1,2,3,4,7,8,9-HpCDF	**40**	= 0.41	**0.301 J**	0.57	NG/KG
1,2,3,4,6,7,8-HpCDD	**1800**	= 0.24	**13.3 J**	0.57	NG/KG
OCDF	**710**	= 0.26	**6.69 J**	1.14	NG/KG
OCDD	**18000**	= 0.3	**84.8 J**	1.14	NG/KG

Dioxins/Furans	QA Results 2BG-TR05-1-B		QC Results 2BG-TR05-1-A		
2,3,7,8-TCDF	70	= 0.14	44 J	= 0.141	NG/KG
2,3,7,8-TCDD	0.26 J	= 0.19	0.452 J	= 0.138	NG/KG
1,2,3,7,8-PeCDF	20	= 0.18	14.2 J	= 0.831	NG/KG
2,3,4,7,8-PeCDF	67	= 0.16	41.4 J	= 0.774	NG/KG
1,2,3,7,8-PeCDD	ND	< 0.15	0.587 J	= 0.345	NG/KG
1,2,3,4,7,8-HxCDF	28	= 0.15	20.5 J	= 1.36	NG/KG
1,2,3,6,7,8-HxCDF	11	= 0.17	7.27 J	= 1.2	NG/KG
2,3,4,6,7,8-HxCDF	17	= 0.23	12.6 J	= 1.3	NG/KG
1,2,3,7,8,9-HxCDF	2.7 J	= 0.21	1.26 J	= 1.59	NG/KG
1,2,3,4,7,8-HxCDD	ND	< 0.33	0.323 J	= 0.345	NG/KG
1,2,3,6,7,8-HxCDD	ND	< 0.22	0.579 J	= 0.345	NG/KG
1,2,3,7,8,9-HxCDD	ND	< 0.23	0.585 J	= 0.345	NG/KG
1,2,3,4,6,7,8-HpCDF	12	= 0.2	8.34 J	= 0.345	NG/KG
1,2,3,4,7,8,9-HpCDF	1.5 J	= 0.28	0.932 J	= 0.345	NG/KG
1,2,3,4,6,7,8-HpCDD	9	= 0.19	6.91 J	= 0.345	NG/KG
OCDF	4.4 J	= 0.37	2.12 J	= 0.689	NG/KG
OCDD	52	= 0.36	33.6 J	= 0.689	NG/KG

Dioxins/Furans	QA Results 2BG-TR09-1-B		QC Results 2BG-TR09-1-A		
2,3,7,8-TCDF	250	= 0.23	225 J	= 0.131	NG/KG
2,3,7,8-TCDD	1.1	= 0.18	1.03	= 0.103	NG/KG
1,2,3,7,8-PeCDF	76	= 0.24	70.8	= 3.91	NG/KG
2,3,4,7,8-PeCDF	270	= 0.22	222 J	= 3.64	NG/KG
1,2,3,7,8-PeCDD	3.1	= 0.26	1.53 J	= 0.259	NG/KG
1,2,3,4,7,8-HxCDF	110	= 0.26	107	= 3.38	NG/KG
1,2,3,6,7,8-HxCDF	43	= 0.33	41.9	= 2.98	NG/KG
2,3,4,6,7,8-HxCDF	71	= 0.28	77.2 J	= 3.24	NG/KG
1,2,3,7,8,9-HxCDF	12	= 0.67	14.9 J	= 3.95	NG/KG
1,2,3,4,7,8-HxCDD	2.1	= 0.41	1.64 J	= 0.296	NG/KG
1,2,3,6,7,8-HxCDD	5.8	= 0.37	5.25	= 0.261	NG/KG
1,2,3,7,8,9-HxCDD	4.7	= 0.22	4.92	= 0.284	NG/KG
1,2,3,4,6,7,8-HpCDF	47	= 0.54	50	= 0.259	NG/KG
1,2,3,4,7,8,9-HpCDF	6.6	= 0.31	6.8	= 0.259	NG/KG
1,2,3,4,6,7,8-HpCDD	67	= 0.23	68.1 J	= 0.259	NG/KG
OCDF	16	= 0.28	17.6	= 0.517	NG/KG
OCDD	310	= 0.45	426 J	= 0.517	NG/KG

Chemical Quality Assurance Report

Reservoir No. 2 Burning Ground
Remedial Investigation, Part 1
Former Plum Brook Ordnance Works
Sandusky, OH

April 2005 Sampling Event

Presented by:

Stratum Engineering, Inc.
3751 Pennridge Drive, Suite 119
Bridgeton, MO 63044
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ABBREVIATIONS AND ACRONYMS

CQAR	Chemical Quality Assurance Report
COC	Chain of Custody
%D	Percent Difference
DL	Detection Limit
DQO	Data Quality Objective
EM	Engineering Manual
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
GC	Gas Chromatograph or Gas Chromatography
HTRW	Hazardous, Toxic, Radioactive Waste
ICAP	Inductively Coupled Argon Plasma Spectrophotometer
ISA	Internal Standard Area
LCS	Laboratory Control Sample
MDL	Method Detection Limit
mg/L	milligram per liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PAH	Polycyclic Aromatic Hydrocarbon
PBOW	Plum Brook Ordnance Works
PCB	Polychlorinated Biphenyl
QA	Quality Assurance
QC	Quality Control
%R	Percent Recovery
RL	Reporting Limit
RPD	Relative Percent Difference
SB	Soil Boring
SDG	Sample Delivery Group
SVOC	Semivolatile Organic Compound
SW-846	Solid Waste Analytical Protocols
TAL	Target Analyte List
TCL	Target Compound List
µg/L	Microgram per liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

INTRODUCTION

This Chemical Quality Assurance Report (CQAR) presents an evaluation of the quality and usability of the Quality Assurance (QA) analytical data generated in support of the soil sampling event performed by Jacobs Engineering, Inc. at the at the Reservoir Number 2 Burning Ground site at the Former Plum Brook Ordnance Works (PBOW) in Sandusky, Ohio in April 2005. The findings of this evaluation are presented in terms of data precision, accuracy, representativeness, sensitivity, and completeness.

Analytical samples evaluated in this report consisted of one QA sample that was collected in conjunction with the project Quality Control (QC) samples (i.e., primary and duplicate) at a frequency of approximately ten percent of the QC samples. The project samples are summarized in Attachment I, Sample Number Correlation. The QA data is presented in tables in Attachment II – QA Data Summary. Data comparison tables with respect to the QC and QA data are presented in Attachment III – Data Comparison.

Analytical Methods

Analyses for this project were performed in strict accordance with the following protocol:

- *Test Methods for Evaluating Solid Waste*, SW-846, 3rd Edition, USEPA, November 1986, (SW-846)

Specific analytical methods used included the following:

- SW-846 8270B – polycyclic aromatic hydrocarbons (PAHs);
- SW-846 8082 – polychlorinated biphenyls (PCBs);
- SW-846 8330A – nitroaromatic compounds (referred to as explosives hereafter); and
- SW-846 6010B – lead by Inductively Coupled Argon Plasma Spectrophotometer (ICAP).

Analytical Laboratories

The following analytical laboratory was contracted to analyze the QC field samples for this project:

ELAB of Tennessee, LLC
Contact: Marcia K. McGinnity, Senior Project Manager
227 French Landing Drive, Suite 550
Nashville, TN 37228
Phone: (615) 345-1115
Fax: (615) 846-5426

The following analytical laboratory was contracted to analyze the QA field samples for this project:

GPL Laboratories, LLLP
7210A Corporate CT
Frederick, MD 21703
Phone: (301) 694-5310;
Fax: (301) 620-0731

Both of these laboratories have been validated by the US Army Corps of Engineers (USACE).

Data Evaluation Procedures

The quality of this project data has been evaluated following procedures consistent with those included in USACE's Engineering Manual (EM) 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997, as well as *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-99/008, October 1999 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540/R-94/013, February 1994 (*Functional Guidelines*). Data evaluations were also based on the QC requirements of the individual analytical methods.

The data evaluation for this project consisted of the following procedures:

- Review of chain-of-custody and sample receipt forms to evaluate sample receipt data, damaged sample containers, etc.;
- Review of laboratory testing methods, detection limits, holding times, data qualifiers, etc.;
- Review of field QC blank data to detect contamination from outside sources;
- Review of QC data to evaluate data reproducibility;
- Review of laboratory QC including verification of calibration, instrument performance checks, laboratory blanks, spike recovery, and duplicates;
- Assignment of appropriate qualifiers to usable data and unusable data as necessary; and
- Presentation of data evaluation findings in terms of the PARCC (precision, accuracy, representativeness, comparability, and completeness) data quality parameters.

Data Qualifier Definitions

Data qualifiers were assigned to the analytical results as part of the data review process. Definitions of these data qualifiers, which are consistent with those used within the *Functional Guidelines* referenced above, are provided below.

U – The analyte was analyzed for but was not detected above the reported sample quantitation limit.

J – The analyte was positively identified. However, the associated numerical value is an estimate of the concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is an estimate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

I. QC DATA EVALUATION

The data evaluation of the QC data is summarized below.

A. Accuracy:

1) Polycyclic Aromatic Hydrocarbons

- Holding times for all analyses for SDG-Plumbrook S001 were met.
- All MS and MSD %Rs were within control criteria limits for SDG-Plumbrook S001.
- The LCS %Rs were within control criteria limits for SDG-Plumbrook S001.
- Surrogate recoveries for all analyses of SDG-Plumbrook S001 were within the control criteria limits.
- The retention times were met for all internal standards of SDG-Plumbrook S001. The internal standard area responses (ISAs) for SDG-Plumbrook S001 were within the control criteria limits except for perylene-d12, which was reported low for the following samples:
  - PBOW-05-SO-2BG-BH25-A-(0-0.5)
  - PBOW-05-SO-2BG-BH27-A-(0-0.5)
  - PBOW-05-SO-2BG-BH28-A-(0-0.5)
  - PBOW-05-SO-2BG-BH34-A-(0-0.5)

2) Explosives

- Holding times for all analyses for SDG-Plumbrook S001 were met.
- The %R for tetryl of the MS sample of SDG-Plumbrook S001 was reported as low (50%). The %Rs for the MSD analyses of SDG-Plumbrook S001 were all within control criteria limits.
- The LCS sample for SDG-Plumbrook S001 reported a low %R for tetryl (50%).
- Surrogate recoveries for all analyses of SDG-Plumbrook S001 were within the control criteria limits.

3) Polychlorinated Biphenyls

- Holding times for all analyses for SDG-Plumbrook S001 were met.
- The MS and MSD %Rs were within control criteria limits for SDG-Plumbrook S001.
- The LCS %Rs were within control criteria limits for SDG-Plumbrook S001.
- Surrogate recoveries on just one column were reported as higher than the control criteria limit for DCB for the following samples:
  - PBOW-05-SO-2BG-BH25-A-(0-0.5)
  - PBOW-05-SO-2BG-BH27-A-(0-0.5)
  - PBOW-05-SO-2BG-BH29-A-(0-0.5)
  - PBOW-05-SO-2BG-BH33-A-(0-0.5)
  - PBOW-05-SO-2BG-BH34-A-(0-0.5)

The surrogate recovery for TCMX on one column was reported as higher than the control criteria limit for sample PBOW-05-SO-2BG-BH25-A-(0-0.5). However, the %Ds were for results obtained for both columns were not greater than 30%.

- Sample PBOW-05-SO-2BG-BH25-A-(0-0.5) had a dilution factor of 20.
- Sample PBOW-05-SO-2BG-BH27-A-(0-0.5) had a dilution factor of 10.
- Sample PBOW-05-SO-2BG-BH29-A-(0-0.5) had a dilution factor of 5.
- Sample PBOW-05-SO-2BG-BH33-A-(0-0.5) had a dilution factor of 10.
- Sample PBOW-05-SO-2BG-BH34-A-(0-0.5) had a dilution factor of 20.

4) Lead

- Holding times for all analyses for SDG-Plumbrook S001 were met.
- The %R reported for the MS and MSD of SDG-Plumbrook S001 were within control criteria limits.
- The LCS %R for SDG-Plumbrook S001 was found to be within the control criteria limits.

B. Precision

1) Polycyclic Aromatic Hydrocarbons

- The MS/MSD pair RPD for SDG-Plumbrook S001 was found to be within control criteria limits.

2) Explosives

- The MS/MSD pair RPD for SDG-Plumbrook S001 was found to be within control criteria limits.

3) Polychlorinated Biphenyls

- The MS/MSD pair RPD for SDG-Plumbrook S001 was found to be within the control criteria limits.

4) Lead

- The RPD reported for the MS/MSD pair of SDG-Plumbrook S001 was within control criteria limits.
- Serial dilution %D control criteria were met for SDG-Plumbrook S001.

C. Laboratory Contamination

1) Polycyclic Aromatic Hydrocarbons

- No contamination was found in any of the associated laboratory blanks of SDG-Plumbrook S001.

2) Explosives

- No contamination was found in any of the associated laboratory blanks of SDG-Plumbrook S001.

3) Polychlorinated Biphenyls

- No contamination was found in any of the associated laboratory blanks of SDG-Plumbrook S001.

4) Lead

- No contamination was found in any of the associated laboratory blanks of SDG-Plumbrook S001.

II. QA DATA EVALUATION

The data evaluation of the QA data is summarized below.

a. Accuracy

1) Polycyclic Aromatic Hydrocarbons

- Surrogate recovery of one compound, phenanthrene (56%), in the MS was reported as low for SDG-054187. All surrogate %Rs were found to be within the control criteria limits for the MSD of SDG-054187.
- All %Rs reported for the LCS of SDG-054187 were found to be within the control criteria limits.

2) Explosives

- MS %Rs were found to be low for the following compounds: 1,3-dinitrobenzene (75%), HMX (73%), nitrobenzene (67%), RDX (67%), m-nitrotoluene (77%), and o-nitrotoluene (77%). MSD %Rs were found to be low for the following compounds: 1,3-dinitrobenzene (65%), 2,4,6-trinitrotoluene (59%), 4-amino-2,6-dinitrotoluene (73%), HMX (63%), nitrobenzene (70%), RDX (70%), m-nitrotoluene (67%), and o-nitrotoluene (70%). All positive sample results for these compounds are qualified as J, estimated.
- The %R for tetryl was found to be low (15%) in the LCS for SDG-054187.
- All initial and continuing calibration results for SDG-054187 are within the control criteria limits.

3) Polychlorinated Biphenyls

- The %R for Aroclor 1016 of the MS sample (45%) for SDG-054187 was found to be lower than the control criteria limits. The %R for Aroclor 1260 of the MSD sample (40%) for SDG-054187 was found to be lower than the control criteria limits.
- The %Rs for the LCS sample of SDG-054187 were found to be within the control criteria limits.
- One surrogate %R was found to be outside the control criteria limits for the soil sample, the MS, and the MSD on one column.

4) Lead

- All analyses were found to be within their respective control criteria limits.

B. Precision

1) Polycyclic Aromatic Hydrocarbons

- All analyses were found to be within their respective control criteria limits.

2) Explosives

- All analyses were found to be within their respective control criteria limits.

3) Polychlorinated Biphenyls

- The MS/MSD pair RPD result for Aroclor 1260 (125%) was found to be much higher than the control limit (20%). Positive PCB results are qualified as J, estimated.

4) Lead

- All analyses were found to be within their respective control criteria limits.

C. Laboratory Contamination

1) Polycyclic Aromatic Hydrocarbons

- No contamination was found in any of the associated blanks.

2) Explosives

- No contamination was found in any of the associated blanks.

3) Polychlorinated Biphenyls

- No contamination was found in any of the associated blanks.

4) Lead

- No contamination was found in any of the associated blanks.

III. QA/QC DATA COMPARISON

In accordance with EM 200-1-6, a data comparison of the QC and QA data was performed based on the agreement criteria summarized in the table below:

Criteria for Comparing Field QC and QA Sample Data

Matrix	Parameter	Disagreement	Major Disagreement
Soil	All	> 5x difference when one result is <DL	>10x difference when one result is <DL
Soil	All	>3x difference when one result is <RL	>5x difference when one result is <RL
Soil	VOCs only	> 5x difference	> 10x difference
Soil	Metals only	> 2x difference	> 3x difference
Soil	All except VOCs and metals	> 4x difference	> 5x difference

Data found out of control were examined to determine if the disagreements were extreme, isolated occurrences, or if negative trends existed. Various factors can contribute to duplicate disagreement, including the natural variability of the sample matrix, high or low analyte concentrations, or the presence of compounds that interfere with analysis. Negative trends may indicate systemic errors made in sampling, handling, or analytical procedures; or may indicate the selection of an inappropriate protocol. If negative trends or extreme non-conformances exist, associated data were evaluated carefully to determine their validity. It should be noted that samples found in disagreement did not necessarily indicate an error had been made or inappropriate procedures used.

Attachment III presents tables that show a side-by-side comparison of the analytical results of the field QC and QA samples. A summary of the evaluation of this comparison is presented below.

A. Polycyclic Aromatic Hydrocarbons

No disagreements were found between the QC and QA samples results for PAHs.

B. Explosives

No disagreements were found between the QC and QA sample results for explosives.

C. Polychlorinated Biphenyls

No disagreements were found between the QC and QA sample results for PCBs.

D. Lead

No disagreements were found between the QC and QA sample results for lead.

IV. PROBLEMS

No major problems were found with the quality and usability of the analytical data generated for this project. All of the results were considered usable. Qualifiers were added to specific data results to indicate estimated concentrations when QA data results were not within specific criteria limitations.

V. SUMMARY AND CONCLUSIONS

In general, the QC and QA sample results indicated that the data met "definitive data" standards and were of known quality. The data reported are acceptable with the required qualifications. No results were found to unusable due to data QC deficiencies. QC data demonstrated that the QA mechanisms were effective in ensuring measurement data reliability within expected limits of sampling and analytical error and were considered, as qualified, representative of actual site and sample conditions at the time sampled.

ATTACHMENT 1 – SAMPLE CORRELATION

Plum Brook 2BG Additional Soil Sampling CQAR Cross Reference

Primary Field Sample ID	Primary Lab Sample ID	QA Field Sample ID	QA Lab Sample ID	Sample Date and Time	Requested Analyses
PBOW-05-SO-2BG-BH26A (0-0.5)	0504201-02 ELAB	PBOW-05-SO-2BG-BH26B (0-0.5)	504187-001-002 GPL	4/22/05 1000	8270 low level PAHs
PBOW-05-SO-2BG-BH26A (0-0.5)	0504201-02 ELAB	PBOW-05-SO-2BG-BH26B (0-0.5)	504187-001-002 GPL	4/22/05 1000	8082 PCBs
PBOW-05-SO-2BG-BH26A (0-0.5)	0504201-02 ELAB	PBOW-05-SO-2BG-BH26B (0-0.5)	504187-001-002 GPL	4/22/05 1000	8330 Nitros
PBOW-05-SO-2BG-BH26A (0-0.5)	0504201-02 ELAB	PBOW-05-SO-2BG-BH26B (0-0.5)	504187-001-001 GPL	4/22/05 1000	6010B Lead only

ATTACHMENT II – QA DATA SUMMARIES

POLYCYCLIC AROMATIC HYDROCARBONS

Location ID	BH26
Field Sample ID	PBOW-05-SO-2BG-BH26-B-(0-0.5)
Lab Sample ID	504187-001-002N1
Sample Date	April 22, 2005
Sample Time	10:00
Sample Depth	0-0.5
Matrix	Soil
Method	SW 8270
Units	ug/kg

SVOCs	Result		DL
Acenaphthene	ND	U	8.7
Acenaphthylene	ND	U	8.7
Anthracene	ND	U	8.7
Benzo(a)anthracene	**20**		**8.7**
Benzo(a)pyrene	**21**		**8.7**
Benzo(b)fluoranthene	**23**		**8.7**
Benzo(g,h,i)perylene	**13**		**8.7**
Benzo(k)fluoranthene	**18**		**8.7**
Chrysene	**23**		**8.7**
Dibenz(a,h)anthracene	ND	U	8.7
Fluoranthene	**39**		**8.7**
Fluorene	ND	U	8.7
Indeno(1,2,3-cd)pyrene	**13**		**8.7**
Naphthalene	ND	U	8.7
Phenanthrene	**26**		**8.7**
Pyrene	**34**		**8.7**

EXPLOSIVE COMPOUNDS

Location ID	BH26
Field Sample ID	PBOW-05-SO-2BG-BH26-B-(0-0.5)
Lab Sample ID	504187-001-002N1
Sample Date	April 22, 2005
Sample Time	10:00
Sample Depth	0-0.5
Matrix	Soil
Method	SW 8330
Units	ug/kg

Explosive Compounds	Result		DL
1,3,5-Trinitrobenzene	ND	U	26
1,3-Dinitrobenzene	ND	U	10
2,4,6-Trinitrotoluene	**98**	**J**	27
2,4-Dinitrotoluene	**45**	**J**	31
2,6-Dinitrotoluene	ND	U	56
2-Amino-4,6-Dinitrotoluene	ND	U	19
2-Nitrotoluene	ND	U	160
3-Nitrotoluene	ND	U	77
4-Amino-2,6-Dinitrotoluene	ND	U	37
4-Nitrotoluene	ND	U	76
HMX	ND	U	52
Nitrobenzene	ND	U	33
RDX	ND	U	78
Tetryl	ND	U	170

ND = Not Detected

PCBs

Location ID	BH26
Field Sample ID	PBOW-05-SO-2BG-BH26-B-(0-0.5)
Lab Sample ID	504187-001-002N1
Sample Date	April 22, 2005
Sample Time	10:00
Sample Depth	0-0.5
Matrix	Soil
Method	SW 8082
Units	ug/kg

PCBs	Result		DL
PCB-1016 (Aroclor 1016)	ND	U	5
PCB-1221 (Aroclor 1221)	ND	U	0.05
PCB-1232 (Aroclor 1232)	ND	U	13
PCB-1242 (Aroclor 1242)	ND	U	6.2
PCB-1248 (Aroclor 1248)	ND	U	9.4
PCB-1254 (Aroclor 1254)	ND	U	9.7
PCB-1260 (Aroclor 1260)	**130**	**J**	3.9

LEAD

Location ID	BH26
Field Sample ID	PBOW-05-SO-2BG-BH26-B-(0-0.5)
Lab Sample ID	504187-001-001N1
Sample Date	April 22, 2005
Sample Time	10:00
Sample Depth	0-0.5
Matrix	Soil
Method	SW 6010
Units	mg/kg

Metals	Result	DL
Lead	39.4	0.21

ATTACHMENT III – QA/QC DATA COMPARISON

POLYCYCLIC AROMATIC HYDROCARBONS

SVOCs (Units in ug/kg)

	2BG-BH26-B-(0-0.5)			2BG-BH26-A-(0-0.5)		
Acenaphthene	ND	U	8.7	ND	U	26
Acenaphthylene	ND	U	8.7	ND	U	26
Anthracene	ND	U	8.7	ND	U	26
Benzo(a)anthracene	**20**		**8.7**	ND	U	26
Benzo(a)pyrene	**21**		**8.7**	ND	U	26
Benzo(b)fluoranthene	**23**		**8.7**	ND	U	26
Benzo(g,h,i)perylene	**13**		**8.7**	ND	U	26
Benzo(k)fluoranthene	**18**		**8.7**	ND	U	26
Chrysene	**23**		**8.7**	ND	U	26
Dibenz(a,h)anthracene	ND	U	8.7	ND	U	26
Fluoranthene	**39**		**8.7**	ND	U	26
Fluorene	ND	U	8.7	ND	U	26
Indeno(1,2,3-cd)pyrene	**13**		**8.7**	ND	U	26
Naphthalene	ND	U	8.7	ND	U	26
Phenanthrene	**26**		**8.7**	ND	U	26
Pyrene	**34**		**8.7**	ND	U	26

EXPLOSIVE COMPOUNDS

Explosive Compounds (Units in ug/kg)

	2BG-BH26-B-(0-0.5)			2BG-BH26-A-(0-0.5)		
1,3,5-Trinitrobenzene	ND	U	26	ND	U	100
1,3-Dinitrobenzene	ND	U	10	ND	U	100
2,4,6-Trinitrotoluene	**98**	**J**	27	**160**	**J**	100
2,4-Dinitrotoluene	**46**	**J**	31	ND	U	130
2,6-Dinitrotoluene	ND	U	56	ND	U	130
2-Amino-4,6-Dinitrotoluene	ND	U	19	ND	U	150
2-Nitrotoluene	ND	U	160	ND	U	100
3-Nitrotoluene	ND	U	77	ND	U	100
4-Amino-2,6-Dinitrotoluene	ND	U	37	ND	U	100
4-Nitrotoluene	ND	U	76	ND	U	150
HMX	ND	U	52	ND	U	100
Nitrobenzene	ND	U	33	ND	U	110
RDX	ND	U	78	ND	U	100
Tetryl	ND	U	170	ND	U	100

PCBs

PCBs (Units in ug/kg)

	2BG-BH26-B-(0-0.5)			2BG-BH26-A-(0-0.5)		
PCB-1016 (Aroclor 1016)	ND	U	5	ND	U	5.3
PCB-1221 (Aroclor 1221)	ND	U	0.05	ND	U	5.3
PCB-1232 (Aroclor 1232)	ND	U	13	ND	U	5.3
PCB-1242 (Aroclor 1242)	ND	U	6.2	ND	U	5.3
PCB-1248 (Aroclor 1248)	ND	U	9.4	ND	U	5.3
PCB-1254 (Aroclor 1254)	ND	U	9.7	ND	U	5.3
PCB-1260 (Aroclor 1260)	**130**	J	3.9	**210**		5.3

LEAD

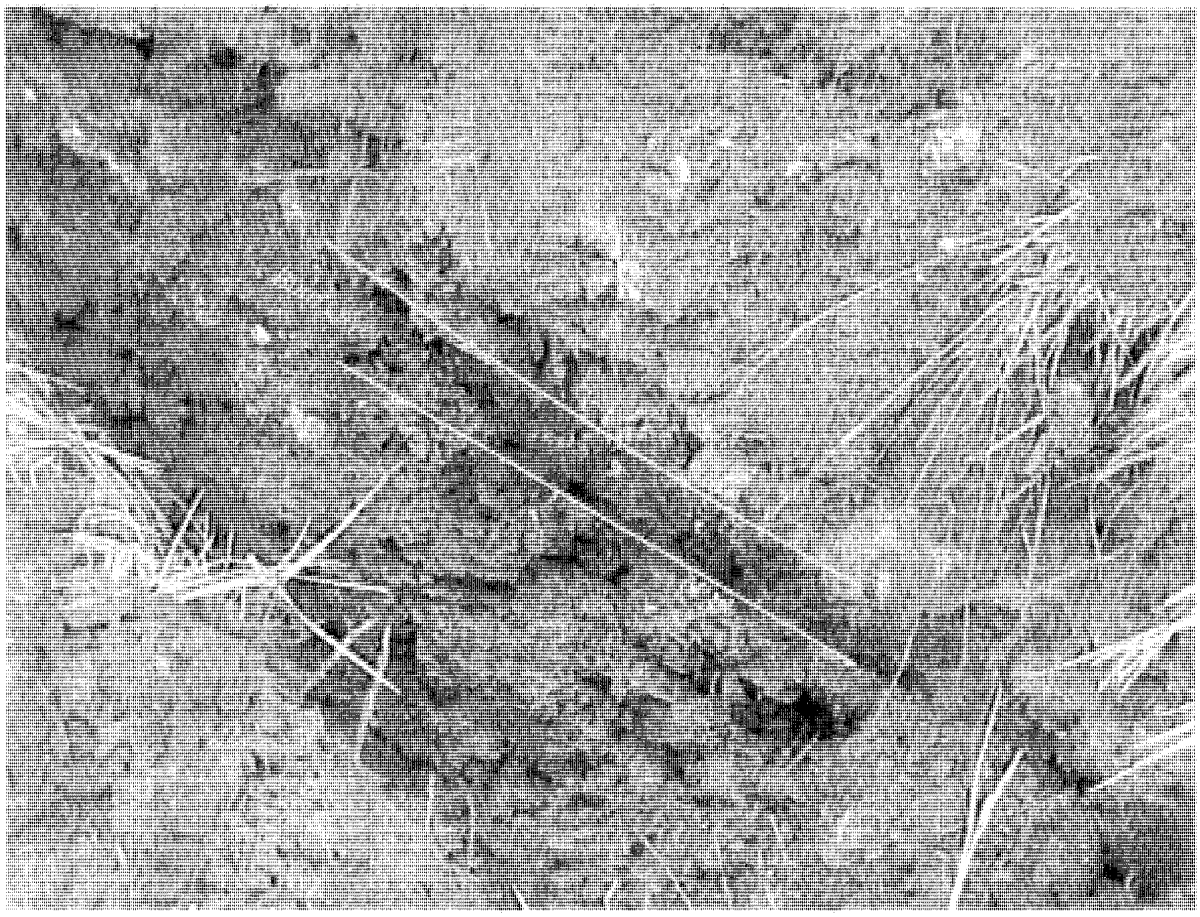
Metals (Units mg/kg)

	2BG-BH26-B-(0-0.5)		2BG-BH26-A-(0-0.5)	
Lead	39.4	0.21	55	0.38

Appendix I
Photologs of Trenching Activities

JACOBS

Photograph Log No. I- 1



Site: Reservoir No. 2 Burning Ground

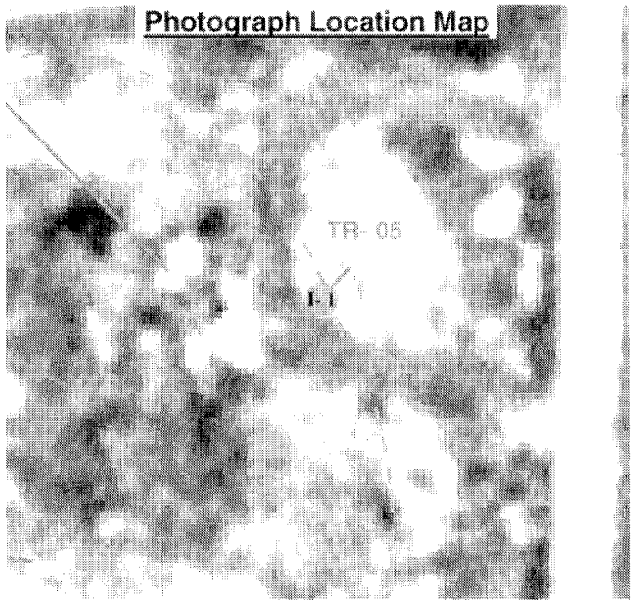
Description:

Exploratory Trench TR05: Photo taken at midpoint of trench showing burn layer on southeast side of trench.

Photograph Date: 5/19/2004

Photograph No.: MVC-493F.jpg

Photograph Location Map



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\Photologs\Photolog 1-1.mxd
June 27, 2005 MZobris Checked by AHardesty

JACOBS

Photograph Log No. I- 2

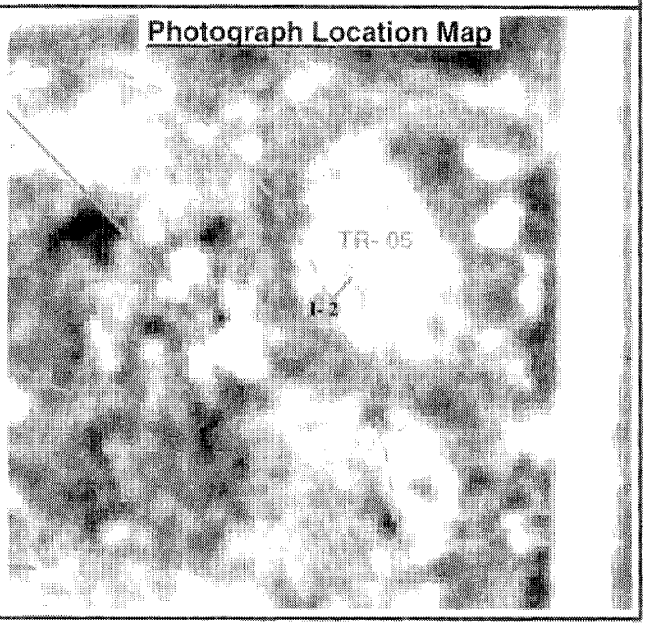
Site: Reservoir No. 2 Burning Ground

Description:

Exploratory Trench TR05: Photo taken of backilling operation - view looking east from inside the burning ground.

Photograph Date: 5/19/2004

Photograph No.: MVC-494F.jpg



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June 27, 2005 NZehms Checked by AHardesty

JACOBS

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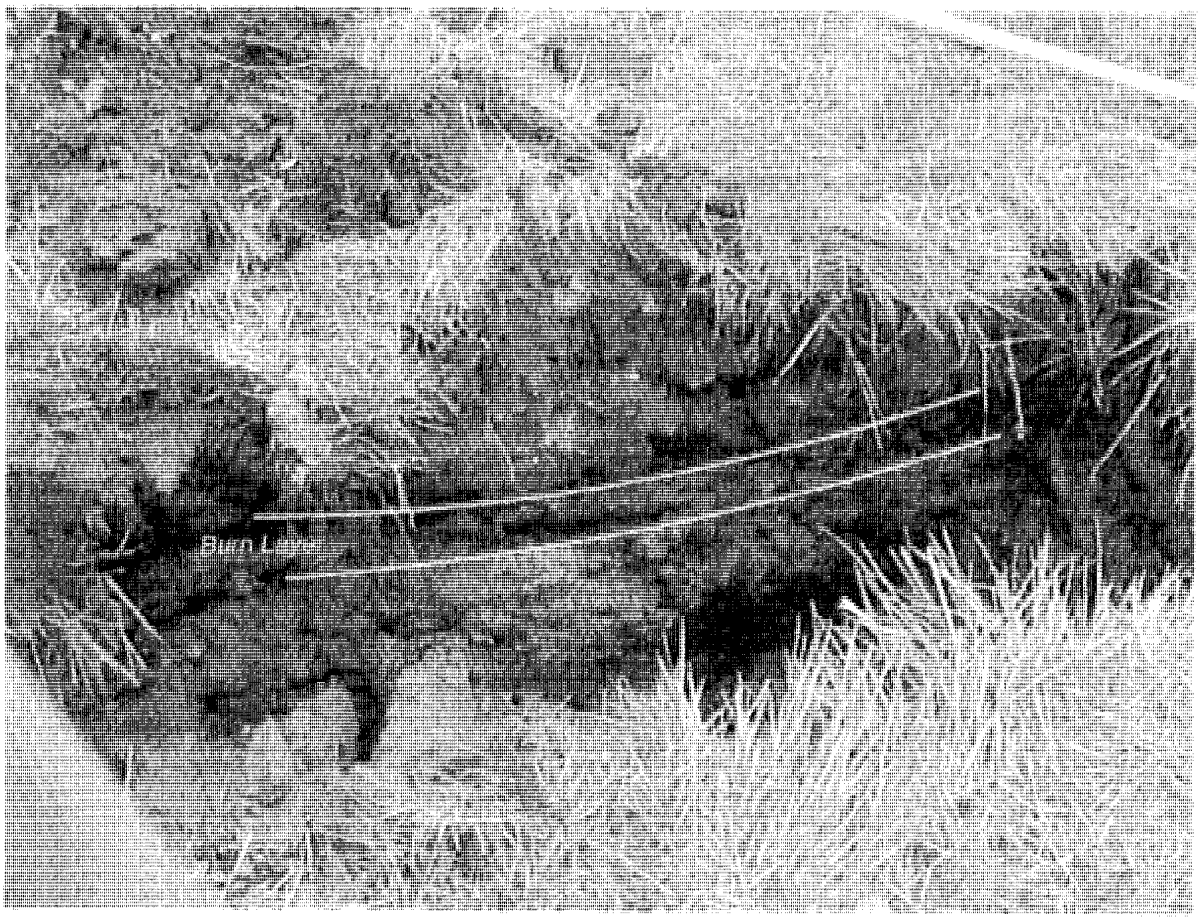


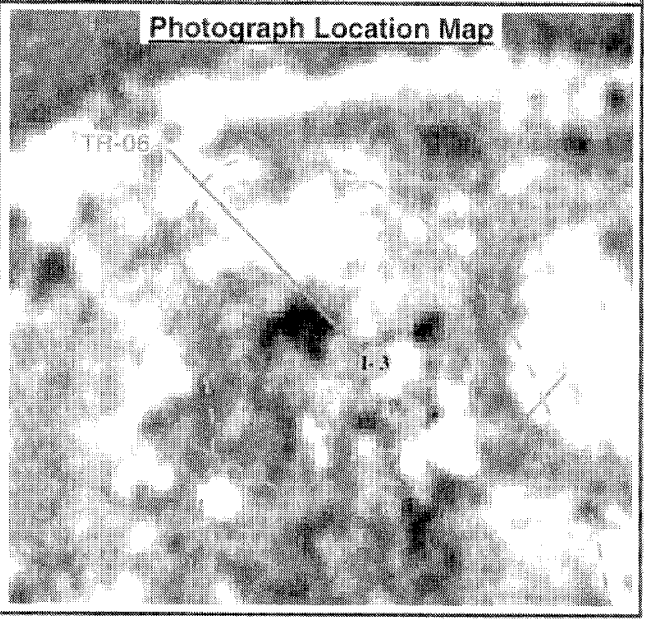
Site: Reservoir No. 2 Burning Ground

Description:

Exploratory Trench TR06: View of northern face of trench, near the starting point, showing burn layer.

Photograph Date: 5/19/2004

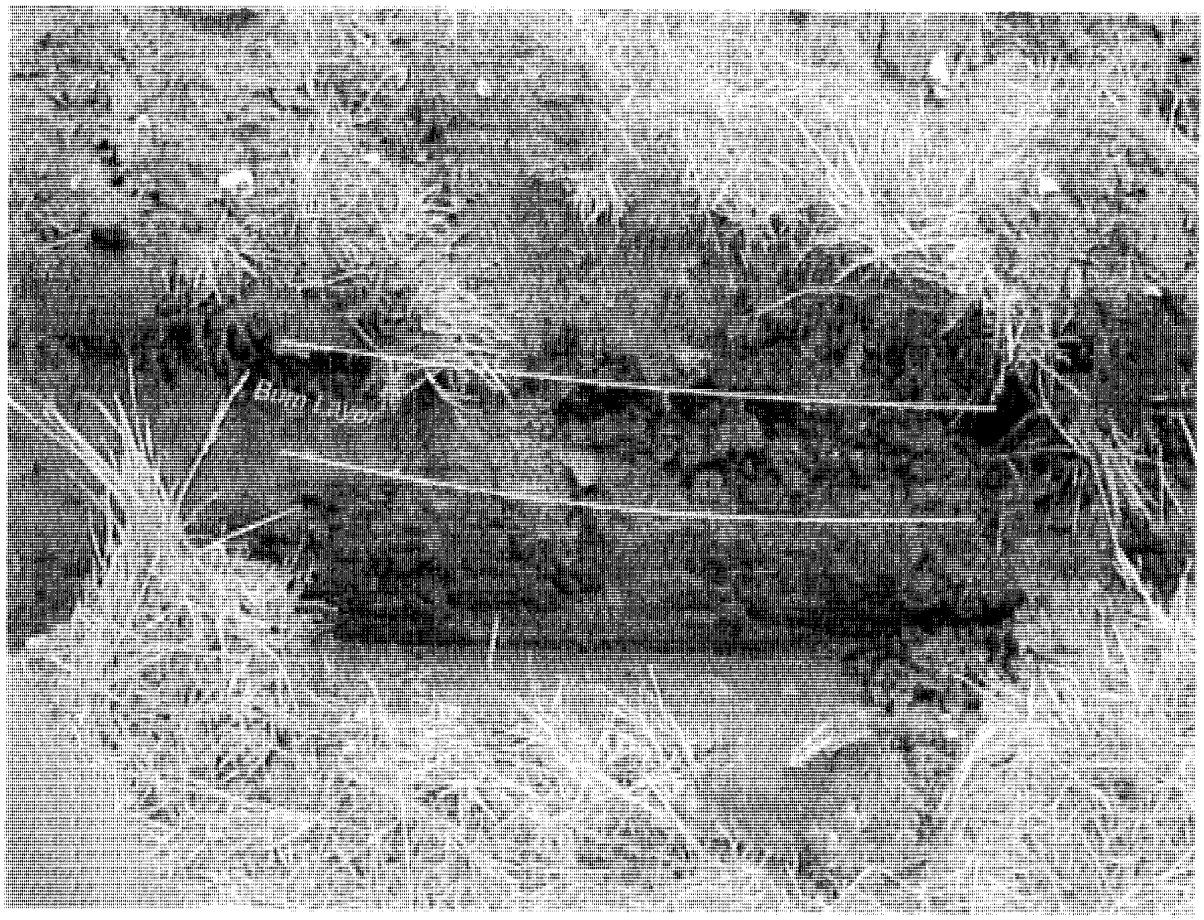
Photograph No.: MVC-495F.jpg



G:\GIS\Plumbrook\Projects\Final_Res2BG_Rt
\Photologs\Photolog 1-3.mxd
June 27, 2006 NZehms Checked by AHardesty

JACOBS

Photograph Log No. I-4



Site: Reservoir No. 2 Burning Ground

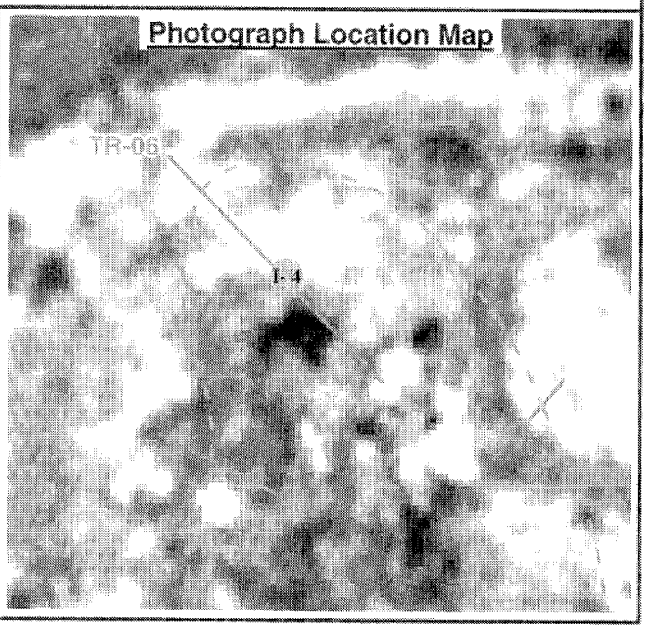
Description:

Exploratory Trench TR06: View of northern side of trench, near the mid point, showing burn layer and metalic debris.

Photograph Date: 5/19/2004

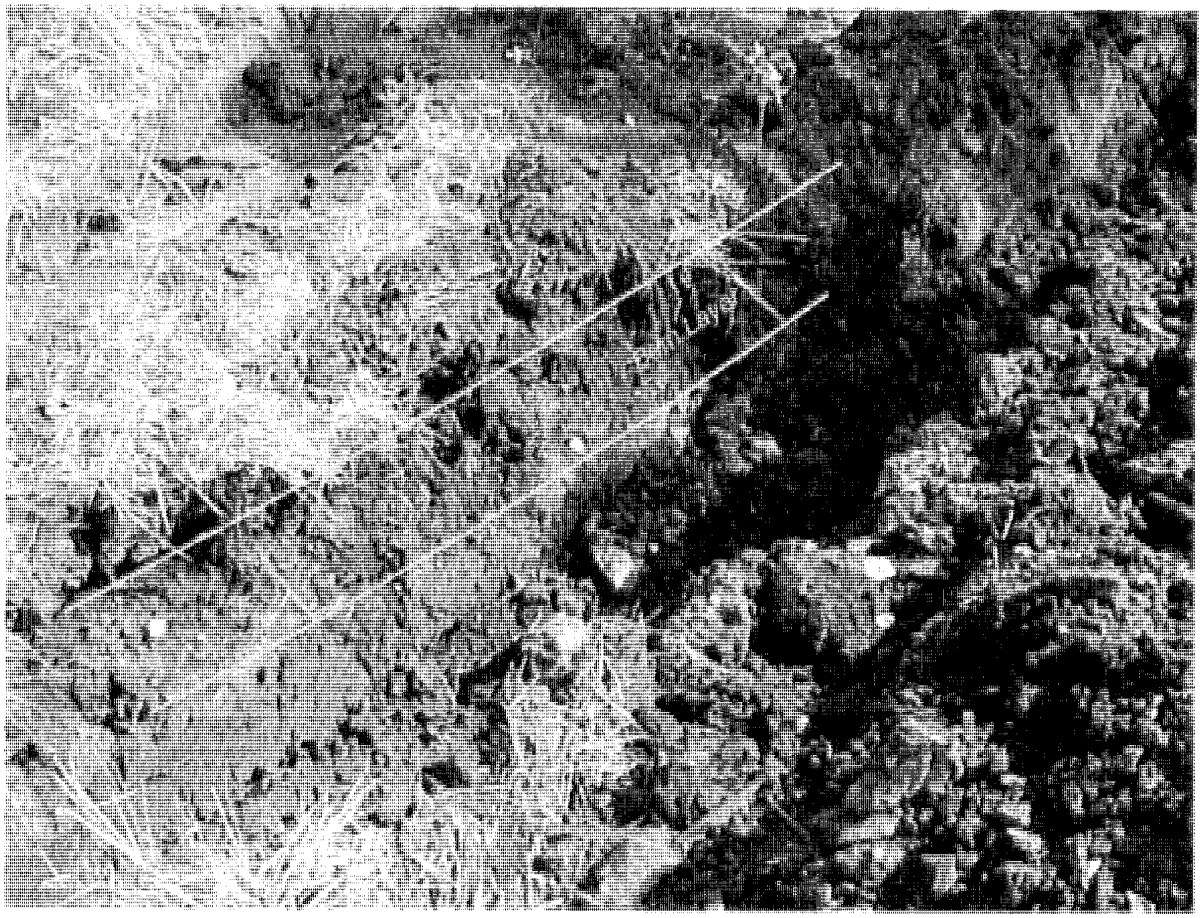
Photograph No.: MVC-496F.jpg

Photograph Location Map



JACOBS

Photograph Log No. I- 5



Site: Reservoir No. 2 Burning Ground

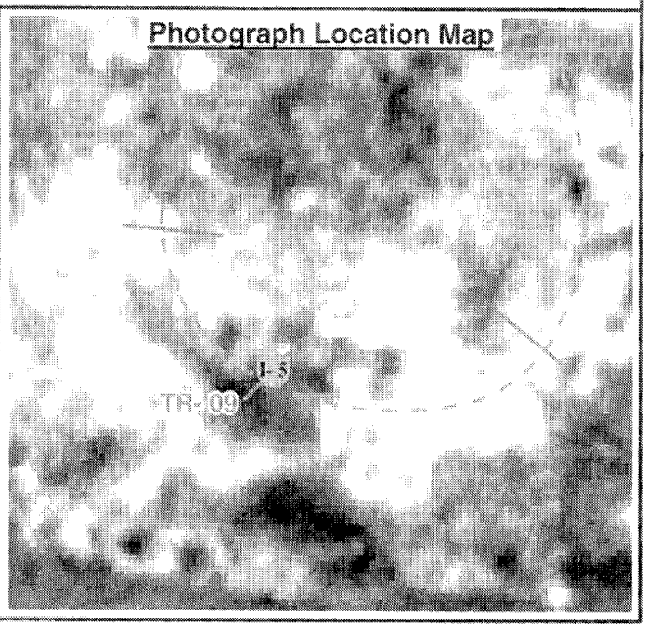
Description:

Exploratory Trench TR09: Photo taken at midpoint of trench showing burn layer just beneath the surface on southeast side of trench.

Photograph Date: 5/19/2004

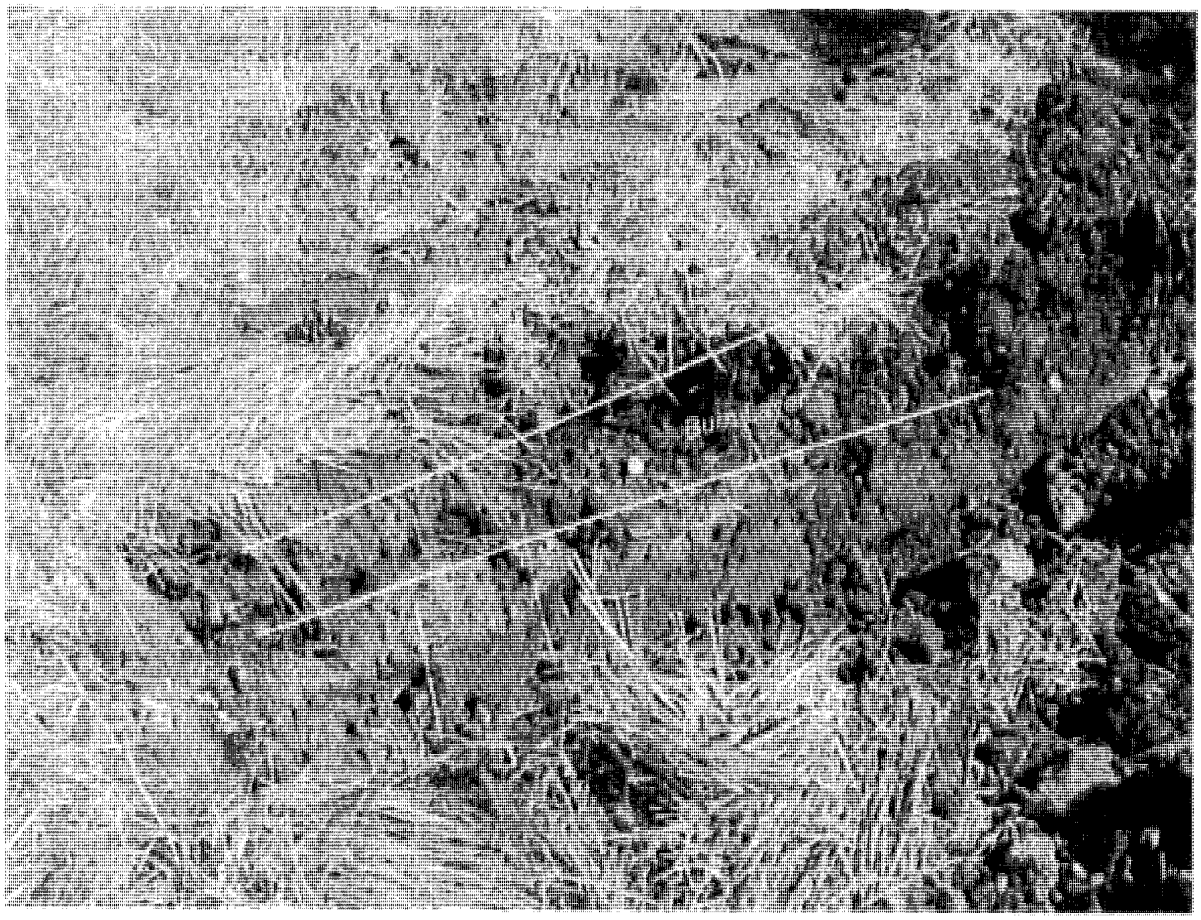
Photograph No.: MVC-497F.jpg

Photograph Location Map



JACOBS

Photograph Log No. I- 6



Site: Reservoir No. 2 Burning Ground

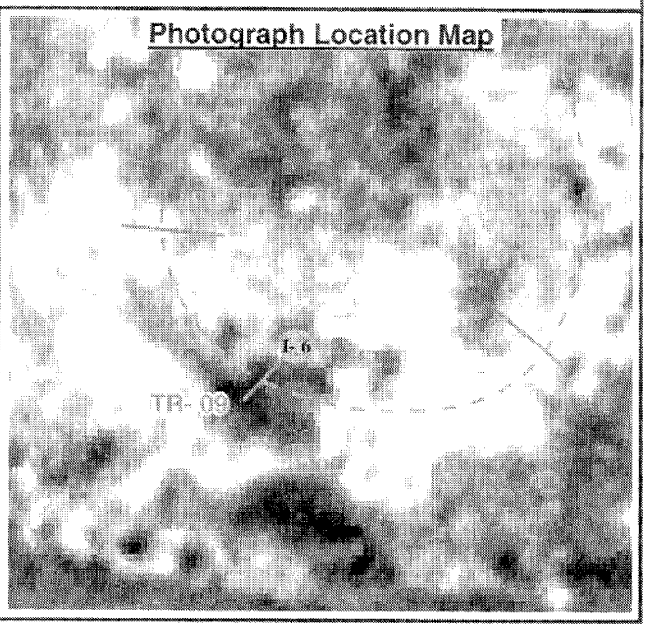
Description:

Exploratory Trench TR09: Photo taken near start of trench showing burn layer just beneath the surface on southeast side of trench.

Photograph Date: 5/19/2004

Photograph No.: MVC-498F.jpg

Photograph Location Map



JACOBS

Photograph Log No. I- 7

Site: Reservoir No. 2 Burning Ground

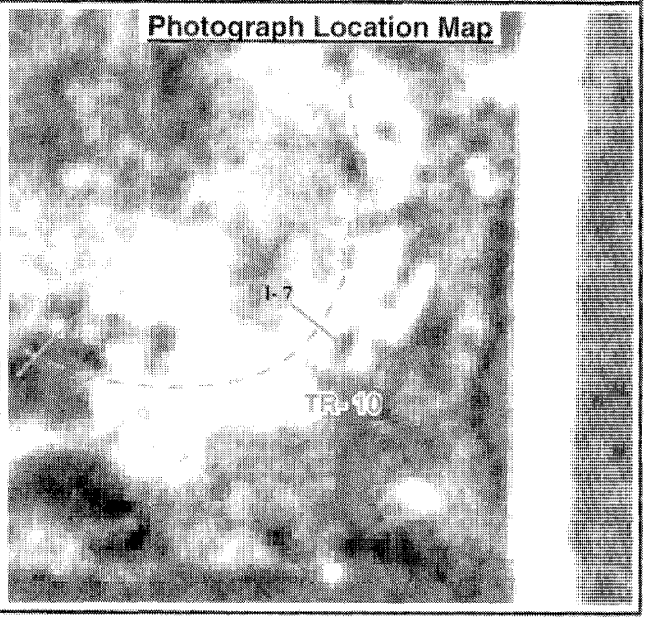
Description:

Exploratory Trench TR10: Photo taken near start of trench showing burn layer just beneath the surface on south side of trench.

Photograph Date: 5/20/2004

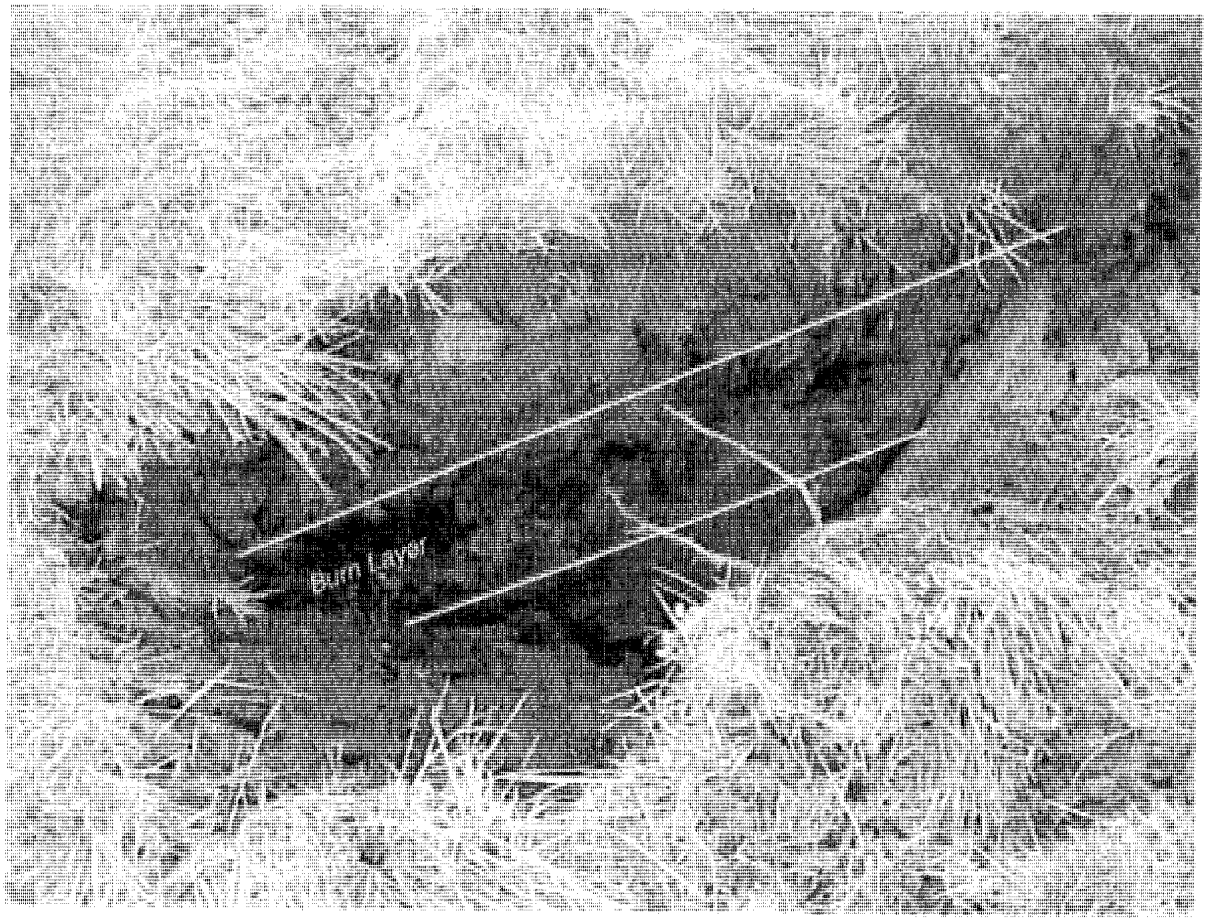
Photograph No.: MVC-499F.jpg

Photograph Location Map



JACOBS

Photograph Log No. I- 8



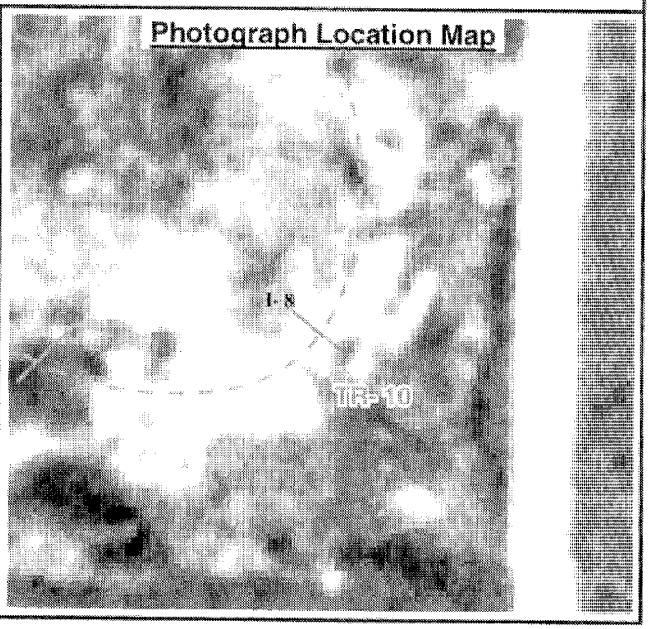
Site: Reservoir No. 2 Burning Ground

Description:

Exploratory Trench TR10: Photo taken near start of trench showing burn layer just beneath the surface on north side of trench.

Photograph Date: 5/20/2004

Photograph No.: MVC-500F.jpg



Appendix J
Photologs of Rock Cores

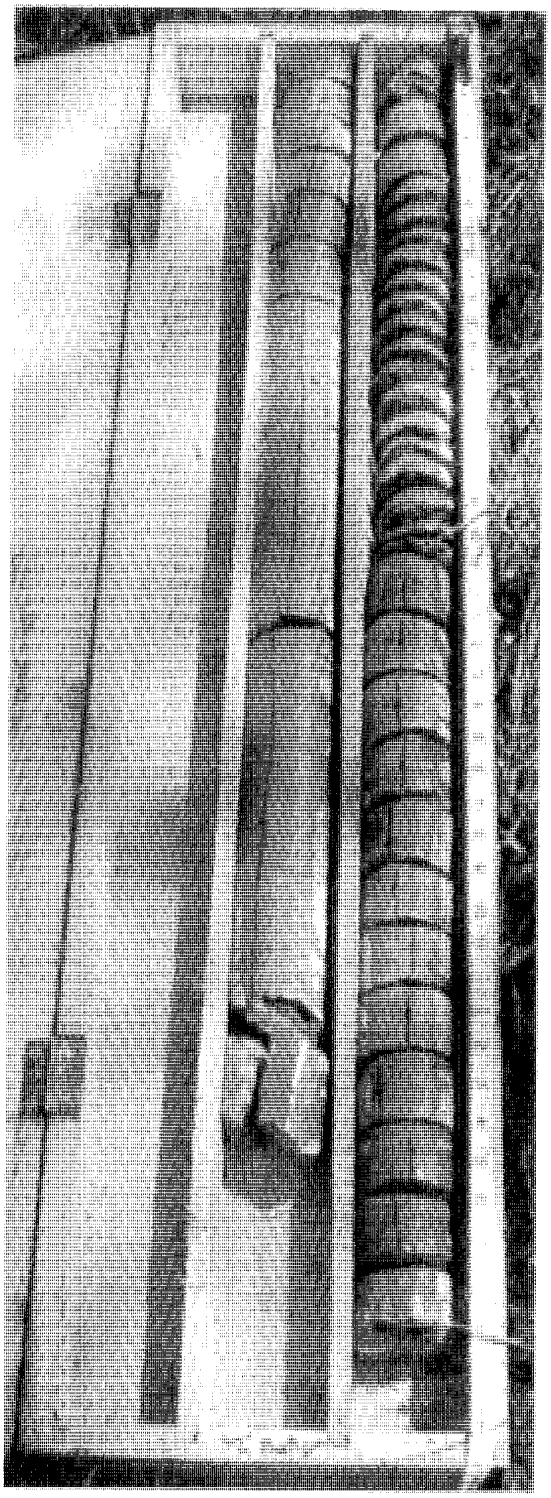
JACOBS

Photograph Log No. J-1

Site:
Reservoir No. 2 Burning Ground

Description:

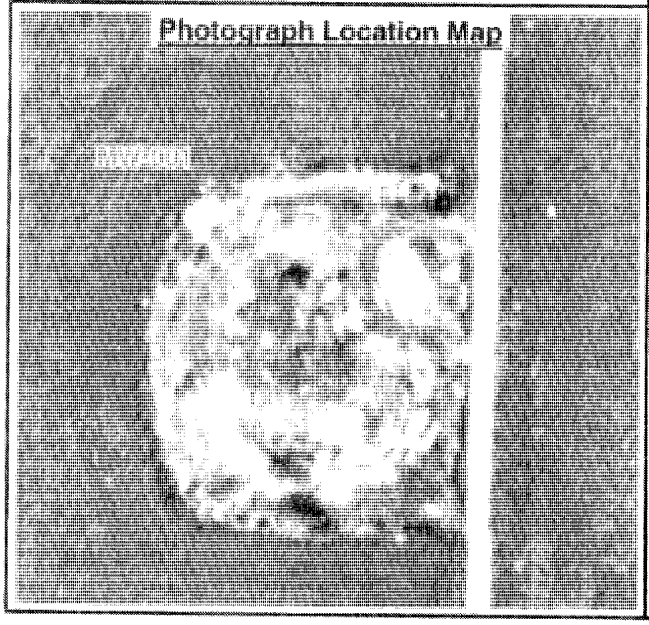
Rock Core: From Monitoring Well 2BG-BEDMW-001, interval 25.25 ft bgs (upper right) to 32 ft bgs (lower left).



Photograph Date: 6/23/2004

Photograph No.: DSCN0204.jpg

Photograph Location Map



JACOBS

Photograph Log No. J-2

Site:
Reservoir No. 2 Burning Ground

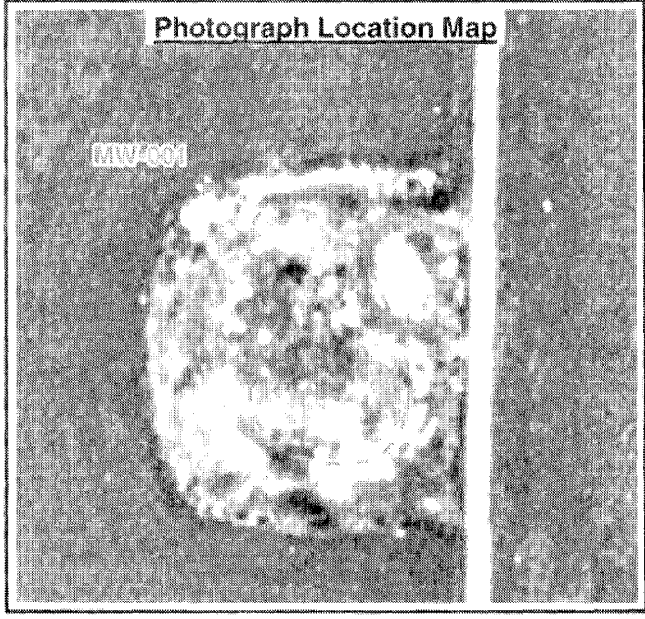
Description:

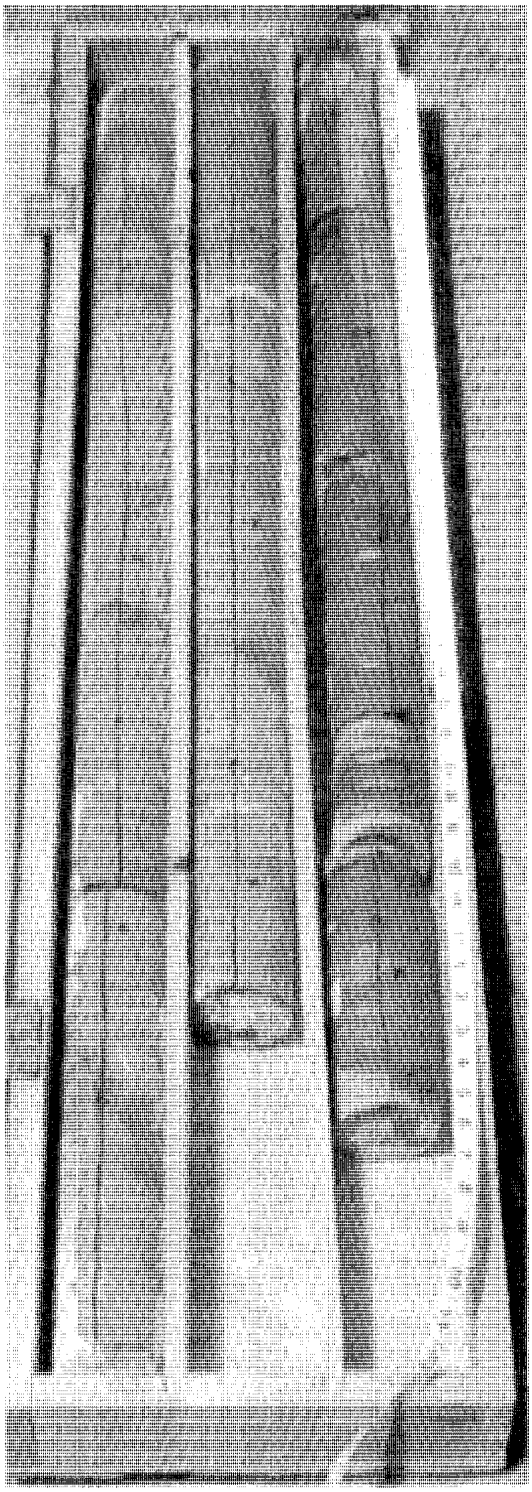
Rock Core: From Monitoring Well 2BG- BEDMW- 001, interval 32 ft bgs (upper right) to 42 ft bgs (lower left).

Photograph Date: 6/24/2004

Photograph No.: DSCN0222.jpg

Photograph Location Map





JACOBS

Photograph Log No. J-3

Site:
Reservoir No. 2 Burning Ground

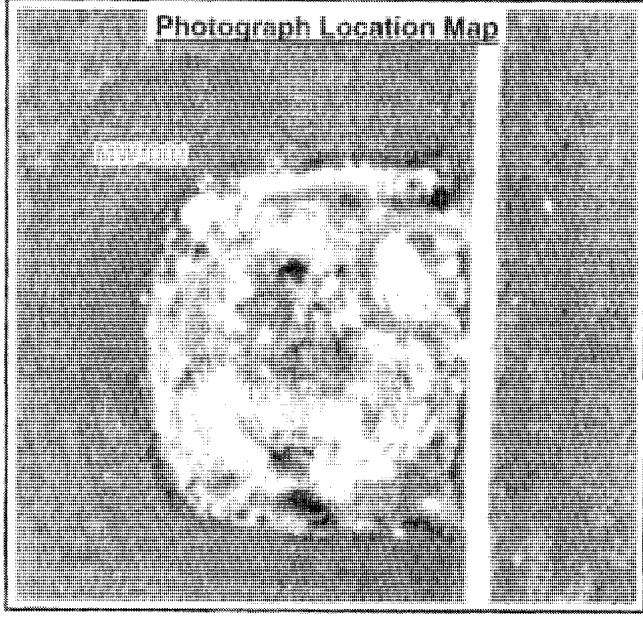
Description:

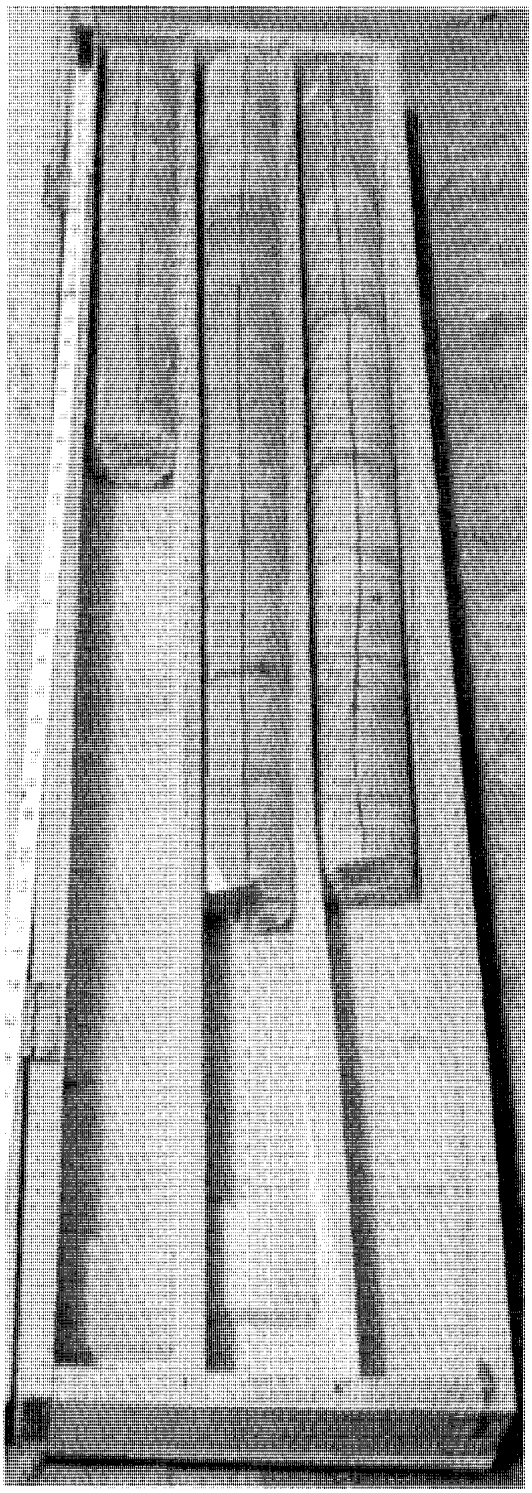
Rock Core: From Monitoring Well 2BG- BEDMW- 001, interval 42 ft bgs (upper right) to 49 ft bgs (lower left).

Photograph Date: 6/24/2004

Photograph No.: DSCN0223.jpg

Photograph Location Map





JACOBS

Photograph Log No. J-4

Site:
Reservoir No. 2 Burning Ground

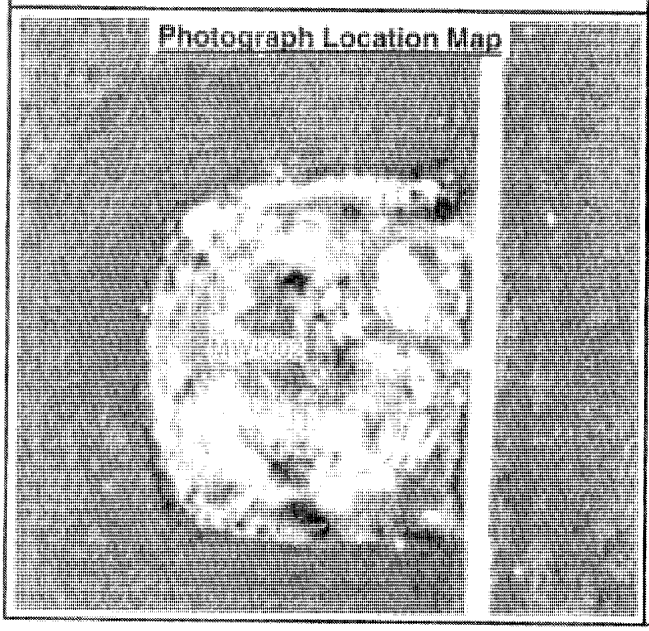
Description:

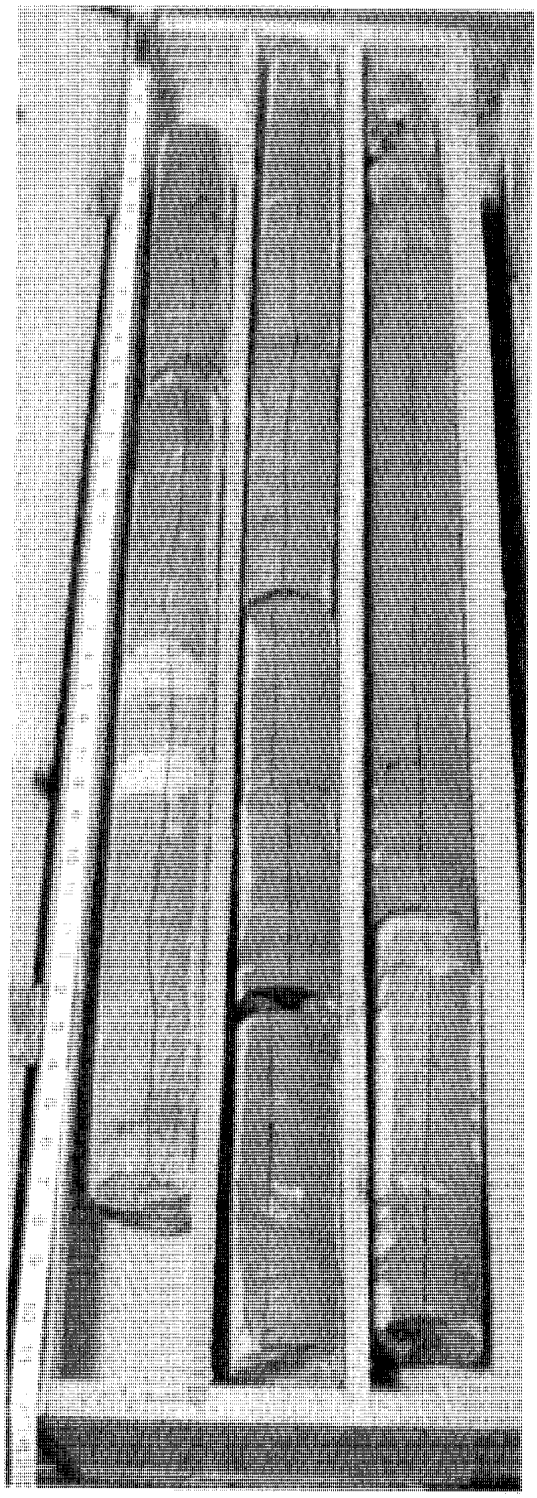
Rock Core: From Monitoring Well 2BG- BEDMW- 002, interval 31.5 ft bgs (upper right) to 42 ft bgs (lower left)

Photograph Date: 6/24/2004

Photograph No.: DCSN0224.jpg

Photograph Location Map





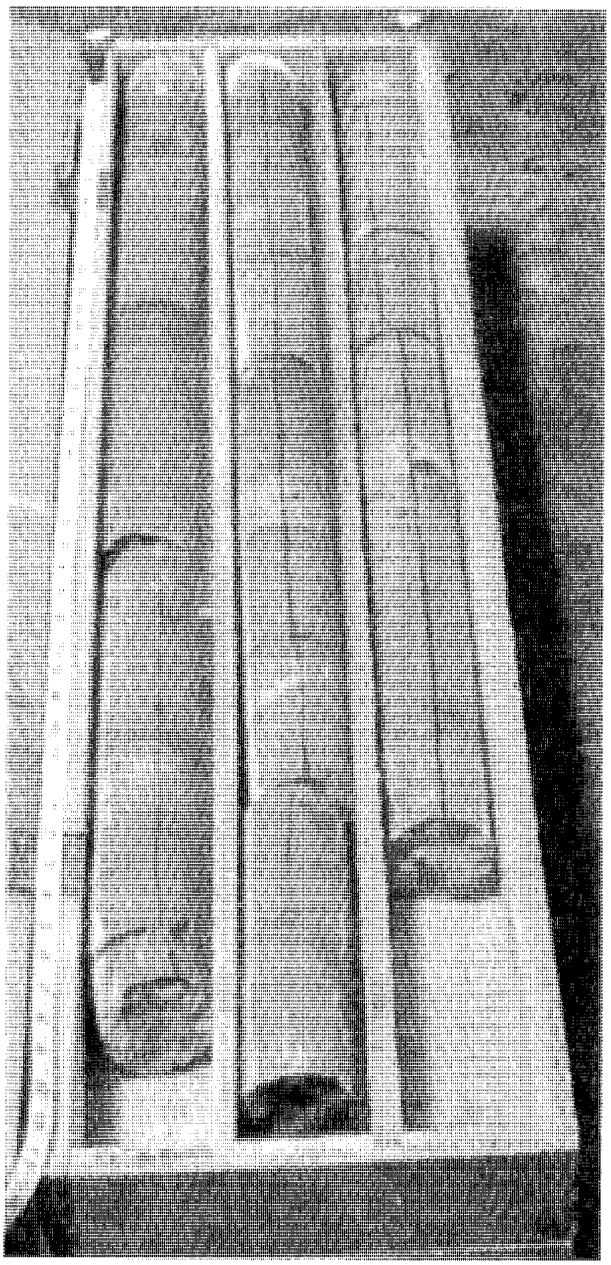
JACOBS

Photograph Log No. J-5

Site:
Reservoir No. 2 Burning Ground

Description:

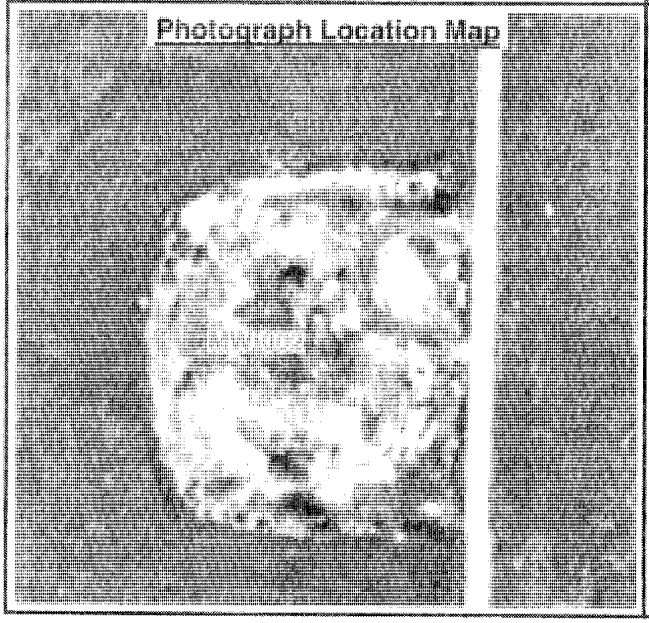
Rock Core: From Monitoring Well 2BG- BEDMW- 002, interval 42 ft bgs (upper right) to 52 ft bgs (lower left).



Photograph Date: 6/24/2004

Photograph No.: DCSN0226.jpg

Photograph Location Map



JACOBS

Photograph Log No. J-6

Site:
Reservoir No. 2 Burning Ground

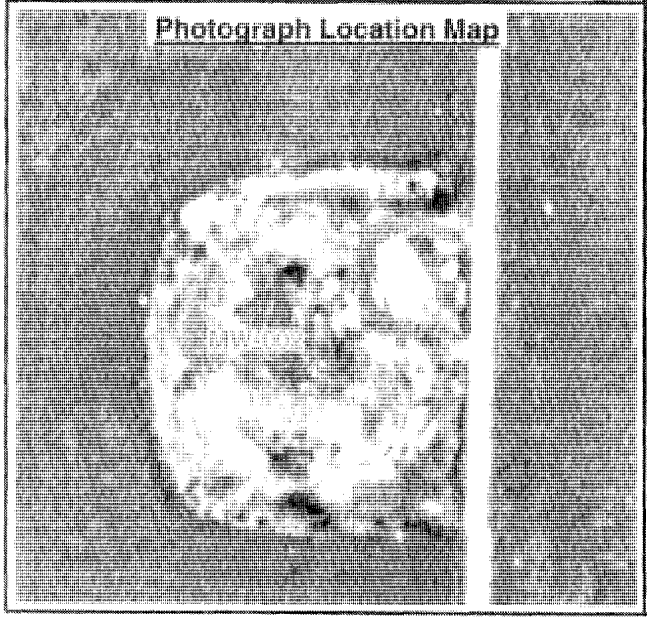
Description:

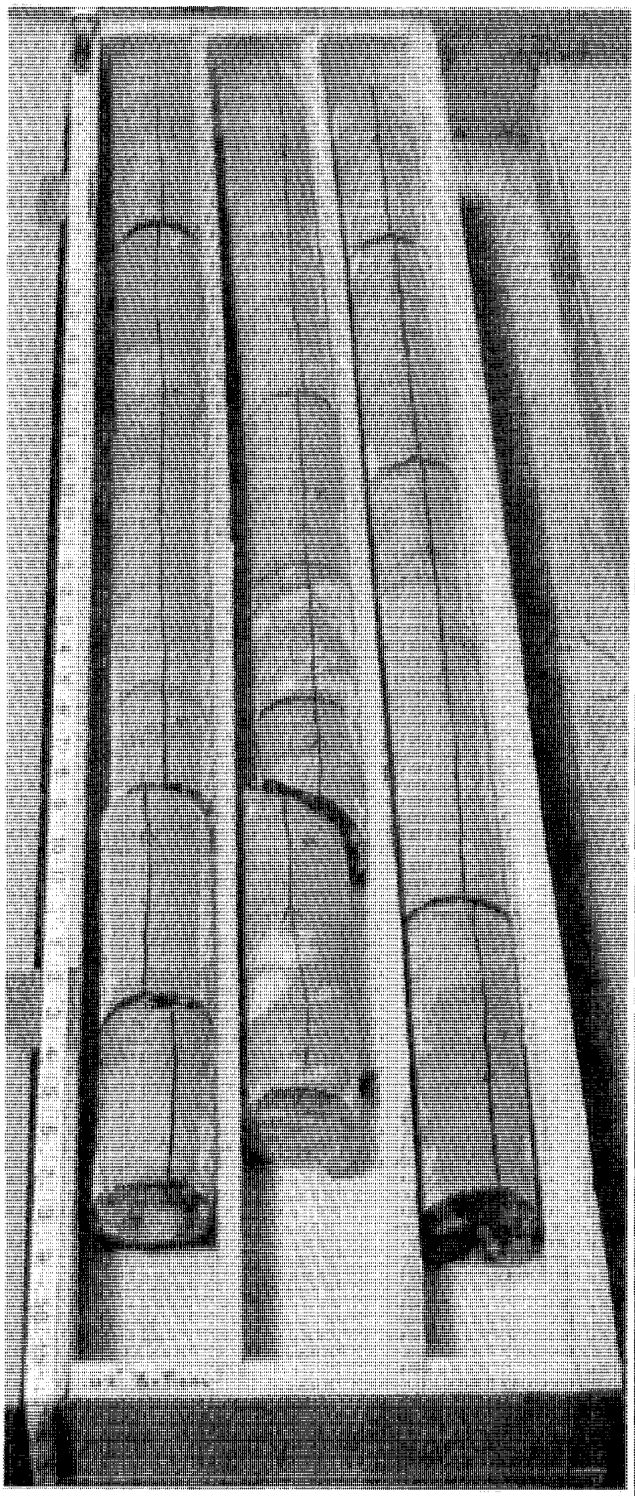
Rock Core: From Monitoring Well 2BG- BEDMW- 002, interval 52 ft bgs (upper right) to 62 ft bgs (lower left).

Photograph Date: 6/24/2004

Photograph No.: DCSN0227.jpg

Photograph Location Map





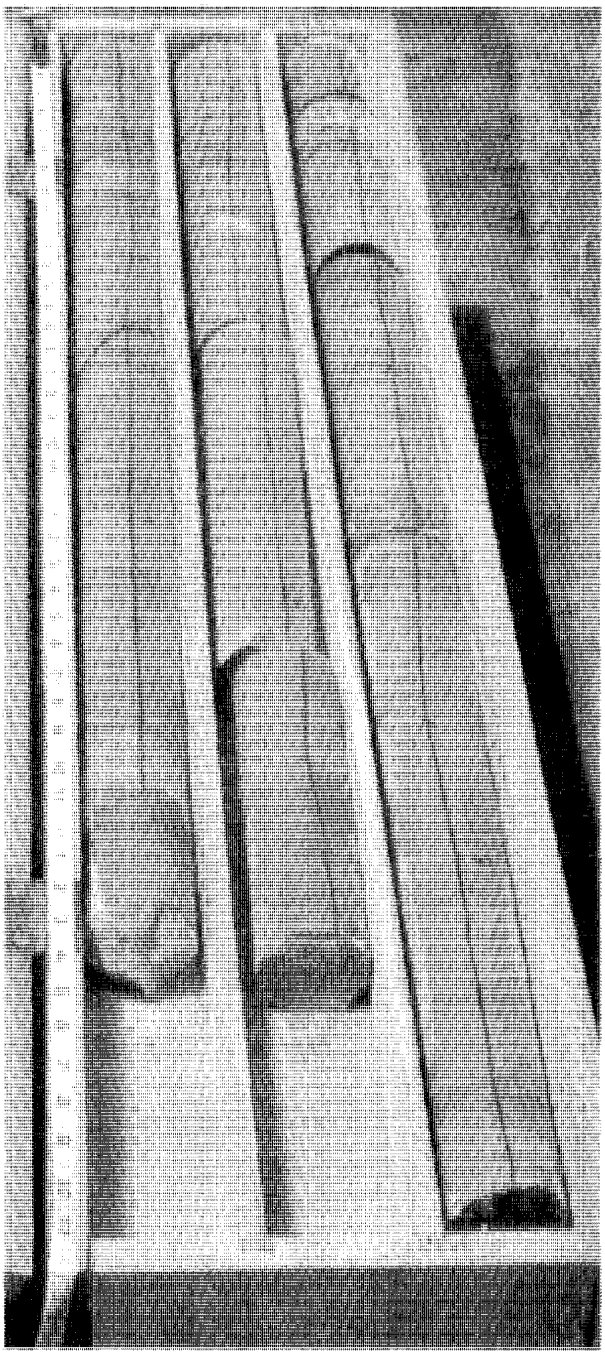
JACOBS

Photograph Log No. J-7

Site:
Reservoir No. 2 Burning Ground

Description:

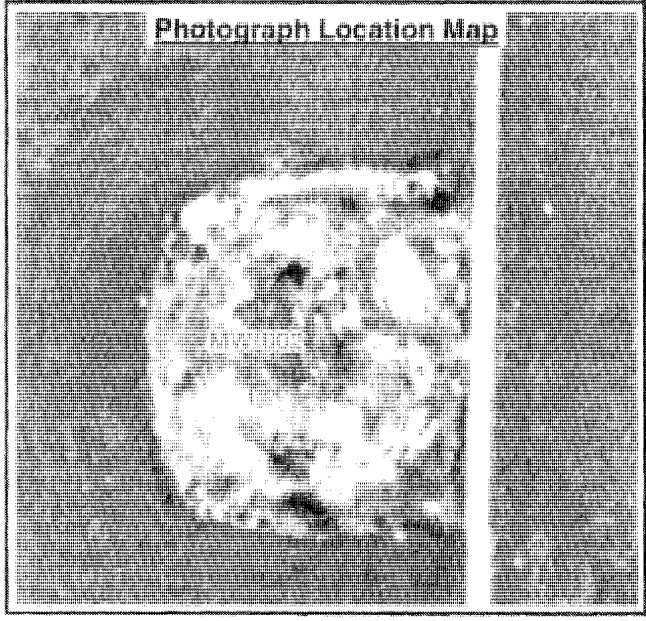
Rock Core: From Monitoring Well 2BG- BEDMW- 002, interval 62 ft bgs (upper right) to 72 ft bgs (lower left).



Photograph Date: 6/24/2004

Photograph No.: DCSN0228.jpg

Photograph Location Map



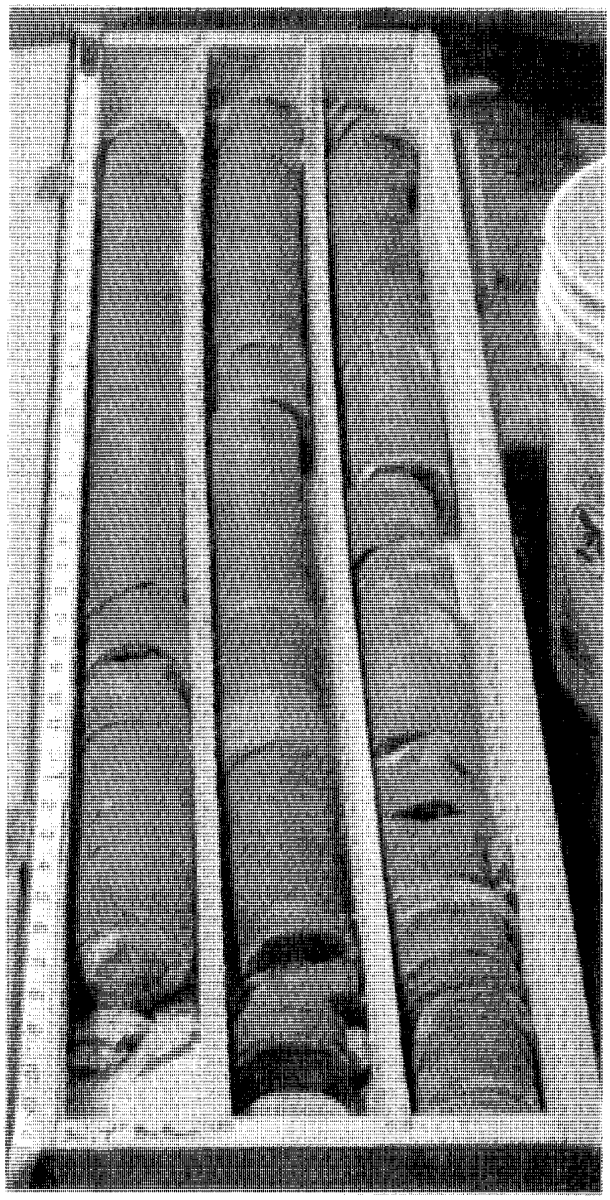
JACOBS

Photograph Log No. J- 8

Site:
Reservoir No. 2 Burning Ground

Description:

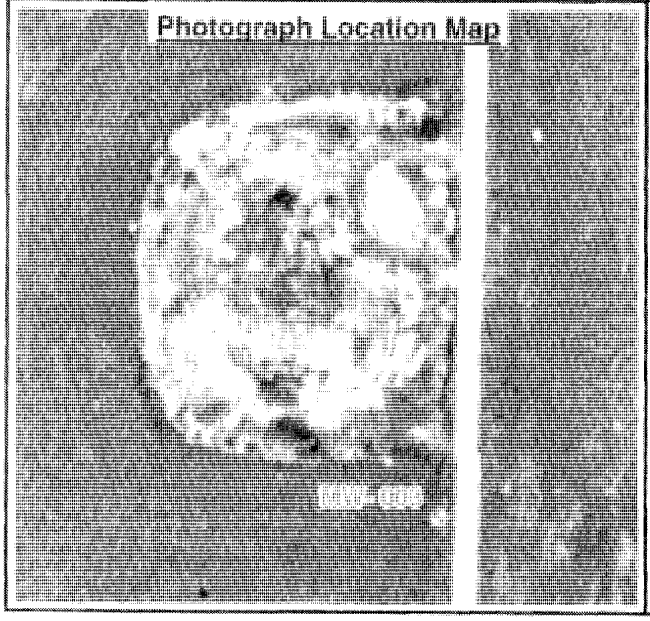
Rock Core: From Monitoring Well 2BG- BEDMW- 003, interval 20.25 ft bgs (upper right) to 30.6 ft bgs (lower left).



Photograph Date: 6/24/2004

Photograph No.: DCSN0229.jpg

Photograph Location Map



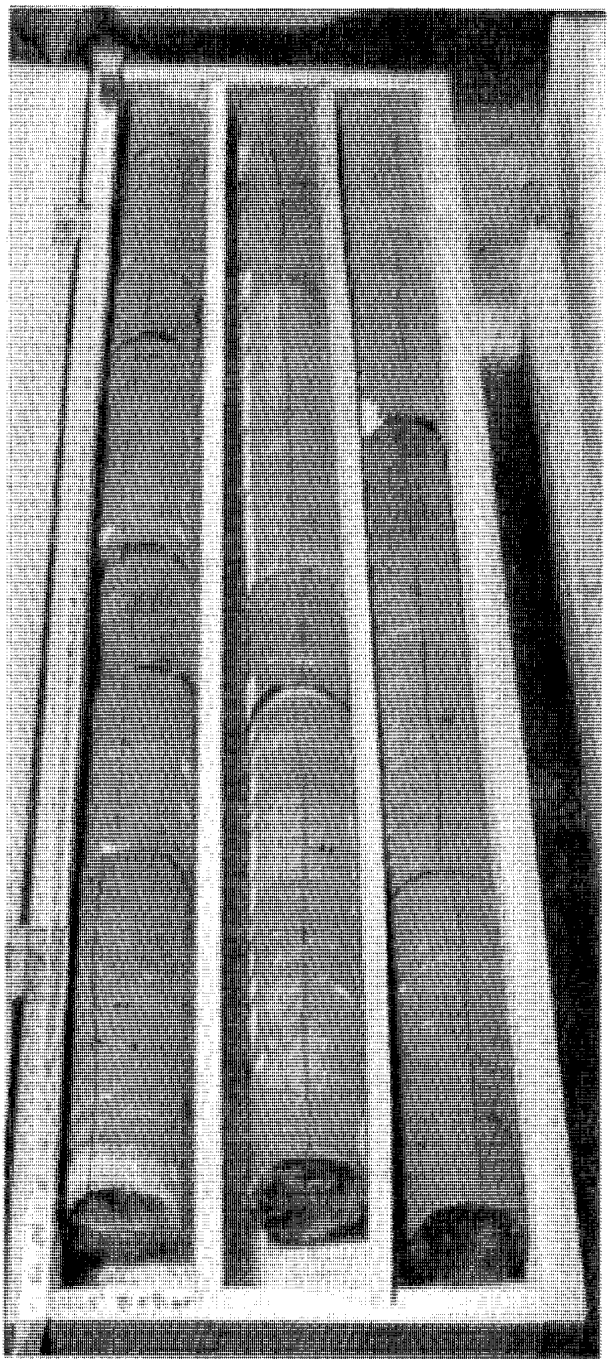
JACOBS

Photograph Log No. J- 9

Site:
Reservoir No. 2 Burning Ground

Description:

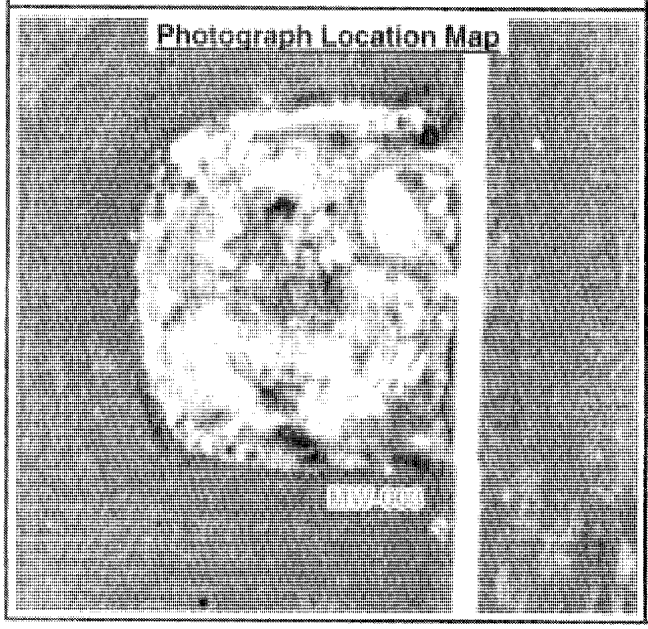
Rock Core: From Monitoring Well 2BG- BEDMW- 003, interval 30.6 ft bgs (upper right) to 41.5 ft bgs (lower left).



Photograph Date: 6/24/2004

Photograph No.: DCSN0230.jpg

Photograph Location Map



Appendix K
Well Sealing Reports

DNR 7810.04

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6605
Voice: (614) 265-6740 Fax: (614) 265-6767

0155454

LOCATION

County Erie Township Oxford Section/Lot Number (Circle One or Both)

Owner/Builder Plum Brook Station (Circle One or Both)

Address of Well Location 6100 Columbus Ave. (Number / Street Name)

City Sandusky Zip Code 44870

Property Location Description: 1/2 miles north (n, e, s, w) of Fox Rd and Reservoir Rd. (nearest intersection) on the west (n, e, s, w) side of Reservoir Road. (road name)

Location of Well in either: State Plane N ☑ S ☐ X 330024.11 +/- ft. or m Y 1730193.93 +/- ft. or m
OR Latitude/Longitude { Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec. Latitude Longitude }

Elevation of Well 640.08 +/- ft. or m Datum Plain: ☐ NAD27 ☑ NAD83

Source of Coordinates: ☐ GPS ☑ Survey ☐ Other

ORIGINAL WELL ODNR Well Log Number ZBGPZ-01 Copy attached? Yes or (No) (circle one)

MEASURED CONSTRUCTION DETAILS Date of measurements 5/25/04

Depth of Well 20' Static Water Level 5.76'
Size of Casing 1" PVC Length of casing 1 @ 20' 22.6'
Well Condition Good. sand filterpack from 20' to 6" bgs. Bentonite chips from 0"-6" (surface seal).

SEALING PROCEDURE

Method of Placement trimmie grout from bottom up

Placement:	From	To	Sealing Material	Volume
	0'	20'	bentonite slurry grout - 100%	6.5 gallons
	From	To		
	From	To		

Was Casing Removed? (Yes) or No (circle one)

Condition of Casing Good

Perforations: From 20' To 10'
From To

Date Sealing Performed 7/20/04

Reason(s) for Sealing Temporary monitoring well / peizometer - investigation completed.

CONTRACTOR

Name Fronte Drilling ODH Registration # 120

Address 2031 Millersburg Rd.

City/State/Zip Wooster, OH 44691

Signature Al Handesty - Jacobs Eng (customer)

I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.

ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 2045 MORSE ROAD, COLS., OHIO 43229-6605

Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

DNR 7810.04

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6605
Voice: (614) 265-6740 Fax: (614) 265-6767

9155455

LOCATION

County Erie Township Oxford Circle One or Both Section/Lot Number

Owner/Builder Plum Brook Station
Circle One or Both

Address of Well Location 6100 Columbus Ave.
Number Street Name

City Sandusky Zip Code 44870

Property Location Description 1/2 miles north (n, e, s, w) of Fox Rd + Reservoir Rd. (nearest intersection)

on the west (n, e, s, w) side of Reservoir Rd. (road name)

Location of Well in either: State Plane N ☑ S ☐ X 30169.50 +/- ft. or m Y 17174.12 +/- ft. or m
OR
Latitude/Longitude Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec.
Latitude Longitude

Elevation of Well 640.17 +/- ft. or m Datum Plain: ☐ NAD27 ☑ NAD83

Source of Coordinates: ☐ GPS ☑ Survey ☐ Other

ORIGINAL WELL ODNR Well Log Number ZBC - P202 Copy attached? Yes or No (circle one)

MEASURED CONSTRUCTION DETAILS Date of measurements 5/25/05

Depth of Well 21.5' Static Water Level 5.40'
Size of Casing 1" PVC Length of casing 23.7'
Well Condition Good, sand filter pack from 21.5' - 6" bgs. Bentonite chips from 0" - 6" (surface seal).

SEALING PROCEDURE
Method of Placement trimmie grout from bottom up

Placement:	From	To	Sealing Material	Volume
	0'	21.5'	bentonite slurry - 100%	7 gallons

Was Casing Removed? Yes or No (circle one)

Condition of Casing Good
Perforations: From 21.5' To 11.5'
From To

Date Sealing Performed 7/20/04
Reason(s) for Sealing Temporary monitoring well / piezometer - investigation completed

CONTRACTOR
Name Frontz Drilling ODH Registration # 120
Address 2031 Millersburg Rd.
City/State/Zip Wooster, OH 44691

Signature Al Hardesty - Jacobs Eng. (customer)
I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.
ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 2045 MORSE ROAD, COLS., OHIO 43229-6605
Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

DNR 7810.04

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6605
Voice: (614) 265-6740 Fax: (614) 265-6767

0155456

LOCATION

County Erie Township Oxford Circle One or Both Section/Lot Number

Owner/Builder Plum Brook Station
Circle One or Both

Address of Well Location 6100 Columbus Ave.
Number Street Name

City Sandusky Zip Code 44870

Property Location Description 1/2 miles north (n, e, s, w) of Fox Rd + Reservoir Rd. (nearest intersection)

on the west (n, e, s, w) side of Reservoir Rd (road name)

Location of Well in either: State Plane N ☐ S ☐ X 30306.23 +/- ft. or m Y 17206.30 +/- ft. or m
OR
Latitude/Longitude Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec.
Latitude Longitude

Elevation of Well 639.57 +/- ft. or m Datum Plain: ☐ NAD27 ☑ NAD83

Source of Coordinates: ☐ GPS ☑ Survey ☐ Other

ORIGINAL WELL ODNR Well Log Number 2B6-P203 Copy attached? Yes or No (circle one)

MEASURED CONSTRUCTION DETAILS Date of measurements 5/25/05

Depth of Well 23.5 Static Water Level 6.20'
Size of Casing 1" PVC Length of casing 26.05'
Well Condition Good, sand filter pack from 23.5' to 6" BGS. Bentonite chips from 0"-6" (surface seal).

SEALING PROCEDURE

Method of Placement tremmie grout from bottom up

Placement:	From	To	Sealing Material	Volume
	0'	23.5'	100% bentonite slurry	7.5 gallons

Was Casing Removed? Yes or No (circle one)

Condition of Casing Good
Perforations: From 13.5' To 23.5'
From To

Date Sealing Performed 7/20/04
Reason(s) for Sealing temporary monitoring well / piezometer - investigation completed

CONTRACTOR

Name Frontz Drilling ODH Registration # 120
Address 2031 Millersburg Rd.
City/State/Zip Wooster, OH 44691

Signature Al Hardesty - Jacobs Eng (customer)
I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.
ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 2045 MORSE ROAD, COLS., OHIO 43229-6605
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DNR 7810.04

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6605
Voice: (614) 265-6740 Fax: (614) 265-6767

LOCATION

County Erie Township Oxford (Circle One or Both) Section/Lot Number
Owner/Builder (Circle One or Both) Plum Brook Station
Address of Well Location 6100 (Number) Columbus Ave (Street Name)
City Sandusky Zip Code 44870
Property Location Description 1/2 miles north (n, e, s, w) of Fox Rd + Reservoir Rd (nearest intersection) on the west (n, e, s, w) side of Reservoir Rd. (road name)
Location of Well in either: State Plane N ☐ S ☐ X 302622.54 +/- ft. or m Y 1738843 +/- ft. or m
OR Latitude/Longitude (Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec.) Latitude Longitude
Elevation of Well 640.33 +/- ft. or m Datum Plain: ☐ NAD27 ☑ NAD83
Source of Coordinates: ☐ GPS ☑ Survey ☐ Other

ORIGINAL WELL ODNR Well Log Number 286 - PZ04 Copy attached? Yes or (No) (circle one)

MEASURED CONSTRUCTION DETAILS Date of measurements 5/26/04

Depth of Well 23.5' Static Water Level 6.38'
Size of Casing Length of casing 27.0'
Well Condition Good, sand filter pack from 23.5' to 6" bgs. Bentonite chips from 0"-6" (surface seal)

SEALING PROCEDURE
Method of Placement tremmie grout from bottom up

Placement:	From	To	Sealing Material	Volume
	0'	23.5'	100% bentonite slurry	7.5 gallons
	From	To		
	From	To		

Was Casing Removed? (Yes) or No (circle one)
Condition of Casing Good
Perforations: From 13.5' To 23.5'
From To

Date Sealing Performed 7/20/04
Reason(s) for Sealing temporary monitoring well / piezometer - investigation completed.

CONTRACTOR
Name Frontz Drilling ODH Registration # 120
Address 2031 Millersburg Rd.
City/State/Zip Wooster, OH 44691
Signature Al Hardesty - Jacobs Eng. (customer)
I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.
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Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

DNR 7810.04

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6605
Voice: (614) 265-6740 Fax: (614) 265-6767

LOCATION

County Erie Township Oxford Circle One or Both Section/Lot Number

Owner/Builder Plum Brook Station
Circle One or Both

Address of Well Location 6100 Number Columbus Ave Street Name

City Sandusky Zip Code 44870

Property Location Description 1/2 miles north n, e, s, w of Fox Rd & Reservoir Rd. nearest intersection

on the west n, e, s, w side of Reservoir Rd. road name

Location of Well in either: State Plane N ☐ S ☐ X 301555.23 +/- ft. or m Y 173841.12 +/- ft. or m
OR Latitude/Longitude Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec
Latitude Longitude

Elevation of Well 640.60 +/- ft. or m Datum Plain: ☐ NAD27 ☑ NAD83

Source of Coordinates: ☐ GPS ☑ Survey ☐ Other

ORIGINAL WELL ODNR Well Log Number 286-P205 Copy attached? Yes or No (circle one)

MEASURED CONSTRUCTION DETAILS

Date of measurements 5/26/04

Depth of Well 22.5' Static Water Level 6.80'
Size of Casing 1" PVC Length of casing 25.0'
Well Condition Good, Sand filterpack from 22.5' - 6" bgs. Bentonite chips from 0" - 6" (surface seal)

SEALING PROCEDURE

Method of Placement tremmie grout from bottom up

Placement:	From	To	Sealing Material	Volume
	0'	22.5'	100% bentonite slurry	6.5 gallons
	From	To		
	From	To		

Was Casing Removed? Yes or No (circle one)

Condition of Casing Good

Perforations: From 12.5' To 22.5'
From To

Date Sealing Performed 7/20/04

Reason(s) for Sealing temporary monitoring well / piezometer - investigation completed.

CONTRACTOR

Name Frontz Drilling ODH Registration # 120

Address 2031 Millersburg Rd.

City/State/Zip Wooster, OH. 44691

Signature Bill Hendricks - Jacobs Eng. (customer)
I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.

ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 2045 MORSE ROAD, COLS., OHIO 43229-6605
Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

Appendix L

Response to Comments

SUBJECT: Response to review comments for the Interim Final Site Characterization Report, Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, September 2004, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0002

Reviewer: Lannae Long, USACE CELRN

1. **Appendix L. Formatting data tables in the text: As you have suggested, it may be too late to re-format these tables for this document, but it is expected that the tables in future documents will be formatted as App L USACE - Nashville #27 comments suggests. Using the CDQR, as suggested in the response, is sufficient for this report, however, since I am not a chemist, I am not familiar with all the notations in the CDQR.**

Response: The tables will be reformatted for the final version and the data qualifers will be defined

2. **Appendix L) Footnotes on tables are still missing. Please footnote all abbreviations and citations.**

Response: Data qualifiers will be defined as a footnote on each page.

3. **The recommendations should be changed to reflect the plan of conducting an EECA non-time critical removal of contaminated soils.**

Response: The EE/CA will be added to the recommendations section.

4. **In the recommendations, only Human Health Risk Assesment was recommended. It should read human health and ecological risk assessment should be evaluted. Note, that eventhough the previous comment was to recommend an EE/CA NTCRA, this does not exempt PBOW from the RI/FS process. An EE/CA temporarily suspends the AOC from the RI/FS process, then when the NTCRA is completed, the AOC steps back into the RI/FS process at where it left. After the EE/CA both human health and ecological assessments should be evalated.**

Response: Ecological risk will be added. The recommendation will include evaluation after the EE/CA is completed.

SUBJECT: Response to review comments for the Interim Final Site Characterization Report, Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, September 2004, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0002

Reviewer: Ohio EPA

The Ohio EPA, has completed its review. Please note the following comments:

1. **Ohio EPA previously recommended that additional attempts at sampling Reservoir No.2 Burning Ground (2BG) bedrock monitoring wells (2BG-BEDMW-001, 002, and 003) be performed as they were installed to characterize ground water quality in the area. Jacobs Engineering Group, Inc. (Jacobs) has subsequently revised Sections 5.2 and 7.2 of the July 2005 Interim Final Site Characterization Report, Remedial Investigation Part 1 at Reservoir No. 2 Burning Ground (report) to state that the single round of ground water data collected at the above wells will be considered screening level quality and will not be used for a human health risk assessment. This is due to the fact that the wells could not be properly developed and they exhibit very slow recharge.**

   Jacobs has added a recommendations section in the report (Section 7.5) which notes that additional water level measurements will be collected from the three 2BG bedrock wells to further characterize the potentiometric surface of the bedrock saturated zone. Jacobs proposes to abandon these wells after an adequate characterization has been completed. Ohio EPA is of the opinion that the wells should not be abandoned as they may yield valuable ground water analytical at some point and continue to provide water level measurements from the bedrock saturated zone. Due to the time and funding required to install the wells, the agency feels it is premature to propose their abandonment at this time.

Response: The recommendation to abandon the monitoring wells has been removed. The wells will remain at the site and will be available for periodic monitoring as needed.

2. **Jacobs states in Appendix L of the report that Section 3.4 has been revised to note that slug testing of bedrock wells was eliminated as the wells exhibited slow recovery. For clarification, Section 3.4.3 of the report does note that the three newly installed bedrock wells (2BG-BEDMW-001, 002, and 003) exhibited slow recharge. However, there is no mention of the elimination of slug testing.**

Response: A new section (Section 3.4.6) will be created to address the elimination of slug testing.

3. **Per Ohio EPA direction, Jacobs has included Ohio Department of Natural Resources Well Sealing Reports for the five temporary piezometers (2BG-PZ01 through 05) which were abandoned at the 2BG (refer to Appendix K of the report). The piezometers were abandoned on July 20, 2004 after characterization of water**

level measurements at the base of the unconsolidated zone. Section 3.4 of the report has also been revised to note the piezometer abandonment.

Response: None required.

4. **Ohio EPA could not locate any ground water sampling logs in the report for the sampling event which took place in January 2005 at bedrock wells 2BG-BEDMW-001, 002, and 003. Ohio EPA could also not locate any corresponding chain of custody documentation.**

Response: Groundwater sampling logs and chain of custody forms will be provided in the final document.

5. **Jacobs notes in Section 5.2 of the report that several inorganics were detected in the 2BG bedrock monitoring wells which exceeded established background concentrations. Ohio EPA is unaware that background concentrations for inorganics were calculated or that the datasets from the entire bedrock background monitoring well network were completed. If bedrock background inorganic concentrations were indeed calculated, then Ohio EPA requests that Jacobs submit the results in a report for review and concurrence.**

Response: Background values for bedrock groundwater were calculated by Shaw and are reported in the 2004 Groundwater Data Summary and Evaluation Report (April 2005).

6. **Ohio EPA observed from a review of Table 4-21 of the report that method detection limits (MDLs) and reporting limits (RLs) for VOC and metals analyses in ground water were elevated. Several MDLs and RLs exceed corresponding maximum contaminant levels (MCLs). Ohio EPA requests an explanation as to why Jacobs and the contracted laboratory are using these elevated MDLs and RLs for the investigation at 2BG. If the elevated analytical limits were simply due to high analyte concentrations and/or matrix interferences necessitating sample dilutions (Appendix G, Section 4.4, page 12 of the ground water results), then this should have been stated in the report (Section 5.2).**

Response: A sentence will be added after the first sentence in the third paragraph of Section 5.2 stating: "Due to the concentrations seen in several of the samples, they were analyzed at dilutions, which raised the respective method detection limits (MDLs) and/or reporting limits (RLs) above the maximum contaminant levels (MCLs) for some analytes. In these cases, however, the analyte in question was also detected above the MCL, so there is no impact from the elevated MDLs and/or RLs."

7. **Figure 4-2 Distribution of Contaminants Exceeding PRG's in Surface Soil: Issue = Legend revision. The Legend reads "DPT Locations – Jacobs 2004" however, the figure displays information from soil samples collected in April 2005. Please revise the legend for DPT Locations to reflect samples collected by Jacobs in 2005.**

Response: Additional symbols will be provided on the figure for 2005 surface soil samples and a corresponding refernece in the legend.

8. **Section 3.9.3.2 PAH Confirmation, page 3-11: Issue = Revisions or clarification needed. Please revise the second full paragraph to reflect the information presented in Figure 4-2. This figure shows several soil sample locations collected in 2004 and 2005 that have PAHs detections exceeding the PRGs. The text states that only one location had PAH results exceeding the PRGs.**

Response: The intent of this sentence was to indicate that all of the other locations with PAH exceedances also have other contaminants exceeding the PRGs. Only one location had a PAH exceednance only. Additional text will be included in section 3.9.3.2 to clarify the intent of the sentence in question.

9. **Section 4.2.1 Surface Soil Sample Results, page 4-2: Issue = Revisions or clarification needed. The text summary, specifically the bulleted points are not consistent with the information in Figure 4-2. Revise the bulleted summary to reflect the information presented in Figure 4-2. For instance, based on the text, only 1 sample is listed as exceeding the PRG and or background value for 2,3,7,8-TCDD. However, Figure 4-2 shows two locations exceeding these screening values. Therefore, please revise all bulleted summary points for consistency/clarity.**

Response: Section 4.2.1 refers to surface soil inside of the burn area. There is only one exceedance for TCDD inside the burn area.

10. **Section 7.5 Recommendation, page 7-4: Issue = Data Useability. Since the PAH analytical data from 2004 was qualified as "NJ", the recommendation made is that this data is not suitable for use in the risk assessment. Ohio EPA does not agree with this recommendation since this data qualifier means that the compound is detected but the concentration of the compound is estimated. Ohio EPA recommends one of the following options: a) you could resample these locations where the data was flagged "NJ" considering that the first recommendation is to conduct additional surface soil sampling in the area west of the burn area or b) use the existing data in the risk assessment and discuss the uncertainty in the appropriate section of the risk assessment report, such as the uncertainty section, since many of the locations where PAHs were detected have a mixture of contaminants present and any future remedial action will likely address co-mingled contamination. One of these two options would maintain a large enough data set needed for statistical analysis of PAHs in the risk assessment.**

Response: The recommendation will be removed since an EE/CA is to be performed. The need for a human health risk assessment will be evaluated following any non-time critical removal actions.

SUBJECT: Response to review comments for the Interim Final Site Characterization Report, Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, September 2004, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0002

Reviewer: Sam Bass, Geologist - HTRW Center of Expertise

Comment # 1: Page 2-3, Section 2.3.1, second paragraph, second sentence. This sentence ("Water levels in the Plum Brook Shale...") appears to contradict the conclusion stated at the bottom of page 7-3, which states "Release of contaminants into the deeper bedrock groundwater is unlikely because of the highly impermeable clay layer beneath the site...". Further, no wells were installed in the Plum Brook Shale at the 2BG site; all three wells were screened in the Delaware Limestone. Please clarify the text to be consistent with the existing data.

Response: This statement is based on data from other wells at PBOW that are completed in the Plum Brook Shale. The sentence will be revised to eliminate any confusion regarding the term "hydrologically isolated".

Comment # 2: Page 7-3, Section 7.4, sixth paragraph on page. The document should clarify if the statements made here have been substantiated by sampling results. If they have, reference the supporting information. If they have not, then the text needs to be modified because the transport and leaching potential has not been realized and does not represent a realistic pathway. If there is no data to support or refute the transport/leaching pathway then a data gap exists. The recommendations should include collection of data to address the data gap or the report should explain why collection of additional data is not needed. Figure 7-1 should be modified as necessary to reflect changes in pathways and to be consistent with the text and vice versa.

Response: This pathway has not been proven or refuted because of the lack of shallow groundwater data and the reviewer is correct, this does represent a data gap. However, the Plum Brook team decided that shallow monitoring wells were not practical. Based on the site conceptual model this mode of contaminant transport for soluble contaminants is the most likely release mechanism at the site, with the exception of excavation. The shallow silt zone at 7' to 9' would likely serve as the primary route of lateral transport. The text will be revised to indicate the uncertainty due to the data gap.

Comment # 3: Page 7-4, Section 7.5, second bullet. If site-related contaminants are not present in bedrock ground water (as stated in Section 7.2), the collection of water level data from bedrock wells appears to be of limited benefit. If project dollars are limited (as implied in responses to comments on the draft document), money that would be spent monitoring water levels and waiting for bedrock wells to stabilize could be spent collecting and analyzing background soil samples for PAHs. This is data that could directly impact risk assessment results and the direction of the project, more so that bedrock ground water that does not appear to be impacted by site activities.

Response: Per the response to OEPA comment #1, the recommendation to abandon the monitoring wells has been removed. The wells will remain at the site and will be available for periodic monitoring as needed.

Comment # 4: Page 7-4, Section 7.5, fourth bullet. Clarify that existing ground water data will not be used to perform a human health risk assessment, as stated in Sections 7.0 and 7.2.

Response: The human health risk assessment will not be performed. Funds will be used to conduct an EE/CA for the remediation of site soil.

Comment # 5: Appendix C. Drill logs for holes that were cored should note the location of mechanical fractures (those caused by drilling, usually along natural parting planes); natural fractures and the presence of any in-filling or stained material that may be indicative of ground water flow; and top and bottom of each core run and core recovered. The term "TD" should not be used until the bottom of the boring. The logs should note in the remarks column whether borings were drilled with water or air. If drilled with water, the significance of "wet" partings decreases.

Response: Cored intervals will be indicated on the logs in the final version. Since these wells were drilled with water all partings were wet.

Comment # 6: Appendix F. Using the information provided here for point locations (Ohio State Plane North Zone, NAD 83, U.S. Survey Feet), the given northings and eastings were converted to latitude and longitude using CorpsCon for Windows, v. 5.11.08. The calculated lats and longs placed samples near Green Bay, WI. Please verify the conversion from the Plum Brook coordinate system to State Plane coordinates, then do a reality check on the conversion to ensure samples can be re-located correctly. Sample locations should be around 41.374 degrees north latitude and 82.7 degrees west longitude.

Response: During conversion of the data to state plane the eastings and northings were inadvertently reversed in the Appendix presentation. The data will be corrected for the final version.

Comment # 7: Appendix L, Response to Bass comment #3. The response is not acceptable. According to ER 200-3-1, the FUDS program operates under CERCLA. Under CERCLA we are not permitted to remediate sites below background concentrations. This implies that background conditions must be known. PAHs can and do occur naturally and can also originate from anthropogenic activities (road construction, controlled burns of vegetation, etc.). While it may be true that collection of background samples was not included in the scope of work for this field effort and report, that does not mean they cannot be included in the scope of future field efforts. Considering that USACHPPM noted potential concerns regarding background in their comments, and also considering the limited nature of "exceedances" above screening levels outside the burn area, future field efforts should include collection of appropriately-located background samples from soil types that are similar to those found on site. Finally, USACE is the lead agency on this project. If USACE needs to collect background data in order to meet project requirements, we can do so without negotiations with the State of Ohio, i.e., such negotiations are not required.

Response: PAHs are not the driver for potential remediation of soil at the site. Other contaminants, such as lead, PCBs, and nitroaromatics exceed the PRGs at every location where there is a PAH exceedance, with the exception of one location BH-16.

SUBJECT: Response to review comments for the Interim Final Site Characterization Report, Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, September 2004, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0002

Reviewer: Julie Weatherington-Rice, TAPP

1. **Executive Summary, top of page ix. "None of the wells recharged quickly enough to enable a complete purge of all drill cuttings and fines or to allow the collection of water parameters". ."Three planned shallow overburden wells, co-located with the three bedrock wells, were not installed due to insufficient permeable zones within the overburden."**

The inability to generate enough water from the bedrock wells to be able to complete well development is probably due to one or a combination of factors. First, the monitoring wells may have not encountered a sufficient number of interconnected fractures and/or bedding planes. Second, the fractures and/or bedding planes that were encountered may have been "sealed off' during drilling and lack of development has only contributed to the problem. The Plum Brook Shale cuttings may have formed a mud and/or been carried down into the Delaware Limestone directly, thereby sealing the bedding planes and/or fractures that were intersected. In our experience with the Delaware Limestone, we have found it to be a water-bearing formation. According to the report, no attempt was made to locate wells in areas of intersecting fractures and jointing systems that transmit most of the water (and contaminants) through the Delaware Limestone. In this type of setting, an alternate approach to drilling vertical wells is horizontal or angled borings. This approach may need to be considered as an alternative in order to intersect greater amounts of fractures.

Based on our review, it appears as though the shallow overburden may provide preferential pathways for migration of contaminants from the bum area. Deletion of the shallow wells does not seem prudent in light of the observed shallow horizontal migration of contaminants to the ditch. Shallow monitoring wells must be installed. Although these lower flow wells are difficult to install, shallow overburden wells have been successfully installed in Ohio following recommendations found in Haeher (2000) and Strobel (1993).

Response: Based on the visual inspection of the cores, which was documented on the boring logs, the formation has occasional fractures and porous zones, however these zones appear to produce more hydrogen sulfide gas than water. Based on discussions with Shaw geologists and Jacobs observations from Acid Area 3, there are numerous areas across the site and off-site where the Delaware Limestone does not produce water. This is a natural occurrence and is not related to drilling methods. The location of the wells was based on the need to characterize upgradient, on-site, and downgradient groundwater within the site boundary. Additional bedrock wells are not recommended, considering that site contaminants were not detected in the bedrock groundwater and the fact that the formation is not a viable water resource because of the naturally occurring hydrogen sulfide and petroleum.

Further characterization of the shallow groundwater would not be prudent since contaminant source removal or treatment is being evaluated. Any incidental migration of contaminants into the shallow groundwater would be a low priority because of the lack of an exposure scenario. The local shallow groundwater is not a viable water resource.

2. Executive Summary page x, 2nd paragraph. "The bedrock aquifer at 2BG has very low potential for contaminant transport based on the low porosity observed from the rock cores and the extremely low permeability observed during development."

In order to assess the volume and routing of contamination at the site (and hence the potential for contaminant transport), a mass balance must be preformed. The volume of water/contaminants that pass through the burn area can be estimated. Can the present hypothesis using a low-permeability model in the bedrock aquifer account for where this volume has gone? Movement of water (and contaminants) through the Delaware Limestone is through joints, fractures and bedding-plane contacts. Little, if any water or contaminant movement is expected through primary porosity in the rock matrix. The bedrock drilling and bedrock wells were not designed and installed for maximum water recovery in the fractures, joints, and bedding-plane contacts. It is our recommendation that this site be re-drilled using techniques for locating fractures in rock. Further, we recommend that a mass balance be performed. At this point in time, no conclusions can be drawn about the potential for contaminant transport in the Delaware Limestone because no reliable data has been collected. To make such an assessment based on the information gathered to date is not acceptable.

Response: Additional characterization of the bedrock aquifer is not recommended, considering that site contaminants were not detected in the bedrock groundwater and the fact that the formation is not a viable water resource because of the naturally occurring hydrogen sulfide and petroleum. Further characterization would also not be prudent since contaminant source removal or treatment is being evaluated.

3. 1.3.2 Groundwater Investigation page 1-3 to 1-4.
Please see our comments to issues 1and 2 above.

Response: See responses to comment 1 & 2.

4. 2.3.1 PBOW Description page 2-3 First & 2nd paragraph. Referencing water levels in the soil and shallow Plum Brook Shale and Ohio Shale. Also "Water levels in the Delaware Limestone are on average 30 ft bgs, suggesting that this unit is hydrogeologically isolated from the overlying units."

The water table conditions referenced in the soils and the Plum Brook Shale *1* Ohio Shale that are found close to the surface in the south and east of the site, are the seasonally-controlled annual precipitation recharge that is found all over Ohio. More information on this condition can be found in the 2002 Interim Soil Survey on Table 21 -Water Features, beginning on page 336. The surrounding Kibbie fine sandy loam at the No. 2 Reservoir Burning Grounds site has a seasonal high water table of 1.O to 2.0 feet below ground surface and a lower limit of greater than 6.0 feet below ground surface. The water table is an "apparent" water table which means that it directly recharges the underlying bedrock and/or discharges locally.

The lower water levels in the Delaware Limestone are expected because this is a ground-water recharge location. The bedrock is recharged by downward- moving ground water from the annual surface recharge. At the Reservoir No. 2 Burring Ground location, the lower water levels in the Delaware Limestone

may also be partly a function of insufficiently developed and/or incorrectly installed and constructed monitoring wells and/or it may also be a function of ground water pumping in the area. Such an important conclusion as the Delaware Limestone is "hydrogeologically isolated" needs to be supported by
definitive field tests as opposed to mere suggestions. Ohio does not have "hydrogeologically isolated" bedrock units. Bedrock units in Ohio allow water and contaminants to move through them by secondary fractures and jointing, even if limited by primary porosity. While not all formations serve as aquifers because of limited storage potential, they do not create confining conditions that lead to hydrogeologically isolated" conditions.

The term "hydrologically isolated" typically does not mean that water from overlying units cannot enter the isolated unit. In this context it means that some formation lying between the two aquifers is restricting downward flow from the overlying aquifer to the underlying aquifer, which prevents the water levels in the lower aquifer from stabilizing at a height equal to the shallow aquifer. For sake of confusion in interpretations the statement will be removed and the disparity in the water levels only will be noted.

5. **3.3.1 Trench Excavation page 3-3 top of page.**
How deep were the trenches dug and how deep were the sampling locations? We could not readily find that information in the report. A good reference for trench construction and preparation in Ohio's glacial materials is Christy and others (2000). There is also a safe trench design that meets OSHA requirements available at www.oardc.ohio-stated.edu/fractures.

Response: General depth of the trenches will be discussed in Section 3.3.1. Additional depth information regarding the samples will be provided in Table 3-1

6. **3.4.1 Piezometer installation and Water Level Measurements, page 3-5.**
The report indicates that piezometers were installed to the top of rock by using a Geoprobe. These piezometers where screened with long screens. The report further indicates that these piezometers had water and were used to determine flow directions. Following up on our comments in issue 1 above, this supports the recommendation that shallow monitoring wells be installed at the site. When the "wells" were installed using methods that "pushed" the screen into the ground (as opposed to rotational drilling), the unconsolidated materials yielded water. Although water quality samples cannot easily be collected from one-inch diameter piezometers, installation of larger diameter monitoring wells using similar techniques (see Haefner, 2000) would appear to be quite promising.

Recent research in Denmark by the Danish Geological Survey, University of Copenhagen professors, and Dr. Larry McKay, University of Tennessee, Knoxville, also addresses the critical issue of spacing in investigation. Recent papers by that team have been published in the journal of Ground Water. The paper by Jorgensen, McKay, and Kistrup (2004) as well as their references, are particularly informative.

Response: Borings were advanced prior to installing the screens and casing materials. As described the remaining annulus was filled with a sand filter pack to within 6-inches bgs, which allows for communication between the overlying coarser silty zones and the screened interval. Further characterization of the shallow groundwater would not be prudent since contaminant source removal or treatment is being evaluated.

7. **3.4.2 Monitoring Well Installation in Bedrock, page 3-5 and photographs in Appendix J.**

Based on our review of photographs in the report, no obvious vertical fractures were noted in the cores. While there are a number of horizontal breaks, it is not possible to determine from the pictures which fractures are "original" to the formation and which fractures are drilling induced. No Rock Quality Designation (RQD) data was presented on the boring logs. Since the cores are still available on site, we recommend that they be reevaluated for RQD determinations and that the fractures be inspected to see if any discoloration or reminieralization due to ground-water movement can be identified at the breaks. While the lack of discoloration or remineralization does not preclude the potential for ground-water movement along the bedding plane, the presence of discoloration or remineralization identifies the fracture as active.

Response: The cores are stored on-site and are available for further examination.

8. 3.4.3 Monitoring Well Development page 3-5
Please see comments to issue 1 above.

Response: See response to comment 1

9. 3.9.3 Data limitations, pages 3-10 and 3-11.
We are concerned that contaminants were found in the ditch sediments but surface water samples were not collected because of the "ephemeral nature of water" in the ditch. According to the report, either it was raining during the site investigations (and so did not meet the program-required 48-hour post rain delay for surface water sampling) or the water remaining in the ditch was found only in a few pools and, therefore, was determined not to be representative of surface water conditions. If the surface water conditions were never within the set of "representative conditions" and the ditch was truly ephemeral, how did the contaminants get carried into the sediments in the ditch in the first place? It is our recommendation that surface water samples be collected. It is further our recommend that pore water be sampled where ground water discharges to the ditch.

Response: Site contaminants such as nitroaromatics, PCBs, or lead, were not detected in the sediment. The only compounds detected were PAHs, which likely originated from the adjacent asphalt road. Further investigation of the surface water shouldn't be warranted since source removal or treatment is being evaluated.

10. 4.0 Soil Investigation Results and associated figures, pages 4-1 through 4- 4
There is an area on the western portion of the site shown on figure 4-3 where surface soils show contaminant levels above the Preliminary Remediation Goals (PRGs). The noted concentrations above the PRGs appear to have a "channelized" shape. One possible explanation is that these elevated concentrations are due to overland flow by contaminated surface water. Has an accurate topographic survey of the field and woods surrounding the Burning Ground been performed? If so, has the "channel" shape been evaluated from this surface water flow perspective?

Figure 4-5, also raises questions of surface to ground-water recharge. The two off-site contamination points south of the Burning Ground are both within the elevations of the Kibbie fine sandy loam profiles. Therefore, the contamination is moving through the soil horizons. Soil properties and internal drainage systems may be controlling this movement. There are physical properties at work that do not appear to have been recognized or identified in this investigation.

Response: Particulate transport via overland flow is unlikely due to the heavy vegetative cover and the limited relief to generate enough energy for erosion to occur. Further investigation shouldn't be warranted other than additional contaminant delineation, because source removal or treatment is being evaluated. The contaminants referred to south of the burn area are naturally occurring metals. This does not constitute contaminant migration from the burn area.

11. 5.0 **Groundwater Investigation Results, pages 5-1 and 5-2 and associated figures. Note quote from Section 5.1.2 "Based on the depths of these wells (referring to the bedrock wells) and water levels in other PBOW bedrock wells, the water column should be 20 to 30 ft. higher when fully recovered."**
We don't have confidence in the ground-water information gathered at the site because we don't have confidence in the well installations. See our comments above.

Response: See response to comment 1 & 2

12. 7.1 **Conclusions and Recommendations Soil Investigation pages 7-1 and 7-2.**
This discussion seems to be more about statistics rather than the clustering at locations where contamination has been found outside the bum area. It is very clear from Figure 4-3 that there is a clustering of hits caused by off-site migration of contamination from the bum area to the area beyond to the west. How did the contamination move there? Is this a condition that occurred as part of the original clean-up action in the 1960s or is it overland surface drainage migration that occurred while the area was a Burning Ground and/or since the original clean-up? Is there an alternate explanation? If these questions can be answered, then the identification of the full area of impact will be greatly aided.

Is there a relationship between the elevated levels to the south at BH-09 and BH-10 in the 0 to 1 foot level and the elevated levels at BH-09 and BH-10 in the 3 to 5 foot levels? Is this a function of surface and/or subsurface drainage from the original burn area? While the report states at the bottom of page 7-1
"Based on this data, downward and lateral migration of contaminants is minimal", it must be noted for the record that migration does occur and that physical properties of the soil horizons at the site and surface/subsurface drainage control the movement. An informed discussion would be helpful in understanding the horizontal and vertical of contamination and the past and future migration pathways from the original Burning Ground.

Response: Further discussion will be included in section 7.1 relative to the possible origins of the contaminated area west of the burn area.

13. 7.2 **Groundwater Investigation, page 7-2 and Appendix J. "The bedrock at the site is characterized as massive and impermeable, with minimal fracturing". Based on our review of the photographs of the bedrock cores and the information contained on the logs, this characterization of the bedrock is unsupported. Please refer to our comments in issue 7 above regarding the additional information needed on fractures prior to drawing such a conclusion.**

Response: The text will be revised to indicate the formation is massive, with minimal fracturing and low permeability, rather than "impermeable"

14. 7.3 **Surface Water and Sediment Investigation, page 7-2.**
Please see our comments to issue 9.

Response: See response to comment 9

15. 7.4 Conceptual Model, pages 7-3 and 7-4

We have many comments and suggestions for this section. There is a notation in the 1" paragraph that the "Collection of ecological data was not within the scope of these investigations; therefore, data is not available for the development of an ecological profile." Some of the contaminants found at the No. 2 Reservoir Burning Ground, especially the heavy metals can easily be translocated by mineral up-take to the grasses and herbs growing at the site. At a minimum, the surface vegetation should be collected and analyzed. This is not a fenced, restricted area and there are wildlife, especially deer and other small animal that live in the area. Deer that roam this facility are harvested by Ohio hunters and are therefore a food source. Other smaller mammals are also a part of the food chain. If there is a bioaccumulation of heavy metals that have translocated out of the burn zone either into the pasture vegetation or into the small mammals via soil ingestion, then that information must be included in the final site evaluation. There is an established risk pathway that can affect human health. When site clean-up determinations are made, if the contaminated burn area is not stripped and removed and there is found to be a reservoir of heavy metals in the vegetation, the area should be, at a minimum, fenced with deer-proof fencing to prevent further foraging.
We concur that "Major components of the physical profile are the silt layer at 7 to 9 ft bgs (the KibbieJine sandy loam parent material -our addition), and the highly plastic clay layer ranging from 10 to 15 ft bgs, and extending to the bedrock interface. These two units control the movement of shallow groundwater at the site. Based on this model, the preferential flow path for shallow groundwater is laterally through the silt layer towards the drainage ditches." Vertical movement through the clay layer, through the Plum Brook Shale, and into the Delaware Limestone also exists. Vertical movement is controlled primarily by primary porosity in the 7 to 9 foot bgs interval and by fractures and secondary porosity within the clay and underlying bedrock. Questions about contaminant movement are not answered by the ground-water investigation that has been conducted at the site. See our previous comments. Additional ground-water investigation must be a high priority for future work at this site.
"The primary release mechanism for PAH and nitroaromatics are removal of the vegetative and backfill layer and leaching to shallow groundwater." Again, we note that the pasture growing at the site is grazed by biota, including deer which are harvested by Ohio hunters and consumed. In addition, the deer may drink the shallow ground water that is contaminated where it enters the drainage ditch. "Release of contaminants into the deeper bedrock groundwater is unlikely because of the highly impermeable clay layer beneath the site and the absence of fractures and low permeability observed in the Delaware limestone." As stated above, we do not concur. We recommend that additional ground water investigation be performed and that a mass balance be used to account for contamination and migration pathways.
Eliminating migration of contaminants to the Delaware Limestone is premature. "The primary release mechanism for PCBs, lead, and dioxinsIfurans is the removal of the vegetative and backfill layer. As discussed above, some form of construction or other human activity would be required for this release mechanism to be viable ..." This is not necessarily the only "primary" release mechanism that must be considered. For example, lead can be translocated into a growing pasture and become a food source for deer, which are consumed by people. It is possible that other contaminants listed in this section are also translocated into vegetation. The report should address this pathway and include information on the potential for uptake by plants of other contaminants present at the site. This topic needs more exploration.

Response: No further investigation is warranted since source removal or treatment is being evaluated. The vegetative cover would be removed in the event of a removal action and would therefore be a non-

issue. Likewise as discussed in response to comments 1 and 2, additional groundwater investigations are not recommended, considering that site contaminants were not detected in the bedrock groundwater and the fact that the formation is not a viable water resource because of the naturally occurring hydrogen sulfide and petroleum.

16. Section 7.5 Recommendations, page 7-4

A. We concur that additional surface soil sampling needs to be conducted and we recommend that a detailed surface topography survey be added to identify the surface runoff routes over the surrounding site. This is particularly important in identifying source(s) and routing(s) for the contaminants detected above the surface soil above the PRGs in the western portion of the study area.

B. We recommend that if the bedrock ground-water wells cannot be adequately purged and developed so that they function with some level of replication to other wells at the site, that they be abandoned and new, properly sited and constructed wells be drilled to replace them.

C. We recommend fracture trace analysis be conducted and ground truthed in the field (at local Delaware Limestone quarries) so that bedrock monitoring well construction success will be improved.

D. We recommend that angled boring techniques be considered as an alternative to vertical wells because these borings will have a higher probability of encountering vertical fracturing and jointing systems.

E. We recommend that the original concept of installing shallow overburden wells be reinstituted. These shallow wells are necessary to ascertain the levels of contamination migrating horizontally towards the ditch as well as the levels of contaminants that may recharge the underlying bedrock by migrating through the glacial deposits. Based on the successful installation of piezometers in these materials and providing that appropriate well installation techniques are employed, these wells should be able to be installed.

F. We recommend that a mass balance that accounts for volume and routing of contaminants at the Burning Grounds be preformed. It is important to understand all the migration pathways (either discharge to air, surface water, and/or ground water). It is critical that all pathways be definitively determined so that all contaminant migration routes are adequately accounted for and monitored.

G. We recommend that the pasture vegetation growing in the vicinity of the Reservoir No. 2 Burning Ground be analyzed for the contaminants of concern and if the plant tissues are found to contain contaminants, that, at a minimum, the site be fenced with deer-proof fencing to prevent further grazing of the contaminated site by deer who are consumed by people.

Response: No further survey work or vegetative investigation is recommended since source removal or treatment is being evaluated. No further groundwater investigation is recommended. See response to comments 1 &2.

Appendix M

Chain of Custody Records

Page: 1 of 1
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865-220-4800
Project/Site Name: Plum Brook Fax #: 865-220-4848
Address: 125 Broadway, Oak Ridge, TN 37830
Collected by: Al Haraczy Send Results To: Mike Houck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: ISCA Regulated	Total number of containers	VOC	PAH / PCB	Hg Pb Cr Cd / As Se	Dioxin Furans							<-- Preservative Type (6)
PBOW-04-SO-ZBG-TR05-1-A	5-19-04	0850							X	X	X	X							
PBOW-04-SO-ZBG-TR05-1-D	5-19-04	0850							X	X	X	X							
PBOW-04-SO-ZBG-TR05-2-A	5-19-04	0947										X							
PBOW-04-SO-ZBG-TR06-1-A	5-19-04	1115							X	X	X	X							
PBOW-04-SO-ZBG-TR06-2-A	5-19-04	1124										X							
PBOW-04-SO-ZBG-TR06-3-A	5-19-04	1208										X							
PBOW-04-SO-ZBG-TR07-1-A	5-19-04	1426							X	X	X	X							
PBOW-04-SO-ZBG-TR07-2-A	5-19-04	1458										X							
PBOW-04-SO-ZBG-TR07-3-A	5-19-04	1445										X							
PBOW-04-SO-ZBG-TR08-1-A	5-19-04	1545							X	X	X	X							MS / MSD

TAT Requested: Normal: X Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: (Yes) / No

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Al Haraczy	5-19-04	1730	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Mike Crook
Method of Shipment: Fed Ex Overnight Date Shipped: 5-19-04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B - 3, 6010B/7470A - 1*).
6.) Preservative Type Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = F ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: _____ C

WHITE = LABORATORY YELLOW = FIL PINK = CLIENT

Page: 1 of 1
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865-220-4300
Project/Site Name: Plum Brook Fax #: 865-220-4348
Address: 125 Broadway, Oak Ridge, TN 37830
Collected by: Al Hardesty Send Results To: Mike Houck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOC's	PAHs/RCB Nitroaromatics / methane	Dioxin/Furans							<-- Preservative Type (6)
PBuw-04-50-2BG-TR03-2-A	5/19/04	1550									X							Comments: Note: extra sample is required for sample specific QC
PBuw-04-50-2BG-TR04-1-A	5/19/04	1635							X	X	X	X						
PBuw-04-50-2BG-TR09-1-D	5/19/04	1635										X						
PBuw-04-50-2BG-TR09-2-A	5/19/04	1056										X						
PBuw-04-TB-051904-1	5/19/04	1700							X									

TAT Requested: Normal: Rush: Specify: (Subject to Surcharge) Fax Results: Yes / No
Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Al Hardesty	5-19-04	1730	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Crook
Method of Shipment: Fed Ex Overnight Date Shipped: 5-19-04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hex = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp:

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865.220.4800
Project/Site Name: Plum Brook Fax #: 865.220.4645
Address: 125 Broadway, Oak Ridge, TN 37830
Collected by: Al Hanesby Send Results To: Mike Houck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOC	PAH/PCB	Nitrosamines/ Metals	Dioxins/Furans								<-- Preservative Type (6)
PBOW-04-SO-2BG-TR10-1-A	5/20/04	0815						1				X								
PBOW-04-SO-2BG-TR10-3-A	5/20/04	0825						1				X								
PBOW-04-SO-2BG-TR10-2-A	5/20/04	0840						1				X								
PBOW-04-SO-2BG-BH11-A-(0'-1')	5/20/04	1155						4	X	X	X	X								
PBOW-04-SO-2BG-BH10-A-(0'-1')	5/20/04	1355						4	X	X	X	X								
PBOW-04-SO-2BG-BH09-A-(0'-1')	5/20/04	1425						4	X	X	X	X								
PBOW-04-SO-2BG-BH17-A-(0'-1')	5/20/04	1525						10	X	X	X	X								DUP/MSD
PBOW-04-TB-5-20-04-1	5/20/04	1715						3	X											

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Comments
Note: extra sample is required for sample specific QC

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Al Hanesby	5-20-04	1712	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Dan Cook
Method of Shipment: Fed Ex Date Shipped: 5-21-04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: HC = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate. If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: _____

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865-220-4800
Project/Site Name: Plum Brook Fax #: 865-220-4640
Address: 125 Broadway Oak Ridge TN 37830
Collected by: Send Results To:

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOA	PAH/PCB	Pb (TCLP) and Ag (TCLP)								<-- Preservative Type (6)
PBCW-04-SO-2BG-BH18-A-(0'-1')	5/21/04	0855						4	X	X	X								
PBCW-04-SO-2BG-BH19-A-(0'-1')	5/21/04	0925						4	X	X	X								
PBCW-04-SO-2BG-BH20-A-(0'-1')	5/21/04	0945						4	X	X	X								
PBCW-04-SO-2BG-BH13-A-(0'-1')	5/21/04	1010						4	X	X	X								Composite 5/21/04
PBCW-04-SO-2BG-BH14-A-(0'-1')	5/21/04	1120						4	X	X	X								
PBCW-04-SO-2BG-BH15-A-(0'-1')	5/21/04	1410						4	X	X	X								
~~PBCW-04-SO-2BG-BH15-B-(0'-1')~~	~~5/21/04~~	~~1410~~						~~3~~							1120	5/21/04			~~Composite~~
PBCW-04-SO-2BG-BH15-D-(0'-1')	5/21/04	1410						4	X	X	X								Duplicate
PBCW-04-SO-2BG-BH21-A-(0'-1')	5/21/04	1500						4	X	X	X								
~~PBCW-04-SO-2BG-BH21-B-(0'-1')~~	~~5/21/04~~	~~1500~~													1140	5/21/04			~~Composite~~

Sample Analysis Requested [5] (Fill in the number of containers for each test)

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Comments
Note: extra sample is required for sample specific QC

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1			1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Good
Method of Shipment: Fed Ex / GN Date Shipped: 5/21/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. *8260B, 6010B/7470A*) and number of containers provided for each (i.e. *8260B - 3, 6010B/7470A - 1*).
6.) Preservative Type: [illegible]ydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = He T = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: 2

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865.220.4800
Project/Site Name: Plum Brook Fax #: 865.220.4648
Address: 125 Broadway, Oak Ridge, TN 37830
Collected by: Jake Crook Send Results To: Jake Hauck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOA	8011/ 504	8011/ 504 (Preservative 3 Thiosulfate)								<-- Preservative Type (6)
PBCW-04-SO-2867-BH21-D-(0'-1')	5/21/04	1500						4	X	X	X								
PBCW-04-TB-052104-1	5/21/04	1721						3	X										

Comments
Note: extra sample is required for sample specific QC

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Jake Crook	5/21/04	1747	1		
2 C			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Crook
Method of Shipment: FedEx O/N Date Shipped: 5/21/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: [illegible] Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = He [illegible] = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering — Phone #: 865 220 4900
Project/Site Name: Plum Brook — Fax #: 865 220 4948
Address: 125 Broadway, Oak Ridge, TN 37830
Collected by: Helen Cluss — Send Results To: Mike Hauck

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	Sample Analysis Requested [5] (Fill in the number of containers for each test): VOC	Mod / Full Rad Suite	Comments / Preservative Type [6]
PBOW-04-SO-2BA-BH22-A-(0'-1')	5/22/04	1120						4	X	X	Note: extra sample is required for sample specific QC
PBOW-04-SO-2BG-BH23-A(0'-1')	5/22/04	1138						4	X	X	
PBOW-04-SO-2BQ-BH24-A(0'-1')	5/22/04	1155						4	X	X	
PBOW-04-SO-2BL-BH12-A(0'-1')	5/22/04	1315						4	X	X	
PBOW-04-SO-2BG-BH16-A(0'-1')	5/22/04	1337						4	X	X	
PBOW-04-SO-2BC-MS 5/22/04)											
PBOW-04-TB-C5221-1	5/22/04	1350						3	X		

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) | Fax Results: Yes / No | Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Helen Cluss	5/22/04	1412	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Crook
Method of Shipment: Fed Ex — Date Shipped: 5/22/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1)
6.) Preservative Type: Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = [illegible], ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: ____ C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: ____ of ____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865-220-4800
Project/Site Name: Plum Brook Fax #: 865-220-4818
Address: 125 Broadway, Oak Ridge TN 37830
Collected by: J. Crook Send Results To: Jake Crook

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOC	PAH/PCB	Nitroaromatics/ Metals	Dioxin/Furan	6 PAH only	#10 5/24/04	<-- Preservative Type (6)
PBOW-04-SD-2EG-SD01-A	5/23/04	1138					9	8	X	X	X	X			
PBOW-04-SD-2EG-SD02-A	5/23/04	1200					9	8	X	X	X	X			
PBOW-04-SD-2EG-SD02-D	5/23/04	1300				5/24/04	9	8	X	X	X	X			
PBOW-04-TB-052304-1	5/23/04	1400				10	4	8	X	~~X~~	~~X~~	~~X~~	11/10	5/24/04	
PBOW-04-SD-2EG-SD03-A	5/23/04	1415						9	X	X	X	X			
PBOW-04-SC-2EG-BH12-A (3'-5')	5/24/04	0849						7	X	X	X				
PBOW-04-SC-2EG-BH12-B (8'-10')	5/24/04	0910						6	X		X		X		

Comments
Note: extra sample is required for sample specific QC

TAT Requested: Normal: ____ Rush: ____ Specify: ____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*
4 cont = VOC 1 cont = metals/nitroaromatics 1 cont = backup soil
1 cont = PAH/PCB 1 cont = Dioxin/furan

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	J. Crook	5/24/04	1715	1		
2				2		
3				3		

Sample Shipping and Delivery Details
GEL PM: Jake Crook
Method of Shipment: FED EX Date Shipped: 5/24/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: [1] [2] Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = He [7] = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #: _____
GEL Quote #: _____
COC Number [1]: _____
PO Number: _____

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865.220.4800
Project/Site Name: Plum Brook Fax #: 865.220.4848
Address: 125 Broadway, Oak Ridge TN 37830
Collected by: Hilly Owens Send Results To: Mike Houck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [1]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	TSCA Regulated	Total number of containers	VOC	PAH/PCB	Metal/Nitro	PAH only							Comments Note: extra sample is required for sample specific QC
PBOW-04-SO-2BG-BH13-D-(3'-5')	5/24/04	1056							X	X	X								
PBOW-04-SO-2BG-BH13-A(8'-10')	5/24/04	1128							X		X	X							
PBOW-04-SO-2BG-BH14A(3'-5')	5/24/04	1458							X	X	X								
PBOW-04-SO-2BG-BH14A(8'-10')	5/24/04	1516							X		X	X							
PBOW-04-TB-052404-1	5/24/04	0844							X										
PBOW-04-TB-052404-2	5/24/04	1643							X										
PBOW-04-SO-2BG-BH11-A(3'-5')	5/24/04	0946							X	X	X	[illegible]	5/24/04	1130					
PBOW-04-SO-2BG-BH11-A(8'-10')	5/24/04	1004							X		X	X							
PBOW-04-SO-2BG-BH13-A(3'-5')	5/24/04	1056							X	X	X								

<-- Preservative Type (6)

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards

VOC cont 4 bottles Metal/nitro = 1 cont
PAH/PCB = 1 bottle PAH only = 1 cont

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Hilly Owens	5/24/04	1715	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Mike Cook
Method of Shipment: FED Ex Date Shipped: 5/24/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: [illegible]ydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = He[illegible] = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: _____ °C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 8652204800
Project/Site Name: Plum Brook Fax #: 8652204845
Address: 125 Broadway, Oak Ridge TN 37830
Collected by: Mike Quinn Send Results To: Mike Houck

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOC	PAH/PCB	Metals/Nitro	PAH								<-- Preservative Type (6)
PBOW-04-SO-2BG-BH16A(3'-5')	05/25/04	0820							X	X	X									MS/MSD
PBOW-04-SO-2BG-BH16A(8'-10')	05/25/04	0848							X		X	X								
PBOW-04-SO-2BG-BH15A(3'-5')	5/25/04	0950							X	X	X									
PBOW-04-SO-2BG-BH15D(3'-5')	5/25/04	0950							X	X	X									
PBOW-04-SO-2BG-BH15A(8'-10')	5/25/04	1013							X		X	X								MS/MSD
PBOW-04-SO-2BG-BH20A(3'-5')	5/25/04	11:31							X	X	X									
PBOW-04-SO-2BG-BH20D(3'-5')	5/25/04	11:31							X	X	X									
PBOW-04-SO-2BG-BH20A(8'-10')	5/25/04	1139							X	X	X									
PBOW-04-TB-052504-1	5/25/04	1500							X											
PBOW-04-TB-052504-3	5/25/04	1500							X											

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Comments
Note: extra sample is required for sample specific QC

Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards
VOC - 4 bottles metals/nitro = 1 bottle
PAH/PCB - 1 bottle backup soil - 1 bottle

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
Mike Quinn	5/25/04	1531	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Crook
Method of Shipment: FED/EX O/N Date Shipped: 5/25/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type: (hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hx T = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #:
GEL Quote #:
COC Number (1):
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865 220 4600
Project/Site Name: Plum Brook Fax #: 865 220 4848
Address: 125 Broadway, Oak Ridge TN
Collected by: Holly Owens Send Results To: Mike Thick

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	VOC	PAH / PCB	metals/nitro	PAH only								<-- Preservative Type (6)
PRAW-04-SO-2RG-BHC9-A-(3'-5')	5/26/04	1045						6	X	X	X									
PRAW-04-SO-2RG-BHC9-A-(8'-10')	5/26/04	1015						6	X		X	X								
PRAW-04-SO-2RG-BH10-A-(3'-5')	5/26/04	0934						6	X	X	X									
PRAW-04-SO-2RG-BH10-A-(8'-10')	5/26/04	0951						6	X		X	X								
PRAW-04-SO-2RG-BH17-A-(3'-5')	5/26/04	1144						6	X	X	X									
PRAW-04-SO-2RG-BH17-A-(8'-10')	5/26/04	1148						6	X	X	X									
PRAW-04-SO-2RG-BH18-A-(3'-5')	5/26/04	1105						6	X	X	X									
PRAW-04-SO-2RG-BH18-A-(8'-10')	5/26/04	1118						6	X	X	X									
PRAW-04-SO-2RG-BH19-A-(3'-5')	5/26/04	1215						6	X	X	X									
PRAW-04-SO-2RG-BH19-A-(8'-10')	5/26/04	1231						6	X	X	X									

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Comments
Note: extra sample is required for sample specific QC

Remarks: Are there any known hazards applicable to these samples? If so, please list the hazards
VOC = 4 containers metals/nitroaromatics = 1 bottle Backup soil = 1 bottle
PAH/PCB = 1 container PAH only = 1 bottle

Chain of Custody Signatures (5)

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 Holly Owens	5/26/04	1646	1		
2			2		
3			3		

Sample Shipping and Delivery Details
GEL PM: Mike Crnck
Method of Shipment: FedEx O/N Date Shipped: 5/26/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = 1 T = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cool - Temp: _____ C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: _____ of _____
Project #: _____
GEL Quote #: _____
COC Number (1): _____
PO Number: _____

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: 865.220.4800
Project/Site Name: Plum Brook Fax #: 865.220.4848
Address: 125 Broadway, Oak Ridge, TN
Collected by: Helly Owens Send Results To: Mike Houck

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	TSCA Regulated	Total number of containers	YOC										<-- Preservative Type (6) Comments Note: extra sample is required for sample specific QC
~~PROW.04.SD.2[illegible].F~~ HJO 5/26/04								~~4~~	~~X~~	5/26/04	HJO								
PROW.04.TB.052604.1	5/26/04	1525						4	X										

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
Helly Owens	5/26/04	1606	1		
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM: Jake Crook
Method of Shipment: FedEx Date Shipped: 5/26/04
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
6.) Preservative Type Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = H[illegible] T = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? *YES* *NO*
Cooler Temp: *C*

WHITE = LABORATORY **YELLOW = FILL** **PINK = CLIENT**

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: Plum Brook
Client: Jacobs Engineering
Send Results To: Mike Houck
Address: 125 Broadway
Oak Ridge, Tn 37830
Phone: 865-220-4800

Turnaround Time
# of Containers
Container Type
Preservative Used
Type of Analysis

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	VOC	PAH/PCB	Nitroaromatic metals	Dioxin/Furan							Lab Cooler No.	CLIENT COMMENTS
PBOW-04-50-2A6-					~~X~~	~~X~~	~~X~~	~~X~~								
* TR05-1-B	5-19-04	0950			X	X	X	~~X~~X								
PBOW-04-50-2A6																
-TR04-1-B	5-19-04	1635						X								
PBOW-04-TB-																
US1904-2	5-19-04	1700			X											

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	5-19-04 1736				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

R.P. W.O. _____

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: Plum Brook
Client: Jacobs Engineering
Send Results To: Mike Hauck
Address: 125 Broadway
Oak Ridge, TN 37830
Phone: 865-220-4800

Turnaround Time
# of Containers
Container Type
Preservative Used
Type of Analysis

Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	VOC	PAH/PCB	Nitrosamine/Metals	~~Dioxin~~ Hydrolyte							CLIENT COMMENTS
PBOW-04-SO															
* ZEG-BH15-B (0'-1')	5/21/04	1410			X	X	X								
PBOW-04-SO-ZEG															
* BH21-B-(0'-1')	5/21/04	1500			X	X	X								
PBOW-04-TB															
CS2104-2	5/21/04	1700			X										

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Helen Cuevas	5/21/04 1704				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

R.P. W.O. _____

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: Plum Brook
Client: Jacobs Engineering
Send Results To: Mike Houck
Address: 125 Broadway
Oak Ridge, TN 37830
Phone: 865-220-4800

Turnaround Time
# of Containers
Container Type
Preservative Used
Type of Analysis

Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	VOC	PAH/PCB	Metrocromatic/Metals	Dioxin/Furan							CLIENT COMMENTS
PBOW-04-SD															
2BG-SD02-B	5/22/04	1300			X	X	X	X			X				
PBOW-04-TB		1400													
052304-2	5/22/04	~~1340~~	HJO 5/23/04		X										
PBOW-04-SO	5/24/04	1056													
2BG-BH13-B(3'-5')					X	X	X				2 bottles				

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[signature]	5/24/04 1737				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

I.P. W.O. _____

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: Plum Brook
Client: Jacobs Engineering
Send Results To: Mike Hauck
Address: 125 Broadway
Oak Ridge TN
Phone: 865 220 4000

Turnaround Time
# of Containers
Container Type
Preservative Used
Type of Analysis

Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	VOC	PAH/PCB	metal/nitro								CLIENT COMMENTS
PBOW.04.SO.2BG.BH15B (3'-5')					X	X	X								
	5/25/04	0950													
PBOW.04.SO.2BG.BH20B (3'-5')					X	X	X								
	5/25/04	11:31													
PBOW.04.TB	5/25/04	1500			X										[illegible]
052504.2															

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
[illegible]	5/25/04 1504				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
				FEDEX/ON	

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. _____

Page: _____ of _____
Project #: _____
GEL Quote #: _____
COC Number [1]: _____
PO Number: _____

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Jacobs Engineering Phone #: [illegible]
Project/Site Name: PBOW - Reservoir #2 BG Fax #: [illegible]
Address: [illegible] Tn 37330
Collected by: [illegible] Send Results To: [illegible]

Sample ID	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	PAH	PCB	Nitroaromatics	Metals unfiltered HNO3	Metals filtered HNO3	VOC HCl	TSS/TDS	Turbidity/Alk/Anions	Hardness HNO3	Cyanide NaOH	TOC H2SO4	Comments Note: extra sample is required for sample specific QC
PBOW-05-GW-ZBG-BEDMW001-01A	1-28-05	1450						4		✓	✓	✓		✓						filter metals at lab
PBOW-05-GW-ZBG-BEDMW002-01A	1-31-05	1330						13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
PBOW-05-GW-ZBG-BEDMW003-01A	1-31-05	1430						11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
PBOW-05-TB-012805-02	1-28-05	1630												✓						trip blank

Sample Analysis Requested [5] (Fill in the number of containers for each test)
Preservative Type (6)

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No
Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	[signature]	1-31-05	1715	1		
2				2		
3				3		

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B - 3, 6010B/7470A - 1*).
6.) Preservative Type: H = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hex [illegible] T = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: ___ °C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

ELAB OF TENNESSEE CHAIN OF CUSTODY RECORD

№ 33897

Ship to:
ELAB of Tennessee
227 French Landing Drive
Suite 550
Nashville, TN 37228
Attn: Analytical Laboratory
(615) 345-1115 (phone)
(615) 846-5426 (fax)

Send Results to:
Name Mike Houck
Company Jacobs Eng.
Address 125 Broadway
City,State,Zip Oak Ridge, TN 37830
Phone 865-220-4866
Fax 865-220-4848
E-mail mike.houck@jacobs.com

Send Invoice To:
Name
Company
Address
City,State,Zip
Phone
Purchase Order
E-mail

Details:
Page 1 of 3
Cooler No. ____ of ____
Date Shipped 4-22-05
Shipped By Al Hardesty
Turnaround
(Std. Turn unless noted otherwise / There may be a surcharge for RUSH-contact lab)

Project No./Name

Samplers (Signature)*

Lab Use Only Lab #	Date Sampled	Time	Comp / Grab	Sample Location/Description	Sample Matrix	Field pH/Temp	Field Cond.	ANALYSIS REQUIRED	No. of Bottles	Lab Use Only Containers/Pres.
4201-01	4-22-05	0955	C	PBOW-05-SO-ZBG-BHZ5-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	1L-UNPRES
	"	"	"	"	soil			Lead	1	
02	4-22-05	1000	C	PBOW-05-SO-ZBG-BHZ6-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	C	"	soil			Lead		
03	4-22-05	1000	C	PBOW-05-SO-ZBG-BHZ6-D-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	C	"	soil			Lead	1	
04	4-22-05	1020	C	PBOW-05-SO-ZBG-BHZ7-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	C	"	soil			Lead	1	
05	4-22-05	1040	C	PBOW-05-SO-ZBG-BHZ8-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	C	"				Lead	1	

Sample Kit Prep'd by: (Signature)	Date	Received By: (Signature)	REMARKS *Signature required to ensure validity
Relinquished by: (Signature)	Date/Time 4/22/05 1633	Received By: (Signature)	
Relinquished by: (Signature)	Date/Time	Received By: (Signature)	
Received for Laboratory by: (Signature)	Date/Time 4/23/05 900	Temperature 2.0 C	

Lab Use Only
VOA Headspace Y N NA
Field Filtered Y N NA
Correct Containers Y N NA
Discrepancies Y N NA
Cust. Seals intact Y N NA
Containers Intact Y N NA

Airbill # FX
CAR #

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers

ELAB OF TENNESSEE CHAIN OF CUSTODY RECORD

N° 33398

Ship to:
ELAB of Tennessee
227 French Landing Drive
Suite 550
Nashville, TN 37228
Attn: Analytical Laboratory
(615) 345-1115 (phone)
(615) 846-5426 (fax)

Send Results to:
Name Mike Houck
Company Jacobs Eng.
Address 125 Broadway
City,State,Zip Oak Ridge, TN 37830
Phone 865-220-4806
Fax 865-220-4848
E-mail mike.houck@jacobs.com

Send Invoice To:
Name
Company
Address
City,State,Zip
Phone
Purchase Order
E-mail

Details:
Page 2 of 3
Cooler No. ____ of ____
Date Shipped 4-22-05
Shipped By Al Hardesty
Turnaround
(Std. Turn unless noted otherwise / There may be a surcharge for RUSH-contact lab)

Project No./Name

Samplers (Signature)*

Lab Use Only Lab #	Date Sampled	Time	Comp./ Grab	Sample Location/Description	Sample Matrix	Field pH/Temp	Field Cond.	ANALYSIS REQUIRED	No. of Bottles	Lab Use Only Containers/Pres.
4201-06	4-22-05	1050	C	PBOW-05-SO-ZBG-BH29-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	1 L-UNPRES
	"	"	"	"	soil			Lead	1	
07	4-22-05	1115	C	PBOW-05-SO-ZBG-BH30-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics (MS/MSD)	3	3X
	"	"	C	"	soil			Lead (MS/MSD)	3	3X
08	4-22-05	1130	C	PBOW-05-SO-ZBG-BH31-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	"	"	soil			Lead	1	
09	4-22-05	1145	C	PBOW-05-SO-ZBG-BH32-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	"	"	soil			Lead	1	
10	4-22-05	1300	C	PBOW-05-SO-ZBG-BH33-A-(0'-0.5')	soil			PAH, PCBs, Nitroaromatics	1	
	"	"	"	"	soil			Lead	1	

	Date		
Sample Kit Prep'd by: (Signature)	4-15-05	Received By: (Signature)	
Relinquished by: (Signature) Kelly Owens	Date/Time 4/22/05 1633	Received By: (Signature)	
Relinquished by: (Signature)	Date/Time	Received By: (Signature)	
Received for Laboratory by: (Signature)	Date/Time 4-23-05	Temperature 2.0 °C	

REMARKS
*Signature required to ensure validity

Lab Use Only
VOA Headspace Y N (NA)
Field Filtered (Y) N NA
Correct Containers (Y) N NA
Discrepancies Y (N) NA
Cust. Seals intact (Y) N NA
Containers Intact (Y) N NA

Airbill # FX
CAR #

Distribution: White and yellow copies accompany sample shipment to laboratory; Pink retained by samplers

ELAB OF TENNESSEE CHAIN OF CUSTODY RECORD

№ 33399

Ship to:
ELAB of Tennessee
227 French Landing Drive
Suite 550
Nashville, TN 37228
Attn: Analytical Laboratory
(615) 345-1115 (phone)
(615) 846-5426 (fax)

Send Results to:
Name Mike Houck
Company Jacobs Eng.
Address 125 Broadway
City,State,Zip Oak Ridge, Tn 37830
Phone 865-220-4866
Fax 865-220-4848
E-mail mike.houck@jacobs.com

Send Invoice To:
Name
Company
Address
City,State,Zip
Phone
Purchase Order
E-mail

Details:
Page 3 of 3
Cooler No. ___ of ___
Date Shipped 4-22-05
Shipped By Al Hardesty

Turnaround
(Std. Turn unless noted otherwise / There may be a surcharge for RUSH-contact lab)

Project No./Name

Samplers (Signature)*

Lab Use Only Lab #	Date Sampled	Time	Comp./Grab	Sample Location/Description	Sample Matrix	Field pH/Temp	Field Cond.	ANALYSIS REQUIRED	No. of Bottles	Lab Use Only Containers/Pres.
420-11	4-22-05	1315		PBOW-05-SO-2BG-BH34-A-(0'-0.5')	soil			PAH, PCB, Nitroaromatics	1	1L-UNPRES
	"	"		"	"			Lead	1	✓

Sample Kit Prep'd by: (Signature)	Date	Received By: (Signature)
[signature]	4-15-05	
Relinquished by: (Signature) [signature]	Date/Time 4/22/05 1633	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature) [signature]	Date/Time 4-23-05 [illegible]	Temperature 2.0°

REMARKS
*Signature required to ensure validity

Lab Use Only

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill # FR

CAR #

Distribution: C[illegible]al and yellow copies accompany sample shipment to laboratory; Pink retained by [illegible]mplers

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

of Pgs.

Project: Plum Brook - ZBG
Client: Jacobs Engineering
Send Results To:
Address:
Phone:

Turnaround Time
# of Containers: 1 1 1 1
Container Type: G G
Preservative Used: No No
Type of Analysis: Lead | PAH | PCB | Explosives | Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Lead	PAH	PCB	Explosives	CLIENT COMMENTS
PBOW-0550-	4/22/08	1000	Soil	HJP	X	X	X	X	PAH, PCB, explosives in 1 bottle.
ZBG-BH26-B-(0'-0.5')									

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Helen Owens	4/22/08 1615				
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:	

G.P. W.O. _____

Appendix N

Groundwater Data Collection Forms

Figure 5-7

GROUNDWATER SAMPLING FIELD DATA FORM

Location ID: 2BG COC Sample Numbers PBOW-05-GW-2BG-BEDMW002-01A
Plume Area: N/A Well Number: 2BG-BEDMW-002
Arrival Date/Sample Time: 1-31-05 / 1330
Sampling Method: Disposable Bailer

Pump # N/A	Pump Length N/A
Dedicated Pump Used	

Weather:

Well Total Depth: 74.4 ft BTOC. Screened Interval: 44.4-74.4 ft BTOC.
Background PID Reading: 0 PPM. Well PID Reading: 0 PPM.
Static Water Level: 66.79 ft BTOC. Pump Set Depth: _____ ft BTOC
LNAPLS Present: _____ DNAPLS Present: _____

Purge volume calculations:
(D_c) Casing diameter (inches) _____, (H_s) Length of saturated screen interval (feet)_____,

(Db) Well boring diameter (inches) _____, (P) Effective porosity of filter pack (dimensionless) = 0.3

(A) Well Screen Unit Volume = $0.041 (D_c)^2 (H_s)$ = _____

(B) Saturated Filter Pack Unit Volume = $0.041 [(D_B)^2 - (D_C)^2] (H_S)P$ = _____

(C) Total Unit Volume = (A) + (B) = _____

(D) Purge Volume = 3 * (C) = _____

NA - no purge

Analytical Parameters

Collected	Parameters	Method	Preservatives
3 x 1000ml Amber	PAH, PCB, Nitroaromatics		4°C
1 x 500 ml poly	~~metals (Filtered)~~ metals unfiltered/hardness		HNO_3 - 4°C
1 x 500 ml poly	metals (Filtered)	filter at lab	4°C
3 x 40 ml vial	VOC		HCl - 4°C
1 x 1000 ml poly	~~turbidity~~, Alkalinity TSS/TDS/Anions		4°C
1 x 250ml poly	Cyanide		NaOH - 4°C
2 x 40ml vial	TOC		H_2SO_4

QA/QC Sampling: Sample Duplicate: NO ✓ YES __ Well Number
MS/MSD Sample: NO ✓ YES __ Well Number:
Rinsate Blank: NO ✓ YES __ Well Number:
Field Blank: NO ✓ YES __ Well Number:

Sample Crew (Print):
Al Hardesty, Neal Emminger (continues)

Well ID ZBG-BEDmW-002

Figure 5-7

Sample Date: 1-31-05

GROUNDWATER SAMPLING FIELD DATA FORM (continued)

Final Well Purging - Field Water Quality Measurement Table

Time	Depth to Water (ft)	Purge Rate (ml/min)	Total Purge (gal)	Temp (C) Stab. Para. (± 0.5 deg.)	pH Stab. Para. (± 0.2)	Sp. Cond. (mS/cm) Stab. Para. (± 3%)	Turbidity (NTUs) Stab. Para. (± 10%)	DO (mg/L) Stab. Para. (± 10%)	ORP (mV) Stab. Para (+/- 10 mV)	Comments Stabilization Parameters
N/A	– No purge or water quality parameters measured per SAP Variance									
										Final Field Parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Field Equipment: PID/OVA SN: N/A Calibration Date: _____ Initials :

YSI SN: N/A Calibration Date: _____ Initials :

Field measurement protocols followed with no exceptions (Y / (N)) Form completed by : Al Hardesty

Date :

*Field Deviations Made :

collected samples with disposable bailer, with no purging and no collection of water quality parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Figure 5-7

GROUNDWATER SAMPLING FIELD DATA FORM

Location ID: 2B6 COC Sample Numbers PBOW-05-GW-2B6-BEDMW003-01A
Plume Area: N/A Well Number: 2B6-BEDMW-003
Arrival Date/Sample Time: 1-31-05 / 1430
Sampling Method: disposable bailer

Pump # N/A	Pump Length N/A
Dedicated Pump Used	

Weather:
Clear, Cold 20° - 25°

Well Total Depth: 65.1 ft BTOC. Screened Interval: 43.6' - 63.6' BTOC.
Background PID Reading: 0 PPM. Well PID Reading: 0 PPM.
Static Water Level: 56.32 ft BTOC. Pump Set Depth: _____ ft BTOC
LNAPLS Present: _____ DNAPLS Present: _____

Purge volume calculations:
(D_c) Casing diameter (inches) _____, (H_s) Length of saturated screen interval (feet) _____,
(Db) Well boring diameter (inches) _____, (P) Effective porosity of filter pack (dimensionless) = 0.3

(A) Well Screen Unit Volume = $0.041 (D_c)^2 (H_s)$ = _____
(B) Saturated Filter Pack Unit Volume = $0.041 [(D_b)^2 - (D_c)^2] (H_s)P$ = _____
(C) Total Unit Volume = (A) + (B) = _____
(D) Purge Volume = 3 * (C) = _____

N/A - No purge performed

Analytical Parameters

Collected	Parameters	Method	Preservatives
3 x 1000 ml Amber	PAH, PCB, Nitroaromatics		4°C
1 x 500 ml poly	metals (unfiltered) hardness		HNO_3 - 4°C
1 x 500 ml poly	metals (filtered)	filter at lab	4°C
3 x 40 ml vial	VOC		HCl - 4°C
1 x 1000 ml poly	turbidity, alkalinity TSS/TDS/ Anions		4°C
1 x 250 ml Poly	Cyanide		NaOH - 4°C

QA/QC Sampling: Sample Duplicate: NO ✓ YES __ Well Number
MS/MSD Sample: NO ✓ YES __ Well Number:
Rinsate Blank: NO ✓ YES __ Well Number:
Field Blank: NO ✓ YES __ Well Number:

Sample Crew (Print):
Al Hardesty, Neal Emmingen (continues)

Well ID 236-BEDMW-003

Figure 5-7

Sample Date: 1-31-05

GROUNDWATER SAMPLING FIELD DATA FORM (continued)

Final Well Purging - Field Water Quality Measurement Table

Time	Depth to Water (ft)	Purge Rate (ml/min)	Total Purge (gal)	Temp (C) Stab. Para. (± 0.5 deg.)	pH Stab. Para. (± 0.2)	Sp. Cond. (mS/cm) Stab. Para. (± 3%)	Turbidity (NTUs) Stab. Para. (± 10%)	DO (mg/L) Stab. Para. (± 10%)	ORP (mV) Stab. Para (+/- 10 mV)	Comments Stabilization Parameters
N/A - No purge or collection of water quality parameters										
										Final Field Parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Field Equipment: PID/OVA SN: N/A Calibration Date: _____ Initials :

YSI SN: N/A Calibration Date: _____ Initials :

Field measurement protocols followed with no exceptions (Y / (N)) Form completed by : Al Hardesty

Date :

*Field Deviations Made :

collected samples with disposable bailer, with no purging or collection of water quality parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Figure 5- 7

GROUNDWATER SAMPLING FIELD DATA FORM

Location ID: ZBG
COC Sample Numbers: PBOW-05-GW-ZBG-BEDMW001-01A
Plume Area: N/A
Well Number: ZBG-BEDMW-001
Arrival Date/Sample Time: 1/28/05 / 1450
Sampling Method: Disposable Bailer

Pump # NA	Pump Length NA
Dedicated Pump Used	

Weather:
Clear, very cold - 20°

Well Total Depth: 50.9 ft BTOC. Screened Interval: 40.9-50.9 ft BTOC.
Background PID Reading: 2 PPM. Well PID Reading: 0 PPM.
Static Water Level: 47.47 ft BTOC. Pump Set Depth: N/A ft BTOC
LNAPLS Present: DNAPLS Present:

Purge volume calculations:
(D_c) Casing diameter (inches) _____, (H_s) Length of saturated screen interval (feet) _____

(Db) Well boring diameter (inches) _____, (P) Effective porosity of filter pack (dimensionless) = 0.3

(A) Well Screen Unit Volume = $0.041 (D_c)^2 (H_s)$ = _____

(B) Saturated Filter Pack Unit Volume = $0.041 [(D_B)^2 - (D_C)^2] (H_S)P$ = _____

(C) Total Unit Volume = (A) + (B) = _____

(D) Purge Volume = 3 * (C) = _____

NA - No purging will be performed per SAP variance and team approval

Analytical Parameters

Collected	Parameters	Method	Preservatives
2x1000ml Amber	PCB, Nitroaromatics		4°C
1x40ml Vial	VOC		HCl
1x500ml poly	metals unfiltered		~~HNO3~~ pH < 2°C

QA/QC Sampling:
Sample Duplicate: NO ✓ YES __ Well Number
MS/MSD Sample: NO ✓ YES __ Well Number:
Rinsate Blank: NO ✓ YES __ Well Number:
Field Blank: NO ✓ YES __ Well Number:

Sample Crew (Print):
M Hardesty, John Guss (continues)

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Well ID 236-BEDMW-001

Figure 5-7

Sample Date: 1-28-05

GROUNDWATER SAMPLING FIELD DATA FORM (continued)

Final Well Purging - Field Water Quality Measurement Table

Time	Depth to Water (ft)	Purge Rate (ml/min)	Total Purge (gal)	Temp (C) Stab. Para. (± 0.5 deg.)	pH Stab. Para. (± 0.2)	Sp. Cond. (mS/cm) Stab. Para. (± 3%)	Turbidity (NTUs) Stab. Para. (± 10%)	DO (mg/L) Stab. Para. (± 10%)	ORP (mV) Stab. Para (+/- 10 mV)	Comments Stabilization Parameters
N/A	- No purging performed of water parameters measured per SAP variance									
										Final Field Parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

Field Equipment: PID/OVA SN: N/A Calibration Date: _____ Initials :

YSI SN: N/A Calibration Date: _____ Initials :

Field measurement protocols followed with no exceptions (Y / (N)) Form completed by : Al Hardesty

Date :

*Field Deviations Made :

collected samples with disposable bailer, with no purging and no collection of water quality parameters

Note: It is the user's responsibility to verify with their supervisor that they are using the most current version of this document.

APPENDIX B

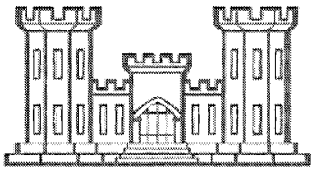
RESERVOIR NO. 2 BURNING GROUND BHHRA
(ELECTRONIC DELIVERABLE ONLY)

Revised Final Baseline Human Health Risk Assessment

Reservoir No. 2 Burning Ground

Former Plum Brook Ordnance Works
Sandusky, Ohio

Prepared for:



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0004

Prepared by:

JACOBS™

JACOBS ENGINEERING GROUP, INC.
125 BROADWAY AVENUE
OAK RIDGE, TN 37830

February 2010

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G05OH001812_03.11_0504_a

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List of Acronyms and Abbreviations

2BG	Reservoir No. 2 Burning Ground
5x, 10x	five-times, ten-times
µg/dL	microgram per deciliter
µg/L	microgram per liter
ABS	dermal absorption factor
AF	adherence factor
amsl	above mean sea level
ATSDR	Agency for Toxic Substances and Disease Registry
AT	averaging time
bgs	below ground surface
BHHRA	baseline human health risk assessment
BSC	background screening concentration
BTEX	benzene, toluene, ethylbenzene, and total xylenes
BW	body weight
cm^2	square centimeter
COC	chemical of concern
COPC	chemical of potential concern
CSEM	conceptual site exposure model
CT	central tendency
DA	dose absorbed per unit body surface area per event
DERP	Defense Environmental Restoration Program
DM	dry matter
DNT	dinitrotoluene
DOE	U.S. Department of Energy
DPT	direct push technology
ED	exposure duration
EF	exposure frequency
EPA	U.S. Environmental Protection Agency
EPC	exposure-point concentration
ET	exposure time
FI	fraction of intake
ft	foot/feet
FUDS	Formerly Used Defense Sites
g	gram
g/m^3	grams per cubic meter

g/kg-day	grams per kilogram of body weight per day
GAF	gastrointestinal absorption factor
gpm	gallons per minute
GSA	U.S. General Services Administration
HHEM	Human Health Evaluation Manual
HI	hazard index
HQ	hazard quotient
hr/day	hours per day
IEUBK	integrated exposure-uptake biokinetic
ILCR	incremental lifetime cancer risk
IR	ingestion rate
IRIS	Integrated Risk Information System
IT	IT Corporation
Jacobs	Jacobs Engineering Group
kg	kilogram
kg/g	kilograms per gram
KM	Kaplan-Meier
L	liter
L/day	liters per day
m	meters
m/sec	meters per second
m^3	cubic meter
m^3/day	cubic meters per day
m^3/hr	cubic meters per hour
m^3/kg	cubic meters per kilogram
MDC	maximum detected concentration
mg	milligram
mg/cm^2	milligrams per square centimeter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
NASA	National Aeronautics and Space Administration
NCRPM	National Council on Radiation Protection and Measurements
OEPA	Ohio Environmental Protection Agency
PAH	polynuclear aromatic hydrocarbon
PBOW	Plum Brook Ordnance Works

PC	permeability coefficient
PCB	polychlorinated biphenyl
PEF	particulate emission factor
PRG	preliminary remediation goal
RA	risk assessment
RBC	risk based criteria
RBRL	risk-based remediation level
RBSC	risk-based screening concentration
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
SA	surface area
SAIC	Science Applications International Corporation
SF	slope factor
Shaw	Shaw Environmental, Inc.
SI	Site Investigation
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TNT	trinitrotoluene
TRW	Technical Review Workgroup
UCL	upper confidence limit
UCL_{95}	95th percent upper confidence limit on the arithmetic mean
UF	uncertainty factor
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

EXECUTIVE SUMMARY

This baseline human health risk assessment (BHHRA) report presents the human health risks from potential exposure to soil, groundwater, and sediment associated with Reservoir No. 2 Burning Ground (2BG) located at the former Plum Brook Ordnance Works (PBOW), Sandusky, Erie County, Ohio. This BHHRA was prepared in accordance with the Baseline Human Health Risk Assessment and Ecological Risk Assessment Work Plans (Jacobs, 2008). It is consistent with U.S. Environmental Protection Agency (EPA) and Ohio EPA guidance and with the procedures established in the BHHRA Work Plan for TNT Areas A & C soil (IT Corporation, 2001a) and the BHHRA work plan for groundwater at PBOW (Shaw Environmental, Inc., 2005a).

The 2BG site is located in the northwestern portion of PBOW, approximately 400 feet (ft) south of Reservoir No. 2 at the former Plum Brook Station ball field between Ransom Road and Campbell Street (Jacobs, 2006).

The 2BG site was used as a burning ground for production process wastes. It is not known when the site was first used for burning; however, a 1950 aerial photo clearly shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. The burn area is approximately 125 ft wide by 175 ft long. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft below ground surface (bgs) and one ft in thickness.

The 2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern edge of the field. The remains of a baseball field are still evident at the site. A paved service road is adjacent to the east side of the site. The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are now wooded. The only surface water feature within the 2BG site is an intermittent drainage ditch that runs east to west and forms the north edge of the site. The drainage ditch is located 200 to 300 ft north of the former burn area and drains to the west across the site, then northwest to Pipe Creek. This drainage feature is approximately four ft wide and six to seven ft deep. A less pronounced drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is intermittent and flows only during the wet season and following precipitation events, remaining essentially dry during the summer months (Jacobs, 2006).

The objective of this BHHRA is to evaluate potential for cancer and noncancer human health effects posed to current and potential future receptors. This objective was met through the process of data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis.

Data evaluation consists of identification of data sources, evaluation of data quality, identification of chemicals of potential concern, and background screening. The exposure assessment consists of development of the conceptual site exposure model including definition of contaminant sources, contaminant release mechanisms, receptors, and exposure pathways; description of exposure-point concentrations (EPCs); and identification of the methods for calculating chemical intake and contact rates. The toxicity assessment defines the potential for cancer and/or noncancer human health effects; provides an estimate of the quantitative

relationship between the magnitude of dose or contact rate and the probability and/or severity of adverse effects; and identifies the toxicity values that are used in the BHHRA. The risk characterization combines the output of the exposure assessment and toxicity assessment to quantify the risk to each receptor. The uncertainty analysis identifies uncertainties in all phases of the BHHRA and discusses their individual effects on the risk assessment results.

PBOW is currently classified for industrial use, but future residential use was considered in the risk assessment to support evaluation of all plausible receptor scenarios. Groundskeeper, construction worker, and hunter scenarios were evaluated under the current site-use assumptions. Groundskeeper, construction worker, indoor worker, hunter (including a child venison consumer), and on-site residential scenarios were evaluated as plausible future exposure scenarios.

For soils, human health risk was evaluated separately between the burn area and areas outside the burn area. Hence two separate risk assessments were completed for soils associated with 2BG. Two separate risk evaluations were completed because the burn area itself is expected to contain greater chemical concentrations than areas outside the burn area, and therefore, greater risk to human receptors. The separate risk evaluation of the two areas (the burn area and outside the burn area) was also completed to assist in future remedial decision making for the site, if warranted. Human health risk associated with groundwater and drainage ditch sediments were assessed across the entire 2 BG site.

Burn Area Risk Characterization Conclusions

A risk characterization was completed for the burn area. Surface soil and subsurface soil data collected from the burn area were used to characterize potential human health risk. Bedrock groundwater from across the entire 2BG site was also used to address burn area risks. Sediment data were not used for the assessment of the burn area because no drainage ditches are located within the burn area.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil inside the burn area. The total hazard index (HI) estimate for the groundskeeper receptor was 12. (Table 5-1). The HI exceeds the threshold for noncancer effects with the primary chemical of concern (COC) driving the HI being 2,4,6-trinitrotoluene. The total incremental lifetime cancer risk (ILCR) estimate for the groundskeeper receptor was 7.8E-5. The COCs for the ILCR were 2,4,6-trinitrotoluene, dinitrotoluene (DNT) mixtures, polychlorinated biphenyl (PCB)-1260, and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in surface soil.

Total HI estimates for the adult hunter and the adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 5.8E-6. The primary COC for the ILCR was 2,4,6-trinitrotoluene from the ingestion of surface soil. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface and subsurface soil inside the burn area. The total HI estimate summed across all media for the construction worker receptor was 187 (Table 5-1). The COC driving the elevated HI in surface and subsurface soils within the burn area was 2,4,6-trinitrotoluene. The total ILCR estimate summed across all media for

the construction worker was 2.7E-5. The COCs driving the ILCR were 2,4,6-trinitrotoluene in surface and subsurface soils and 2,3,7,8- TCDD in subsurface soil.

The indoor worker was evaluated for exposure to surface soil and groundwater. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 5.9, respectively (Table 5-1). The ILCR for groundwater and surface soil were 1.7E-3 and 3.8E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater, and 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8- TCDD, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in subsurface soils.

The adult and child residential receptors were evaluated for exposure to surface and subsurface soil associated within the burn area and groundwater across the site. HI sums for groundwater and surface and subsurface soil were 129 and 892 for the adult and child, respectively (Table 5-1). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface and subsurface soil COCs driving the adult HI were 2,4,6-trinitrotoluene and 2,4-dinitrotoluene (subsurface soil only). For the residential child, groundwater COCs driving the HI are total arsenic, total iron, total manganese, total thallium, and benzene. Surface and subsurface soil COCs factoring into the elevated HI include 2,4,6-trinitrotoluene in surface soil and 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2,4,6-trinitrotoluene, and PCB-1254 in subsurface soils within the burn area.

The total ILCR estimates summed for groundwater and surface and subsurface soil within the burn area for adult and child residential receptors were 5.1E-3 and 2.8E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for both the residential adult and child. The surface soil COCs for the burn area ILCR were 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the adult and 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the child. The subsurface soil COCs were 2,4,6-trinitrotoluene and 2,3,7,8-TCDD for the adult and 2,4,6-trinitrotoluene, 2,3,7,8-TCDD, and PCB-1254 and PCB-1260 for the child. Vapor intrusion into dwellings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

Outside the Burn Area Risk Characterization Conclusions

A risk characterization was completed for the area outside the burn area. Surface soil, subsurface soil, and sediment data collected from outside the burn area were used to characterize potential human health risk. Bedrock groundwater data from across the entire 2BG site were also used to address outside the burn area risks.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil from areas outside and adjacent to the burn area. The total HI estimate for the groundskeeper receptor was 1.2 (Table 5-2). The primary COC driving the HI for the groundskeeper was 2,4,6-trinitrotoluene. The total ILCR estimate for the groundskeeper receptor exposed to soil outside the burn area was 3.0E-5. The COCs for the ILCR were 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260. Total HI estimates for the adult hunter, and adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 1.4E-6. The primary COCs were 2,4,6-trinitrotoluene and PCB-1260 from the ingestion of surface soil while the adult was hunting. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface, subsurface soil, and sediment outside the burn area. The total HI estimate summed across all media for the construction worker receptor outside the burn area was 4.7 (Table 5-2). The COC driving the elevated HI outside the burn area for surface and subsurface soils was 2,4,6-trinitrotoluene. The total ILCR estimate summed across all media (soils and sediment) for the construction worker receptor was 2.1E-6. The COC driving the ILCR was arsenic in subsurface soils. Surface soil and sediment COCs did not contribute significantly to the construction worker ILCR.

The indoor worker was evaluated for exposure to surface soil outside the burn area and groundwater across the site. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 0.6, respectively (Table 5-2). The COCs for the groundwater HI include total arsenic and benzene. The ILCR for groundwater and surface soil were 1.7E-3 and 1.0E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater and 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

The adult and child residential receptors were evaluated for exposure to outside the burn area surface soil, subsurface soil, sediment, and groundwater. The total HI estimates summed across all media for the adult and child residential receptors were 46 and 121 respectively (Table 5-2). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface soil COC driving the adult HI was 2,4,6-trinitrotoluene. The adult residential HI for both subsurface soil and sediment were below 1 and do not contribute significantly to the total HI estimate. For the residential child, groundwater COCs driving the HI are total arsenic, total iron, total manganese, total thallium, and benzene. The surface soil and subsurface soil COCs for the residential child include 2,4,6-trinitrotoluene in surface soil and arsenic and iron in subsurface soils.

The total ILCR estimates summed for groundwater, surface and subsurface soil, and sediment outside the burn area for adult and child residential receptors were 5.0E-3 and 3.1E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for both the residential adult and child. The ILCR surface soil COCs for the area outside the burn area include 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260 for both the residential adult and child. The subsurface soil COC is arsenic. Vapor intrusion into dwellings from subsurface soil was not evaluated as there were no VOCs detected in the subsurface soil.

Groundwater and Sediment Conclusions

HIs for the indoor workers and adult and child residential receptors exceeded 1 for exposure to groundwater. The primary contributor to the elevated HIs was total arsenic, total iron, and benzene. Cancer risk estimates were outside the cancer risk range of 1E-6 to 1E-4 for the indoor worker and adult and child residential receptors exposed to groundwater. The primary contributor to the elevated groundwater ILCRs was total arsenic and benzene.

Cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker and adult and child residential receptors for exposures to sediment.

1.0 INTRODUCTION

This baseline human health risk assessment (BHHRA) report presents the human health risks from potential exposure to soils both inside and outside the burn area, groundwater, and sediment associated with Reservoir No. 2 Burning Ground (2BG) located at the former Plum Brook Ordnance Works (PBOW), Sandusky, Erie County, Ohio.

This BHHRA was prepared by Jacobs Engineering Group (Jacobs) under contract DACW62-03-D-0004, Delivery Order #4. This work is being conducted for the U.S. Army Corp of Engineers (USACE) under the Defense Environmental Restoration Program (DERP) – Formerly Used Defense Sites (FUDS). The Army is the executive agent for the FUDS program and the USACE manages and directs the program's administration. Investigations at PBOW under DERP-FUDS are being managed by the USACE Huntington District and technically overseen by the USACE Nashville District.

This BHHRA was prepared in accordance with the *Baseline Human Health Risk Assessment and Ecological Risk Assessment Work Plans* (Jacobs, 2008). It is consistent with U.S. Environmental Protection Agency (EPA) and Ohio EPA (OEPA) guidance and with the procedures established in the BHHRA Work Plan for TNT Areas A & C soil (IT Corporation [IT], 2001a) and the BHHRA work plan for groundwater at PBOW (Shaw Environmental, Inc. [Shaw], 2005a).

1.1 Facility Description

PBOW is located approximately 4 miles south of Sandusky, Ohio, and 59 miles west of Cleveland (Figure 1-1). Although located primarily in Perkins and Oxford Townships, the eastern edge of the facility extends into Huron and Milan Townships. PBOW is bounded on the north by Bogart Road, on the south by Mason Road, on the west by Patten Tract Road, and on the east by U.S. Highway 250. The area surrounding PBOW is mostly agricultural and residential (IT, 2001b). The facility is currently surrounded by a chain-link fence, and the perimeter is regularly patrolled. Access by authorized personnel is limited to established checkpoints. Public access is restricted, except during the annual deer hunting season.

The 2BG site is located in the northwestern portion of PBOW, approximately 400 feet (ft) south of Reservoir No. 2 at the former Plum Brook Station ball field between Ransom Road and Campbell Street (Figure 1-2) (Jacobs, 2006). The burn area is approximately 125 ft wide by 175 ft long. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft below ground surface (bgs) and one ft in thickness.

The 2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern edge of the field. The remains of a baseball field are still evident at the site. A paved service road is adjacent to the east side of the site. The ground surface is relatively flat, with minimal slope toward the north and northwest. Elevations at the site range from 639 to 641 ft above mean sea level (amsl). The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are now wooded. The only surface water feature within the 2BG site is an intermittent drainage ditch that runs east to west and forms the north edge of the site. The drainage ditch is located 200 to 300 ft north of the former burn area and drains to the west across the site, then northwest to Pipe Creek. This

drainage feature is approximately four ft wide and six to seven ft deep. Elevations in the ditch range from 635 ft amsl upstream of the site to 633 ft amsl downstream. A less pronounced intermittent drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is intermittent and flows only during the wet season and following precipitation events, remaining essentially dry during the summer months (Jacobs, 2006).

1.2 Background

The 9,009-acre PBOW site was built in early 1941 as a manufacturing plant for trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Production of explosives began in December 1941 and continued until 1945. It is estimated that more than one billion pounds of explosives were manufactured during the four-year operating period.

The National Aeronautics and Space Administration (NASA) acquired PBOW in 1963 and presently utilize about 6,400 acres for conducting space research. The site is operated by NASA as the Plum Brook Station of the John Glenn Research Center, which is headquartered in Cleveland, Ohio. In 1978 NASA declared approximately 2,152 acres of land as excess (IT, 1997a). The Perkins Township Board of Education acquired 46 acres of the excess property for use as a bus transportation center. The Ohio National Guard has an agreement with the U.S. General Services Administration (GSA) to use 604 acres of the facility.

The 2BG site was used as a burning ground for production process wastes. It is not known when the site was first used for burning; however, a 1950 aerial photo clearly shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. Restoration of the site was performed in 1963 when the area was cleared of debris and the ground restored to proper grade. A review of aerial photographs taken in 1950, 1958, and 1968 indicated the presence of a disturbed area with a rectangular berm (1950), a pronounced burn ground (1958), and a large cleared area that shows the land to have been restored (1968). Based on these photos, the size of the burning ground was estimated to be 125 ft wide by 175 ft long (Jacobs, 2006).

A Site Investigation (SI) (IT, 1997a) was performed at 2BG in 1996, which identified surface and subsurface soil contamination above U.S. EPA Region 3 Risk-Based Criteria (RBC). Organic contaminants in surface and subsurface soil exceeding the RBCs included polynuclear aromatic hydrocarbons (PAH), explosives, polychlorinated biphenyls (PCB), and lead.

A Remedial Investigation (RI) (Jacobs, 2006) was performed May through July 2004 to define the extent of soil contamination and to evaluate impacts to the groundwater, surface water, and sediment in the vicinity of 2BG. RI sample collection and data evaluation are discussed in detail in the *Final Site Characterization Report Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground* (Jacobs, 2006).

Based on the information obtained from these investigations, the burn layer at 2BG covers an area approximately 21,000 sq ft, or approximately half an acre. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft bgs and one ft in thickness.

A summary of the RI findings relevant to the evaluation of risk to human health is presented here.

Contaminants in soil exceeding the U.S. EPA Region 9 Residential Preliminary Remediation Goals (PRGs) (U.S. EPA 2004a & b) and established background values for inorganics are primarily limited to surface soil and the burn layer material. These contaminants include dioxins/furans, PCBs, explosives, PAHs, and metals.

Soil within the burn layer footprint represents the most contaminated area at the site. All seven of the surface soil samples from inside the burn area contained multiple contaminants exceeding the PRGs. All five of the samples analyzed for the full analytical suite collected from burn layer material contained multiple contaminants exceeding the PRGs. The highest concentrations of explosives and lead at the site were found in the burn layer material. Concentrations of these contaminants are two to three orders of magnitude higher than the PRGs for all samples. The burn layer material sampled from trenches TR08 and TR09 is composed of 3.6% and 4.5% explosives, respectively (Figure 2-1).

Surface soil contamination outside of the burn area is not as pervasive. However, the majority of the surface soil samples collected outside of the burn area contained one or more contaminants exceeding PRGs. Section 2.3 discusses the number of samples collected and detected contaminants in greater detail.

Subsurface soil contamination is minimal both inside and outside of the burn layer footprint. Only three subsurface soil samples contained organic constituents exceeding the PRGs, which were located within the burn area. Compounds exceeding the PRGs outside of the burn area are primarily metals.

Concentrations of organic compounds in subsurface soil are generally several orders of magnitude lower than the PRGs. PCBs were not detected in any of the subsurface soil samples. Explosives were detected in the subsurface soil beneath the burn layer at six of the seven locations, but at levels considerably lower than the PRGs. Based on these data, downward and lateral migration of contaminants is minimal.

Contaminants in sediment exceeding the U.S. EPA Region 9 Residential PRGs are limited to PAHs. Other contaminants detected in the sediment include dioxins/furans and volatile organic compounds (VOCs). Organic concentrations are significantly higher at the location upstream of the site, adjacent to the service road, suggesting that contaminants are related to a source other than the burning ground. PCBs and explosives, which are the primary contaminants associated with the burning ground, were not detected in the sediments.

The bedrock aquifer at 2BG has very low potential for contaminant transport, based on the low porosity observed from the rock cores and the extremely low permeability observed during groundwater monitoring well development. Bedrock groundwater contaminants exceeding the U.S. EPA Region 9 Tap Water PRGs (U.S. EPA 2004a) and established background values for inorganics include PAHs, metals, and VOCs. The organic contaminants are believed to be related to naturally occurring petroleum in the Columbus Limestone, which has been observed throughout PBOW.

1.3 Site Use and Groundwater Use

Prior to acquisition of the site for construction of the PBOW, the area was largely agricultural. Most of the forested areas were cleared during construction of the PBOW. Today, second generation forests have returned to large portions of the site that are not actively used by NASA. Other undeveloped areas of the site are maintained as open fields. The surrounding area is mostly agricultural and residential.

Potential future uses of portions or all of the facility property include:

1. The continuation of NASA activities at PBOW.
2. Recreational uses such as hunting and fishing. PBOW is open to deer hunters during the hunting season.
3. Selling of portions of the site by GSA to other parties (state or local government or private individual).
4. Agricultural uses.
5. Residential uses.
6. Training area for use by National Guard Units.
7. Construction activities.

Items three through seven are speculative and no negotiations have been scheduled to define future land use.

1.3.1 2BG Land Use

The 2BG site was used as a burning ground for production process wastes. It is not known when the facility was constructed; however, the 1950 aerial photo clearly shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. Restoration of the site was performed in 1963 when the area was cleared of debris and the ground restored to proper grade. The 2BG site was used temporarily as a baseball field by NASA and is currently a grass-covered open field with young hardwood trees and brush surrounding the area (Jacobs, 2006).

1.3.2 Groundwater Use

Two aquifers are utilized for drinking water in the area surrounding PBOW: a carbonate aquifer outcropping in the western portion of Erie County and a shale aquifer outcropping in the eastern portion. PBOW is located within the transition of the two aquifers and does not offer adequate yields from either aquifer for potable use. Also the water quality in the on-site carbonate aquifer is not adequate for potable use due to naturally occurring petroleum and associated hydrogen sulfide. Both aquifers are overlain by a veneer of glacial drift, generally less than 20 ft thick, that is considered a poor source of groundwater except in areas of sand and gravel lenses. No such lenses are present at the 2BG site.

Most of PBOW is mapped by the Ohio Department of Natural Resources as an area in which well yields seldom exceed three gallons per minute (gpm) from the shale aquifer and overlying discontinuous sand and gravel deposits. The carbonate aquifer is subdivided into two zones by the Ohio Department of Natural Resources based on usage and yields. Zone one is characterized as cavernous limestone and dolomite. Yields from zone one range from 100 to 500 gpm in the karst terrain of western Erie County and decrease to the east, as evidenced by a well just west of PBOW that has a yield of eight gpm. Zone one is present in the north and northwestern portions of PBOW at depths of approximately 100 ft. Zone two is a deeper carbonate aquifer that generally yields 15 gpm or less. Zone two is present in the north portion of PBOW at depths of 300 ft.

The bedrock monitoring wells installed at 2BG were completed in massive limestone with little or no porosity. Yields from these wells are so low that they are measured in units of less than a gallon per day. No overburden wells were installed at 2BG because of limited porosity in the overlying clays, as agreed to by the PBOW team. Shallow groundwater does not yield sufficient volume or quality of water for potable use and will be evaluated qualitatively in the BHHRA.

Residences to the north and east of PBOW are served by city, county and rural water departments. Residences south and west of PBOW are supplied by wells. As of 1991, a total of 179 permitted private drinking water wells, listed at the Erie County Health Department, were within a four-mile radius of PBOW (Science Applications International Corporation [SAIC], 1991). The nearest recorded well was at 6115 Schenk Road, approximately 3800 ft from the site; however, a closer well was observed at 1810 Schenk Road, located approximately 2250 ft from the site. Based on the low yields and presence of a public water supply, exposure to bedrock groundwater at 2BG is not likely to occur.

1.4 Protocol for the Baseline Human Health Risk Assessment

This BHHRA was prepared based on U.S. EPA, OEPA, and USACE, guidance, including, but not limited to, the following:

- OEPA, 2004a, *Technical Decision Compendium, Methodology for Evaluating Site-specific Background Concentrations of Chemicals* Ohio EPA Division of Emergency and Remedial Response Remedial Response Program, 14 April 2004.

- OEPA, 2004b, *Technical Decision Compendium, Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response and Office of Federal Facility Oversight* Ohio EPA Division of Emergency and Remedial Response, 28 April 2004

- OEPA, 2005a, *Use of Risk-Based Numbers in the Remedial Response Process Overview* DERR-00-RR-038, June 28, 2005.

- OEPA, 2005b, *Technical Decision Compendium, Assessing Compounds without Formal Toxicity Values Available for Use in Human Health Risk Assessment* Ohio EPA Division of Emergency and Remedial Response Remedial Response Program, August 2005.

- U.S. EPA, 1989a, *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*, Interim Final, Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-89/002.

- U.S. EPA, 1991a, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors*, Interim Final, Office of Solid Waste and Emergency Response, OSWER Directive: 9285.6-03.

- U.S. EPA, 1991b, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual Part B – Development of Risk-Based Preliminary Remediation Goals*, Interim, Office of Emergency and Remedial Response, Washington, D.C., EPA/540/R-92/003, December.

- U.S. EPA, 1992a, *Supplemental Guidance to RAGS: Calculating the Concentration Term*, Office of Solid Waste and Emergency Response, Washington, D.C., Publication 9285.7-081.

- U.S. EPA, 1992b, *Dermal Exposure Assessment: Principles and Applications*, Interim Report, Office of Research and Development, Washington, D.C., EPA/600/891/011B, including Supplemental Guidance, dated August 18, 1992.

- U.S. EPA, 1992c, "Guidance on Risk Characterization for Risk Managers and Risk Assessors," Memorandum from F. Henry Habicht II, Deputy Administrator, to Assistant Administrators, Regional Administrators, February 26.

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- U.S. EPA, 2004c, *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E - Supplemental Guidance for Dermal Risk Assessment)*, Final, Office of Superfund Remediation and Technology Innovation, Washington, D.C., EPA/540/R-99/005, July.

1.5 Organization of the Baseline Human Health Risk Assessment

This BHHRA report presents the methods used, results generated, and the interpretation of these results. The remainder of this report is organized as follows:

Section 2.0, Data Evaluation: Identifies data sources, evaluates data quality, identifies chemicals of potential concern (COPCs), and provides the background screening.

Section 3.0, Exposure Assessment: Presents the conceptual site exposure model (CSEM), including contaminant sources, contaminant release mechanisms, receptors, and exposure pathways; describes exposure-point concentrations (EPCs); and presents methods for calculating chemical intake and contact rates.

Section 4.0, Toxicity Assessment: Describes the potential for cancer and/or noncancer human health effects; provides an estimate of the quantitative relationship between the magnitude of dose or contact rate and the probability and/or severity of adverse effects; identifies the toxicity values that are used in the BHHRA; and describes the development of dermal toxicity values.

Section 5.0, Risk Characterization: Combines the output of the exposure assessment and toxicity assessment to quantify the risk to each receptor. Risks associated with exposure to all appropriate media were evaluated. This section includes the derivation of risk-based remediation levels (RBRLs), which describes their development based on the methods of the BHHRA and discussion between OEPA and USACE.

Section 6.0, Uncertainty Analysis: Identifies uncertainties in all phases of the BHHRA and discusses their individual effects on the risk assessment results, focusing on those issues that are most likely to have the greatest effect on risk estimates and/or risk management decisions.

Section 7.0, Summary and Conclusions: Provides a brief summary of the BHHRA, including quantitative results, uncertainties, and pertinent site information. The summary focuses those results and issues that are most likely to directly affect site management decisions.

Section 8.0, References: Provides a complete list of all references used and cited in the BHHRA.

The text of this document is supported by the following appendices:

Appendix A, Dermal Absorbed Dose Calculations

Appendix B, Risk Calculations

Appendix C, Toxicological Profiles for Chemicals of Concern

Appendix D, ProUCL Calculations for Exposure-Point Concentrations

2.0 DATA EVALUATION

An SI of 2BG was conducted in 1996 by IT to delineate the boundary of the burn area, to determine the existence and nature of contamination, and to evaluate potential risks to human health and the environment (IT 1998). Eight soil borings were completed to a depth of seven ft bgs to characterize lithology and to collect soil samples for off-site laboratory analysis.

An RI was performed by Jacobs from May through July 2004 to define the extent of soil contamination and to evaluate impacts to the groundwater, surface water, and sediment in the vicinity of 2BG (Jacobs 2006). One round of groundwater sampling was performed in January 2005. Additional soil sampling was completed April 2005 to further delineate the extent of contamination of surface soil west of the burn area.

Six trenches were completed to more accurately define the burn area and to collect discrete subsurface samples. A total of 15 soil samples were collected during trenching: 10 from the burn layer material (five for full analytical suite, five for dioxins/furans only), three from the soil beneath the burn layer, and two from the soil outside of the burn layer.

Soil borings were completed both inside and outside of the burn area during the RI to further characterize the overburden and to collect surface and subsurface soil samples. A total of 50 soil samples were collected from 26 locations during the RI: four inside the burn area and 22 outside of the burn area. Subsurface soil samples were collected from two intervals: three to five ft bgs and eight to 10 ft bgs.

Five temporary piezometers were installed outside of the burn area to determine the depth, gradient, and seasonal variability of the shallow overburden groundwater. Water level measurements were collected over a two-month period from 22 May through 20 July 2004.

Three bedrock wells were installed at the site to determine the depth and gradient of the bedrock aquifer and to collect groundwater samples to evaluate impacts from the burning ground. Development of the bedrock monitoring wells was limited due to slow recovery of the wells. None of the wells recharged quickly enough to enable a complete purge of all drill cuttings and fines or to allow for the collection of water quality parameters. One round of groundwater samples were collected using a dedicated disposable bailer, without performing any purge or the collection of water quality parameters. This deviation from the work plan was necessary due to the slow recharge and limited water volumes and was agreed to at the December 2004 team meeting. Three planned shallow overburden wells, collocated with the three bedrock wells, were not installed due to insufficient permeable zones within the overburden.

Sediment samples were collected from the drainage ditch north of the site at three locations: one upgradient of the site, one directly adjacent to the site, and one downgradient of the site. Surface water samples were not collected due to the intermittent nature of the drainage ditch.

RI sample collection and data evaluation are discussed in detail in the *Final Site Characterization Report Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground* (Jacobs, 2006). Sufficient data have been collected at the 2BG site to support a risk assessment.

2.1 Identification of COPCs

COPCs are the chemicals that are identified as site-related and potentially capable of contributing significantly to risk, and are carried forward to quantitative evaluation in the risk assessment (RA). The following subsections describe the process for their identification. Prior to initiation of the RA, a list of chemicals present in site samples was compiled. This initial list included all chemicals detected in any site medium. COPCs were selected from this list as discussed in the following sections.

2.1.1 Evaluation of Data Quality

The quality of the analytical data was evaluated to select data for inclusion in the BHHRA. Data quality is expressed by the assignment of qualifier codes during the analytical laboratory quality control process or during data validation that reflect the level of confidence in the data. The following are some of the more common qualifiers and their meanings (U.S. EPA, 1989a):

U Chemical was analyzed for but not detected; the associated value is the sample quantitation limit.

J Value is estimated, probably below the contract-required quantitation limit.

N The analysis indicates an analyte for which there is presumptive evidence to make a tentative identification.

NJ The analysis indicates a "tentatively identified analyte," and the reported value represents its approximate concentration.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R Quality control indicates that the data are unusable (chemical may or may not be present).

B Inorganic chemicals: the concentration is less than the contract-required detection limit but greater than the instrument detection limit. Organic chemicals: the concentration in the sample is not sufficiently higher than the concentration in the blank, using the five-times, ten-times (5x, 10x) rule, whereby a chemical is considered a nondetect unless its concentration exceeds 5 or 10 times the blank concentration. For common laboratory contaminants (acetone, 2-butanone [methyl ethyl ketone], methylene chloride, toluene, and the phthalate esters), the sample concentration must exceed 10 times the blank concentration to be considered a detection.

"J", "N", and "NJ" qualified data were used in the BHHRA; "R" data and "B" qualified data were not. The handling of "U" qualified data (nondetects) in the BHHRA is described in Section 3.2. Data for which the identity of the chemical was unclear were not used in the BHHRA. When confidence was reasonably high that the chemical was present but the actual concentration was somewhat in question, the data generally were used.

Some chemicals were analyzed under two different analytical programs. For example, the DNT isomers were analyzed by U.S. EPA Method 8330 for nitroaromatics as well as U.S. EPA Method 8270C for semivolatile organic compounds (SVOCs). Analytical results from U.S. EPA Method 8330 were used to quantify risks. The potential uncertainties associated with analytical results obtained by U.S. EPA Method 8270C are discussed in the uncertainty analysis (Section 6.0).

2.1.2 Frequency of Detection

As stated above, if confidence was high that a given chemical was present, the data generally were used in the RA. For most chemicals, their identification at concentrations above levels in blanks (considering the 5x, 10x rule) was presumptive evidence of their presence. However, chemicals that were reported infrequently (i.e., in less than 5 percent of the samples) may be artifacts in the data that do not reflect the presence of the chemical in question. Chemicals that were reported only at low concentrations in less than 5 percent of the samples from a given medium were dropped from further consideration unless their presence would be expected based on site historical information.

2.1.3 Risk-Based Screening

Risk-based screening for human health focuses the assessment on the chemicals that may contribute significantly to overall risk and to remove from quantification those chemicals whose contribution is clearly inconsequential. In this screening, the maximum detected concentration (MDC) was compared to the appropriate risk-based screening concentration (RBSC). The units of the MDC and RBSC are the same for each chemical in a given medium.

If the MDC of a chemical was less than or equal to its RBSC, then the chemical in this medium was not considered further in the BHHRA because it is unlikely that chemical concentrations at or below the RBSC would contribute significantly to risk. An analyte was identified as a COPC if its MDC exceeded its RBSC. RBSCs used in this BHHRA were derived from the U.S. EPA Region 9 PRG tables (U.S. EPA, 2004a).

For soils, the human health risk-based screening was evaluated separately between the burn area and areas outside the burn area. Hence, two risk-based screenings were completed for soils associated with 2BG. This was completed because the burn area itself is expected to contain greater chemical concentrations than areas outside the burn area, and therefore, greater risk to human health receptors. The separate risk evaluation of the two areas (the burn area and outside the burn area) was completed to assist in future remedial decision making for the site if warranted. The human health risk-based screening associated with groundwater and drainage ditch sediments were evaluated with data representing the entire 2BG site.

PRG values are based on a concentration equal to either an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 1, the threshold at or below which adverse noncancer effects are regarded as unlikely to occur. For this BHHRA, the noncancer values listed in the PRG tables were multiplied by a factor of 0.1 to provide additional protection for simultaneous exposure to multiple chemicals resulting in RBSC values associated with an HQ of 0.1. For cancer risk, the PRG values were used directly as RBSCs in the BHHRA because they are based on an ILCR of 1E-6. An increased upper bound lifetime cancer risk to an individual of 1E-6 to 1E-4 (U.S. EPA, 1990), referred to as the "risk management range," has

been applied throughout the baseline human health risk assessment. Cancer risks associated with PRG values represent the lower end of this range. For this BHHRA, the RBSC for a chemical that elicited both cancer and noncancer health effects was selected based on either a cancer risk exceeding 1E-6 or an HQ exceeding 0.1, whichever associated concentration was lower.

2.1.4 Evaluating Essential Nutrients

Evaluating essential nutrients is a special form of risk-based screening applied to certain ubiquitous elements that are generally considered to be required human nutrients. Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPCs because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine, and phosphorus, may be eliminated as COPCs, provided that their presence in a particular medium is shown to be unlikely to cause adverse effects on-human health. No members of this latter group were selected as site-related chemicals. Therefore, an exposure analysis was not performed.

2.1.5 Background Screening

For background screening, the MDC was compared to the PBOW chemical-specific background screening concentration (BSC) for groundwater and soil. The derivation of groundwater BSCs was described in the 2004 groundwater report (Shaw, 2005b). BSCs were calculated for use at PBOW based on concentrations found in background bedrock monitoring wells installed upgradient of PBOW sources. Each groundwater BSC is either the MDC or the calculated 95 percent upper tolerance limit of the background groundwater data set based on unfiltered samples collected using low-flow sampling, whichever value is lower (Shaw, 2005b). BSCs for soil established as part of the acid areas investigation (IT, 1998) were used for this RA. BSCs for soil were reported as the 95 percent upper tolerance limit for lognormal data sets or the 95th percentile for datasets with a nonparametric distribution.

Background screening also applies to certain organic compounds that are part of normal background concentrations. Such chemicals may include VOCs and PAHs, a class of organic compounds that form from natural or anthropogenic combustion of organic matter including fossil fuels, and are generally ubiquitous in the environment. Airborne PAHs associated with non-Department of Defense sources may be deposited on soil and leach to groundwater. Benzene, toluene, ethylbenzene, and xylenes may also be associated with background due to the presence of natural petroleum-derived compounds present in the vicinity of PBOW.

Background screening was applied to each inorganic constituent whose MDC exceeded the RBSC and that could not be characterized as an infrequently detected analyte. Background screening consisted of comparing the MDC of the site data set to the BSC. Background screening was not used to eliminate COPCs. Comparison of COPC concentrations to background levels are discussed in Section 6.0.

2.2 Developing Exposure-Point Concentrations

The EPC is a conservative estimate of the average concentration of a COPC, statistically calculated from the analytical results of all samples for a particular environmental medium within an exposure unit.

Because of the uncertainty associated with characterizing contamination in environmental media, both the mean and the upper confidence limit (UCL) of the mean are usually estimated for each COPC in each medium of interest. The UCL of the mean computed at a 95 percent confidence level is generally referred to as the 95 percent upper confidence limit of the arithmetic mean (UCL_{95}).

Concentrations of analytes in environmental samples are determined by using established analytical methods and accurately calibrated laboratory instrumentation. These methods and instruments have practical limits in their ability to accurately report very low and very high analyte concentrations. Each laboratory data value is typically reported with two associated limits: a detection limit and a quantitation limit. The detection limit is the minimum concentration of the analyte that can be differentiated from the normal, random noise of an analytical method or instrument. The quantitation limit, sometimes referred to as the reporting limit, is the minimum concentration of the analyte that can be reliably quantitated. Laboratories sometimes report numerical values for analyte concentrations that are greater than the detection limit but less than the quantitation limit. These values are often referred to as "trace level concentrations" and are only rough approximations of the true analyte concentration.

Very high analyte concentrations can cause serious damage to some analytical instruments. Samples with known or suspected high analyte concentrations may be diluted before analysis to lower the analyte concentrations to levels that can be safely analyzed. The analyzed concentration values are then adjusted by the dilution factor to properly represent the analyte concentration in the original undiluted sample.

When a sample is diluted, the detection limits and quantitation limits for that sample must be adjusted by the dilution factor. For example, if a sample is diluted by a factor of 10 (the sample volume is increased to 10 times the original sample by dilution with a solvent before analysis), then the corresponding detection limit and quantitation limit must be multiplied by a factor of 10.

The detection limits and quantitation limits used in this project have been adjusted for dilutions and are referred to as sample detection limits and sample quantitation limits to indicate that the limits are specific to each individual sample and analytical method. These sample detection and quantitation limits may have also been adjusted by the laboratory for percent moisture in soil and sediment samples. Samples with higher moisture content will have higher sample detection and quantitation limits when the data are reported on a dry-weight basis.

For some analytical methods, the presence of even just one analyte with a very high concentration in a sample may necessitate the use of a large dilution that will result in elevated sample detection and quantitation limits for all analytes in that sample for that analytical method. This is especially true for organic analyses using gas-chromatography and mass-spectrometer methods such as for dioxins/furans, nitroaromatics, PCBs, PAHs, VOCs and SVOCs. For these methods a lower dilution for the non-detected analytes cannot be used without possible damage to the analytical instruments. Large dilutions of 1000 or even 5000 times may be required for some samples from heavily contaminated areas. These large dilutions result in two significant complications for statistical computations.

- Some analytes may be present in a sample at significant concentrations, but are reported as non-detects with elevated sample detection limits because of dilutions.

- Elevated sample detection limits, even for true non-detects, can cause a high-bias in computed UCL_{95} estimates. The magnitude of this high-bias can be significant and is unpredictable for most non-parametric UCL methods.

The proper handling of non-detect data points in statistical computations is critical for the generation of realistic UCL_{95} estimates. Analytical laboratory data sets used for UCL_{95} estimates can be classified as full, left-censored, or interval-censored data sets.

- A full data set is one in which every data point has a value that is assumed, for the purposes of statistical computations, to accurately represent the true analyte concentration in each sample. All data values in a full data set are considered to be positive detections because each reported concentration is greater than the associated sample quantitation limit.

- A left-censored data set is one in which some of the data points cannot be reported with an accurately known value. The non-detects in a laboratory data set are known as censored values. Laboratory data non-detects are called left-censored because the data are reported as "less-than" some value, usually the sample detection limit. These "less-than" data are said to be censored at the detection limit. The only information known about the numerical value of a censored data point is that the true concentration is less than the censoring value.

- Interval-censored data sets contain data points that are reported as being between two censoring values. Many laboratories report estimated data as "trace-level values" with concentrations between the sample detection limit and the sample quantitation limit. These trace-level values are intended to represent concentrations that are believed by the laboratory to be positive detections, above the sample detection limit, but have concentrations too small to be accurately quantified. These interval censored data can be evaluated by some statistical methods as being greater than a lower censoring level (the sample detection limit) and less than higher censoring level (the sample quantitation limit).

The interval-censored data values for this project were evaluated as though they were positive detections. Trace-level values reported as greater than the sample detection limit but less than the sample quantitation limit are assumed to be detected, uncensored values. For this project, all data sets were considered to be either full or left-censored.

The U.S. EPA statistical software package ProUCL Version 4.0 was used to compute estimated UCL_{95} concentrations for all data sets containing four or more distinct detected values (U.S. EPA 2007a and b). ProUCL uses numerous parametric and nonparametric statistical methods to compute UCLs. Parametric methods assume that the data set being evaluated fits closely to a known, predictable data distribution. Nonparametric methods do not rely on the data set fitting a specific distribution.

ProUCL computes parametric UCLs using normal, lognormal, and gamma distributions. Nonparametric UCLs are computed using a variety of methods including maximum likelihood estimation, central limit theorem, jackknife, bootstrap, Kaplan-Meier (KM), and regression on order statistics. Maximum likelihood estimation and regression on order statistics methods are sometimes referred to as semi-parametric methods. These two methods use techniques to

estimate or assume temporary surrogate values for censored data points before computing estimated UCLs.

Detailed descriptions of the statistical methods use in ProUCL are available in the following two documents:

- ProUCL Version 4.0 User Guide (EPA/600/R-07/038, April 2007, www.epa.gov)
- ProUCL Version 4.0 Technical Guide (EPA/600/R-07/041, April 2007, www.epa.gov)

The ProUCL User Guide acknowledges that at one time the U.S. EPA recommended using one-half the detection limit as replacement values for non-detects when only a small percentage of the data were non-detects. This has become the traditional approach for many projects and is known as the "DL/2" method. The U.S. EPA now advises against using DL/2 for any statistical calculations. Several studies have shown that DL/2 frequently results in unrealistic statistical results. Several nonparametric statistical methods are now recommended for data sets with non-detects (censored data sets). Since many work plans still reference the DL/2 method, it has been included in ProUCL Version 4.0 but with the following comment "Note: DL/2 is not a recommended method."

ProUCL computes estimated UCLs using two slightly different approaches depending on whether the data set to be evaluated is a full data set or a censored data set.

Full Data Sets

- Raw statistics are computed (i.e., minimum, maximum, mean, median)
- Data set is tests for normal distribution, lognormal distribution, and gamma distribution
- Parametric UCLs are computed as appropriate
- Nonparametric UCLs are computed as appropriate
- Recommended UCLs are listed based on logic programmed into ProUCL

Censored Data Sets

- Raw statistics are computed based in the detected data points only
- Data set is tested for normal, lognormal and gamma distributions using the detected data points only

Note: For data sets with multiple detection limits for non-detects, all data less than the largest non-detect detection limit are considered non-detects. This includes positive detections with values less than the maximum non-detect detection limit. If non-detects exist for samples with very large dilutions, a large percentage of the detected data may be considered to be non-detect at an elevated detection limit. This approach is known as "censoring at the highest detection limit."

- Parametric UCLs are computed as appropriate, treating all values less than the largest non-detect detection limit as non-detects

- Nonparametric UCLs are computed as appropriate, treating all values less than the largest non-detect detection limit as non-detects --- except for the KM, regression on order statistics, and DL/2 methods. KM and regression on order statistics are able to handle multiple detection limits. The DL/2 method simply uses one-half the sample detection limit for each non-detect value

- Recommended UCLs are listed based on logic programmed into ProUCL

For data sets with multiple detection limits for non-detects, ProUCL (U.S. EPA, 2007a) recommends using the KM method UCLs (Kaplan et al, 1958). For this project, essentially all data sets with more than one non-detect have multiple detection limits for the non-detect samples. The KM UCLs are therefore recommended for data sets in this project that have more than one non-detect sample.

Analytical data from field duplicates were joined with parent sample results to yield one result for use in the statistical manipulations as follows:

- Use average of field duplicate and parent sample if both are positive detections

- Use average of field duplicate and parent sample detection limits if both are non-detects

- Use detected value if one sample is a positive detection and the other is a non-detect

The UCL_{95} or MDC, whichever is smaller, was selected as the EPC and is understood to represent a conservative estimate of average for use in the RA or in various transport models used to estimate exposure. ProUCL calculations for 2BG are presented in Appendix D.

2.3 Results of the Data Evaluation

Previous investigations at 2BG confirmed the presence of soil contamination from former PBOW operations. The objective of the soil investigation conducted under the RI (Jacobs, 2006) was to evaluate the presence of soil contamination at additional former site facilities not previously sampled. The objective of the groundwater investigation was to characterize the shallow and bedrock aquifers and to evaluate the presence of chemical contamination in groundwater in the vicinity of 2BG. Two rounds of groundwater samples were collected from the shallow and bedrock monitoring wells. Sediment samples were collected from the drainage ditches bounding 2BG. Surface water samples were not collected from the drainages because no surface water was present at the time of sampling. Sampling locations are provided in Figure 2-1.

Table 2-1 provides the following information for each detected chemical for each medium at 2BG:

- Chemical name

- Frequency of detection

- Range of detected concentrations
- Range of detection limits
- Estimate of the mean of site concentrations including detected and non-detected compounds
- Appropriate RBSC
- Appropriate BSC and
- Selection/exclusion of chemical as a COPC

Surface Soil Within Burn Area. A total of 7 surface soils samples were collected from within the burn area at 2BG, which includes three samples collected in October 1996 and four samples collected in May 2004. Depths for the samples were from surface to one ft bgs. Contaminants detected include dioxins/furans, nitroaromatics, metals, PCBs, PAHs, SVOCs, and VOCs. Not all compounds were tested for in every sample. Only one sample was tested for dioxins/furans. Only three samples were tested for SVOCs. Specific compounds exceeding the U.S. EPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

Surface Soil Outside Burn Area. A total of 42 surface soil samples were collected from outside the burn area at 2BG, which includes five samples collected in October 1996, 12 samples collected in May 2004, 10 samples collected in April 2005, and 15 samples collected in December 2005. Depths for the samples were from surface to one ft bgs. Contaminants detected include nitroaromatics, cyanide, metals, PCBs, PAHs, SVOCs, and VOCs. Not all compounds were tested for in every sample. Only 32 samples were tested for metals (except for lead, which was tested for in all 42 samples, and tin, which was tested for in only 4 samples). Cyanide was tested for in 20 samples. SVOCs were tested for in five samples (except for 2-methylnaphthalene which was tested for in 30 samples and four tri/di-chlorobenzene compounds which were tested for in 17 samples). VOCs were tested for in 17 samples. Specific compounds exceeding the U.S. EPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

Subsurface Soil Within the Burn Area. A total of 29 subsurface soil samples were collected from within the burn area at 2BG, which includes six samples from three locations collected in October 1996, and 23 samples collected from 17 locations in May 2004. Depths for the samples ranged from one to ten ft bgs. Contaminants detected include dioxins/furans, nitroaromatics, metals, PCBs, PAHs, SVOCs, and VOCs. None of the 29 samples were tested for all detected compounds. Generally, 13 samples were tested for dioxins/furans and 19 samples were tested for nitroaromatics, metals, PCBs, PAHs, and VOCs. Six samples were tested for SVOCs except four tri/di-chlorobenzene compounds were tested for in 19 samples. Specific compounds exceeding the USEPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

Subsurface Soil Outside Burn Area. A total of 26 subsurface soil samples were collected from outside the burn area at 2BG, which includes 10 samples from five locations in October 1996, and 16 samples from eight locations in May 2004. Depths for the samples ranged from two to 10 ft bgs. Contaminants detected include nitroaromatics, metals, PAHs, and VOCs. Not all compounds were tested for in every sample. PAHs were tested for in 25 of the 26 samples. Specific compounds exceeding the U.S. EPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

Bedrock Groundwater. Contaminants detected in three bedrock groundwater samples from January 2005 include cyanide, metals, PAHs, and VOCs. Cyanide was tested for in two of the three samples. PAHs were tested for in only one sample. Five PAH compounds were detected in this one sample. Specific compounds exceeding the U.S. EPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

Sediment. Contaminants detected in three sediment samples from May 2004 at 2BG include dioxins/furans, metals, PAHs, and VOCs. Specific compounds exceeding the U.S. EPA Region 9 Residential PRGs (U.S. EPA, 2004a) are identified in Table 2-1.

3.0 EXPOSURE ASSESSMENT

Exposure is the contact by a receptor with a chemical or physical agent. An exposure assessment estimates the type and magnitude of potential exposure of a receptor to COPCs found at or migrating from a site (U.S. EPA, 1989a). The following steps are included in an exposure assessment:

- Characterize the physical setting
- Identify the contaminant sources, release mechanisms, and migration pathways
- Identify the potentially exposed receptors
- Identify the potential exposure pathways
- Estimate EPCs and
- Estimate chemical intakes or contact rates

This BHHRA characterizes potential exposures to COPCs in soil, groundwater, and sediment associated with 2BG. Estimation of risk from potential exposure is described in the risk characterization for each COPC (Section 5.0). The Scope of Work (USACE, 2001) requires the summation of potential risks from all environmental media evaluated in the risk characterization.

3.1 Conceptual Site Exposure Model

The CSEM provides the basis for identifying and evaluating the potential risks to human health in the BHHRA. The CSEM was constructed from plausible site-use scenarios and the potential exposure pathways. The elements of the CSEM include:

- Source
- Source media (i.e., initially contaminated environmental media)
- Contaminant release mechanisms
- Contaminant transport pathways
- Intermediate or transport media
- Exposure media
- Plausible receptors and
- Routes of exposure

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact with a contaminated source medium (e.g., ingestion of or dermal contact with groundwater).

Figure 3-1 depicts the CSEM used for 2BG. The receptors and pathways on the figure reflect plausible scenarios developed from information on site background and history, topography, climate, and demographics as presented by the site-wide groundwater investigation (IT, 1997a). Exposure pathways that are identified as complete on the CSEM will be addressed in the BHHRA, and additional potential receptors not listed on the CSEM figures are briefly discussed in Section 3.1.3.

No current or future exposures by off-site residents will be evaluated. The majority of the off-site residents are serviced by municipal water (from surface water sources), and there are numerous private groundwater wells in the vicinity, including eight within one mile of the facility boundary. Although natural hydrocarbons are known to be present within the bedrock limestone and shale formations, groundwater underlying the sites cannot be summarily excluded for consideration as a tap water source based on natural water quality parameters. Therefore, given the presence of numerous off-site wells and the assumption of unrestricted future land use on site, the development of groundwater for on-site residential (or on-site worker) use as tap water is regarded as plausible.

3.1.1 Physical Setting

The 2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern edge of the field. The remains of a baseball field are still evident at the site. A paved service road is adjacent to the east side of the site. The ground surface is relatively flat, with minimal slope toward the north and northwest. Elevations at the site range from 639 to 641 ft amsl. The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are now wooded. The 2BG site covers approximately three to five acres of which the actual burn area encompasses approximately one-half acre.

Geology: Overburden thickness ranges from 20 to 23.5 ft, with thickness tending to increase toward the north. The overburden is characterized as clay or silty clay with a fairly continuous layer of silt and clayey silt near the surface. The top of this silt layer ranges in depth from 5.25 to eight ft bgs and the bottom of the silt layer ranges from 6.25 to 10 ft bgs. The thickness of the silt layer, where present, ranges from 0.25 to 3 ft, with an average thickness of 1.7 ft. No silt was present at four of the direct push technology (DPT) boring locations. The clay content of this silt layer varies with location and with depth and is generally marked by gradational changes downward from silt to clay. The lower 10 to 15 ft of the overburden is a highly plastic clay, with decreasing plasticity and increasing angular rock fragments near the bedrock interface.

The Plum Brook Shale subcrops beneath these unconsolidated deposits over the entire site. The thickness of this shale ranges from 1.75 ft to 11 ft, with thickness decreasing to the north-northwest. The Delaware Limestone and Columbus Limestone underlie the Plum Brook Shale. Average thickness of the limestone at the 2BG site is unknown, since borings extended no further than 41 ft below the top of the formation. Rock cores collected during the monitoring well installation showed few fractures, low porosity, and occasional zones with naturally occurring oil and hydrogen sulfide gas which are common in the Columbus Limestone (Shaw, 2005b).

Groundwater: Groundwater at PBOW includes the shallow overburden and the bedrock aquifers. Numerous wells have been installed across the site to characterize these two water-bearing units (Shaw, 2003). The shallow overburden generally has low yields over most of the site due to the high percentage of silt and clay. Water levels in the shallow overburden range from less than one ft bgs to six ft bgs during wet season and fluctuate up to four ft on a seasonal basis. Shallow water levels generally mirror the local topography and flow is typically toward the local surface drainage features with a general northerly trend. Shallow groundwater is not considered to be a potable water source due to the low yields and poor quality.

Groundwater at 2BG includes both shallow overburden and the Delaware Limestone aquifers. Groundwater elevations in the shallow overburden range from 634.4 ft amsl to 637.4 ft amsl. Depths to the shallow groundwater during the summer months range from 2.4 to 6.2 ft bgs. Shallow groundwater generally flows to the north toward the drainage ditch.

Groundwater elevation contours for the deeper Delaware Limestone aquifer indicate a linear feature on a regional scale, running northeast-southwest through PBOW, in the vicinity of 2BG, which acts as a preferential flow path (Shaw, 2003). This feature is parallel to the bedrock strike and may represent a fracture system and/or karst development. Groundwater elevations drop steeply toward this zone on either side. The 2BG site is located approximately 500 ft northwest of the axis of this feature. Although adequate water level data has not been collected at the site to confirm flow directions, it is likely that groundwater flows from the site in a southeastern direction toward this regional feature.

Bedrock groundwater has been subdivided into two separate units at PBOW: 1) the Plum Brook Shale and Ohio Shale, and 2) the Delaware and Columbus Limestones. Water levels in the Plum Brook Shale and Ohio shale closely match those of the shallow overburden suggesting good vertical communication between the two units. Water levels in the Delaware and Columbus Limestones are on average 30 ft bgs. Water in the limestone typically occurs in fractures, along bedding planes, or in solutionally enlarged openings. The conceptual model indicates that bedrock groundwater flow in the Delaware and Columbus Limestones is dependant on the frequency, orientation, density, and connectivity of the fractures. Bedrock groundwater flow is generally to the north, however there are major fracture zones transecting the site, which influence groundwater flow in several areas (Shaw, 2003). Use of bedrock groundwater at the 2BG site is questionable due to the low yields observed during sampling and the possible presence of petroleum deposits.

Surface Water: The only surface water feature within the 2BG site is a drainage ditch that runs east to west and forms the north edge of the site. The drainage ditch is located 200 to 300 ft north of the former burn area and drains to the west across the site, then northwest to Pipe Creek. This drainage feature is approximately four ft wide and six to seven ft deep. Elevations in the ditch range from 635 ft amsl upstream of the site to 633 ft amsl downstream. A less pronounced drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is ephemeral and flows only during the wet season and following precipitation events, remaining essentially dry during the summer months. Flowing water was observed during a site reconnaissance in November 2003 and during the soil investigation in May 2004. Flow in the ditch began to dissipate in mid June, with only small, disconnected pools observed at this time. By late June 2004 the stream channel was dry and remained so during investigation activities in late July

2004. The potential for exposure to surface water are limited due to the ephemeral nature of the drainage ditch.

Reservoir No. 2 lies approximately 400 ft north of this drainage ditch. This reservoir is roughly circular, has a surface area (SA) of less than one acre, and has an embankment approximately five ft above the natural ground surface. Reservoir No. 2 is not associated with the 2BG site and will not be evaluated as a potential source for exposure to surface water or sediment.

3.1.2 Contaminant Sources, Release Mechanisms, and Migration Pathways

The 2BG site was used as a burning ground for production process wastes. Contamination involved the inadvertent release of contaminants and residues resulting from the burning of production waste (such as PAHs and dioxin/furan compounds). Releases occurred to the surface soil as spills and burning and to the subsurface soil from infiltration/percolation of unburned waste or residues. Runoff and erosion are not likely to have spread contamination over the surrounding surface soil or to have carried contaminants to nearby streams due to the presence of a berm around the burn area. Infiltration and leaching may have carried contaminants into the subsurface soil and groundwater.

3.1.3 Receptors and Exposure Pathways

Receptors, selected to represent the upper bound on exposure from all plausibly exposed groups of people at 2BG, and the pathways by which they may be exposed to chemicals are summarized in Figure 3-1 and Table 3-1. The exposure variable values used in the contaminant intake models for soil, and sediment are compiled in Table 3-2. The exposure variable values used in the contaminant intake models for groundwater are compiled in Table 3-3. The receptors to be evaluated in the Human Health Risk Assessment are:

- Current and future groundskeeper
- Current and future construction worker
- Future on-site resident
- Future indoor worker and
- Current and future hunter

Most RAs are based on a reasonable maximum exposure (RME) assumption. The intent of the RME assumption is to estimate the highest exposure level that could reasonably be expected to occur, but not necessarily the worst possible case (U.S. EPA, 1989a, 1991a). It is interpreted as reflecting the 90th to 95th percentile on exposure. In keeping with U.S. EPA (1991a) guidance, variables chosen for a baseline RME scenario for ingestion rate (IR), exposure frequency (EF) and exposure duration (ED) are generally upper bounds. Other variables such as body weight (BW) and exposed skin SA, are generally central or average values. In the case of contact rates consisting of multiple components (e.g., dermal contact with soil or water, which consists of a dermal absorption factor [ABS] and soil-to-skin adherence factor [AF] for soil, and permeability coefficient [PC] and exposure time [ET] for water), only one variable, ABS or PC,

needs to be an upper bound. The conservatism built into the individual variables ensures that the entire estimate for contact rate is sufficiently conservative.

The averaging time (AT) for noncancer evaluation is computed as the product of ED (years) times 365 days per year (days/year), to estimate an average daily dose over the entire exposure period (U.S. EPA, 1989a). For cancer evaluation, AT is computed as the product of 70 years, the assumed human lifetime, times 365 days/year, to estimate an average daily dose prorated over a lifetime regardless of the frequency or duration of exposure. This methodology assumes that the risk from short-term exposure to a high dose of a given carcinogen is equivalent to long-term exposure to a correspondingly lower dose, provided that the total lifetime doses are equivalent. This approach is generally consistent with the U.S. EPA policy of carcinogen evaluation (U.S. EPA, 1986), although it introduces considerable uncertainty into the cancer RA.

The chemical intake equations contain a fraction of intake (FI) parameter to account for scenarios in which exposure to a potentially contaminated medium associated with the site is less than total daily exposure to that medium. For example, if the site of interest is small enough such that a groundskeeper may spend only one-half of his working time at the site, an FI of 0.5 is applied to the soil ingestion and dermal intake equations. An FI is used also if a receptor's exposure is split between two comparable media. For example, if a construction worker is exposed to both soil and sediment, FIs are introduced that apportion his exposure between the two media. The default value of FI is 1.

3.1.3.1 Overburden Groundwater

Shallow groundwater in the vicinity of 2BG is not regarded as a potential source of potable water because of the high clay content and limited discontinuous permeable zones resulting in low yields. It is possible that a construction worker may be exposed to shallow groundwater via direct contact; however, such exposure would likely be sporadic and of short duration. No monitoring wells were installed in the overburden at 2BG because of limited porosity in the overlying clays, as agreed to by the PBOW team. However, the BHHRA will qualitatively evaluate potential exposures to perched groundwater due to the potential for limited exposure of construction workers to shallow groundwater.

3.1.3.2 Bedrock Groundwater

The following receptors were evaluated to represent the upper bound on bedrock groundwater exposure for all plausibly exposed groups of people at 2BG.

Current on-site. No current on-site exposure to bedrock groundwater exists.

Future on-site. The evaluation of future on-site exposure to bedrock groundwater was based on measured concentrations at 2BG described in this report. Future receptors were the on-site worker and on-site resident.

If on-site groundwater were to be developed as a tap water source, other potential future groundwater receptors may include short-term (e.g., construction) workers or site visitors. However, the levels of exposure to these would be shorter in duration and/or frequency than that of an on-site worker or resident. Therefore, the on-site worker and resident receptor represent an upper bound on exposure for all potential receptors.

The potential exposure scenarios evaluated for groundwater were the future on-site resident and the future on-site worker. Exposure assumptions and parameter values specific to the resident and worker are described in the paragraphs that follow. The fraction of tap water intake/exposure attributed to groundwater was 1.0 for each receptor. Exposure parameters and parameter values are summarized in Table 3-3.

Resident. The resident was assumed to be exposed to groundwater as household tap water and, for volatile compounds, to air concentrations associated with groundwater use in the residence. Cancer and noncancer assessments were performed for both an adult and child. The evaluations assumed 30 years of exposure: 24 years as a 70-kilogram (kg) adult (U.S. EPA, 1991a) and 6 years as a 15-kg child (U.S. EPA, 1991a). For cancer effects, the adult and child effects were summed together; for noncancer effects, the child and adult were evaluated separately. An EF of 350 days per year (U.S. EPA, 1991a) was used for adult and child residential pathways.

Drinking water ingestion rates for the adult of 2 liters (L) per day (U.S. EPA, 1991a) and for the child of 1 L/day (U.S. EPA, 1991a) were assumed. Both the child and adult resident were assumed to be dermally exposed to COPCs in groundwater while bathing/showering. The child was assumed to bathe for 20 minutes per day (0.333 hour per day [hr/day]) (U.S. EPA, 2004c). The adult was assumed to shower for 35 minutes per day (0.6 hr/day) (U.S. EPA, 2004c). Inhalation rates of 0.833 cubic meters (m^3)/hour for the adult (EPA, 1991a) and 0.416 m^3/hour for the child (U.S. EPA, 2004a) were used. Because the *Exposure Factors Handbook* (U.S. EPA, 1997a) lists a 90th percentile for time spent in a residence as over 23 hr/day, it was conservatively assumed that the resident spends 24 hr/day in the house. Calculations are included in Appendix A.

On-Site Worker. Under the future land-use scenario, a site worker may be exposed to groundwater, which theoretically could be developed as a source of drinking water. His drinking water ingestion rate was assumed to be 1 L/day (U.S. EPA, 1991a). He could also experience dermal contact with groundwater used to clean equipment and to rinse dust or perspiration from his body. For this evaluation, it was assumed that the head, forearms, and hands, comprising approximately 3,300 square centimeters (cm^2) (U.S. EPA, 2004c), would be exposed intermittently for up to 1 hr/day. Dermal absorbed dose was calculated using the spreadsheet model developed by U.S. EPA (U.S. EPA, 2004c) (Appendix A).

3.1.3.3 Surface Soil

The following receptors were evaluated to represent the upper bound on surface soil exposure for all plausibly exposed groups of people at 2BG. Surface soil data was evaluated separately between the burn area and areas outside the burn area. Exposure assumptions and parameter values specific to the potential current and future receptors are described in the paragraphs that follow. Exposure parameters and parameter values are summarized in Table 3-2.

Current on-site. Potential current on-site receptors are construction workers, groundskeepers, and hunters. The evaluation of current on-site exposure to surface soil was based on current measured concentrations.

Future on-site. Potential future receptors are construction workers, on-site indoor workers, on-site residents, groundskeepers and hunters. The evaluation of future on-site exposure to surface soil was based on current measured concentrations.

Groundskeeper. Under the current and future land-use scenarios, a groundskeeper may be exposed to surface soil. The groundskeeper scenario was designed to evaluate the upper bound for site worker exposure to surface soil in the current and future site-use scenario. Direct exposure pathways include incidental ingestion and dermal contact. Inhalation of dust raised by operating lawn mowers or other equipment was also evaluated because relatively high dust concentrations may be produced within the groundskeeper's breathing zone, with little opportunity for dilution by ambient air. The groundskeeper was assumed to be a 70-kg adult who works 8 hr/day, approximately 5 days per week (days/week) year-round on site for a total of 250 days/year for 25 years (U.S. EPA, 1991a). The respiratory rate for the groundskeeper was assumed to be 20 m^3/8-hour workday (2.5 m^3/hour), and the soil incidental ingestion rate was assumed to be 100 milligrams per day (mg/day), comparable to that for an agricultural worker.

Recent studies evaluating soil adherence that consider the nature of the activity performed and the different body regions were reviewed by U.S. EPA (1997a). Measurements of soil adherence to hands, arms, legs, feet, and face for 29 groundskeepers revealed AFs ranging from 8E-4 milligrams per square centimeters (mg/cm^2) (legs) to 1.5E-1 mg/cm^2 (hands). The AF weight averaged across these body regions (i.e., adjusted to reflect the different SAs of the different body regions) for males and females is 9E-3 mg/cm^2. The SA of body regions evaluated for groundskeepers includes approximately 11,300 cm^2 (U.S. EPA, 1997a).

Hunter. Under the current and future land-use scenarios, a hunter may be exposed to surface soil. The hunter was assumed to be a 70-kg adult nearby resident with an exposure duration of 30 years (U.S. EPA, 1991a). Small children would be unlikely to accompany the hunter afield. Therefore, the direct exposure pathways evaluated for the hunter (incidental ingestion and dermal contact with soil) were not evaluated for the small child. It was assumed that the hunter would spend his entire 2-week vacation hunting on PBOW; i.e., his EF for incidental soil ingestion and dermal contact was 14 days/year. His incidental soil ingestion rate was assumed to be 100 mg/day (U.S. EPA, 1991a). It was assumed that approximately 25 percent of his body SA, or 4,500 cm^2, would be available for exposure to soil (U.S. EPA, 2004c). A soil AF of 0.2 mg/cm^2 was assumed. Inhalation of airborne dust would be a potential exposure pathway; however, vegetation would reduce dust emissions to insignificant levels, and it was assumed that the hunter would spend virtually all of his time on vegetated rather than bare soil. Therefore, it was assumed that inhalation exposure would contribute much less than incidental ingestion and the inhalation exposure pathway was not evaluated.

Future On-Site Resident. It was assumed that the future on-site resident would be exposed to surface soil. The on-site residential scenario was evaluated using both an adult and a child. Lifetime cancer risk was estimated as the sum of the risks calculated for the adult and the child.

The adult resident was assumed to be a 70-kg person with an incidental soil ingestion rate of 100 mg/day, and an inhalation rate of 20 cubic meters per day (m^3/day) (0.83 m^3/hour) (U.S. EPA, 1991a). Approximately 25 percent of his body SA, or 4,500 cm^2, was assumed as available for exposure to soil (U.S. EPA, 2004c). The adult resident was assumed to be exposed 350 days/year for 24 years (U.S. EPA, 1991a).

The child resident was assumed to be a 1- through 6-year-old with an average BW of 15 kg, a soil ingestion rate of 200 mg/day, and an inhalation rate of 10 m^3/day (U.S. EPA, 1991a). Approximately 25 percent of his body SA, or 1,750 cm^2, was assumed to be available for exposure to soil (U.S. EPA, 2004c). The child resident was assumed to be exposed for 350 days/year for 6 years (U.S. EPA, 1991a).

An average soil AF of 0.2 mg/cm^2 was adopted for the on-site resident (U.S. EPA, 2004c).

Evaluation of exposure to VOCs from soil by the future on-site resident was addressed during evaluation of airborne dust as described for the groundskeeper, above. It was assumed that 80 percent of the soil surface would be covered with pavement or vegetation for evaluating inhalation to airborne dust. Inhalation of VOCs released from subsurface soil and entrapped in indoor air was not evaluated as there were no VOCs detected in the subsurface soil. Inhalation rates of 20 m^3/day for the adult (U.S. EPA, 1991a) and 10 m^3/day for the child (U.S. EPA, 1991a) were used.

Future On-Site Indoor Worker. Under the future land-use scenario, an on-site worker may be exposed to surface soil. This receptor scenario was developed to evaluate exposure to indoor airborne VOCs entrapped in a building. However, as there were no VOCs detected in the subsurface soil, this pathway was not evaluated. The indoor worker would also be potentially exposed to surface soil via incidental ingestion. Dermal exposure to surface soil and inhalation of airborne dust and VOCs from surface soil, although plausible, were expected to be less significant than incidental ingestion because he would spend his work time indoors. Therefore, dermal contact and inhalation of dust and airborne VOCs from surface soil was not quantified.

The indoor worker was assumed to be a 70-kg adult who works 8 hrs/day, approximately 5 days/week year-round on the site for a total of 250 days/year for 25 years (U.S. EPA, 1991a). His soil incidental ingestion rate was assumed to be 50 mg/day, and his inhalation rate was assumed to be 20 m^3/8-hour workday.

Construction Worker. Under the current and future land-use scenarios, a construction worker may be exposed to surface soil. The construction worker scenario was developed to evaluate short-term exposure to surface and subsurface soil (total soil) in either the current or future site-use scenario. Construction projects were expected to be infrequent. It was assumed that the construction worker would participate in only one construction project on the site. Relevant exposure pathways include incidental ingestion and dermal contact, inhalation of dust raised by operating construction equipment, and inhalation of airborne VOCs released from subsurface soil during excavation and grading.

The construction worker was assumed to be a 70-kg adult who works 8 hr/day, approximately 5 days per week (days/week) for 6 months. Potential exposure pathways were incidental ingestion and dermal contact, inhalation of dust raised by operating construction equipment, and inhalation of airborne VOCs released from subsurface soil during excavation and grading. However, as there were no VOCs detected in the subsurface soil, inhalation of airborne VOCs released from subsurface soil during excavation and grading was not evaluated. Excavation and soil grading activities, which result in intensive soil contact, were assumed to last for 3 months; for the remaining 3 months, construction activities were assumed to result in less intensive soil contact. Soil ingestion rates of 480 mg/day (U.S. EPA 1991a) and 100 mg/day, similar to an

agricultural worker, were assumed for the intensive and less intensive contact periods, respectively. The resulting time-weighted average soil ingestion rate was 290 mg/day.

Construction workers would also experience dermal contact with soil adhered as dust or from direct contact with the soil. An AF for soil for the construction worker of 8E-2 mg/cm^2 was estimated using the same method as previously described for the groundskeeper, combining U.S. EPA (1997a) data for construction workers, utility workers, and equipment operators to capture the full range of activities likely to be performed by this receptor. The SA of the body regions evaluated for construction workers total approximately 11,300 cm^2. An inhalation rate of 20 m^3/day (U.S. EPA, 1991a) for potential exposures to VOCs and air borne dust was assumed.

3.1.3.4 Subsurface Soil

The following receptors were evaluated to represent the upper bound on subsurface soil exposure for all plausibly exposed groups of people at 2BG. Subsurface soil data was evaluated separately between the burn area and areas outside the burn area. Exposure assumptions and parameter values specific to the potential current and future receptors are described in the paragraphs that follow. Exposure parameters and parameter values are summarized in Table 3-2.

Current on-site. The only potential current on-site receptors are construction workers. The evaluation of current on-site exposure to subsurface soil was based on current measured concentrations.

Future on-site. Potential future receptors are construction workers and on-site residents. The evaluation of future on-site exposure to subsurface soil was based on current measured concentrations.

Groundskeeper. Under the current and future land-use scenarios, contact with subsurface soil would be infrequent and sporadic, since such contact would not be part of the groundskeeper's regular duties or activities. Therefore, exposure to subsurface soil was not evaluated.

Future On-Site Resident. Exposure parameters for the future on-site resident are identical to those described above for surface soil (Section 3.1.3.3). Future on-site residents were assumed to be exposed to subsurface soil as a result of residential development that would involve excavation and grading, which would bring subsurface soil to the surface.

Future On-Site Indoor Worker. Under the future land-use scenario, an on-site worker may be exposed to indoor airborne VOCs entrapped in a building. VOCs released from subsurface soil may enter a building through joints or cracks in the foundation or slab. However, as there were no VOCs retained as COPCs in the subsurface soil, this pathway was not evaluated. The exposure parameters for the on-site indoor worker are the same as described above for surface soil (Section 3.1.3.3).

Construction Worker. Under the current and future land-use scenarios, a construction worker may be exposed to subsurface soil. Exposure parameters for the construction worker were identical to those described above for surface soil (Section 3.1.3.3).

3.1.3.5 Sediment

The following receptors were evaluated to represent the upper bound on sediment exposure for all plausibly exposed groups of people at 2BG. Exposure assumptions and parameter values specific to the potential current and future receptors are described in the paragraphs that follow. Exposure parameters and parameter values are summarized in Table 3-2.

Current on-site. The only potential current on-site receptors are construction workers. The evaluation of current on-site exposure to sediment was based on current measured concentrations.

Future on-site. Potential future receptors are construction workers and on-site residents. The evaluation of future on-site exposure to sediment was based on current measured concentrations.

Groundskeeper. Under the current and future land-use scenarios, a groundskeeper may be exposed to sediment. However, such exposure would be infrequent and sporadic since contact would not be part of the groundskeeper's regular duties or activities. Therefore, exposure to sediment was not quantified.

Hunters. Under the current and future land-use scenarios, a hunter may be exposed to sediment. However, such exposure would be infrequent and sporadic since contact would not be part of the hunter's regular activities. Therefore, exposure to sediment was not quantified.

Future On-Site Resident. The future on-site resident was assumed to be exposed to sediment. The resident could have access to sediments associated with 2BG and could be exposed to sediment. It was assumed that the resident would visit the streams for 8 hr/day, 2 days/week during the warmer half of the year. The resident was assumed to wade for 3 hr/day on 52 days/year. The exposure pathway evaluated was dermal contact with sediment. The mechanisms of exposure to soil and sediment are likely to be similar; therefore, the incidental soil ingestion rate of 100 mg/day was also applied to sediment. Approximately 25 percent of the adults and child's total body SAs, 4,500 cm^2 and 1,750 cm^2, respectively, were used.

On-Site Indoor Worker. Under the future land-use scenario, an on-site indoor worker would not be expected to be exposed to sediment. Therefore, exposure to sediment was not quantified.

Construction Worker. Under the current and future land-use scenarios, a construction worker may be exposed to sediment. The construction worker may be exposed to sediment during projects such as installation of underground utilities or rerouting stream flow. Dermal contact would be the most significant pathway for exposure to sediment. Incidental ingestion of sediment would also be possible, but would be expected to be much less significant than dermal contact. Dermal exposure to sediment was assumed to occur for 4 hr/day, or one-half the normal work day. It was assumed that the arms, forearms and hands, an SA of approximately 3,100 cm^2 (U.S. EPA, 1997a), would be exposed to sediment. Inhalation of VOCs from sediment would also be possible; but the large volume of outdoor air and natural air currents would be expected to dilute airborne concentrations such that this pathway would be less significant than dermal contact, which was quantified. For these reasons, incidental ingestion and inhalation of VOCs from sediment were not quantified.

3.1.3.6 Game Animals

The following receptors were evaluated to represent the upper bound on exposure via ingestion of game animals taken at 2BG.

Current and future on-site. The potential current and future on-site receptors are hunters. The evaluation of current on-site exposure to game animals was based on current measured concentrations.

Exposure assumptions and parameter values specific to the potential current and future receptors are described in the paragraphs that follow. Exposure parameters and parameter values are summarized in Table 3-2.

Hunters. This scenario was developed to evaluate the potential for contaminants in soil to affect food-chain pathways. Reservoir No. 2 Burning Ground provides habitat for deer and other wildlife, and deer hunting is permitted on the PBOW facility. Therefore, a hunter who consumes his game is a plausible exposure scenario requiring evaluation. Many kinds of game animals may be hunted and consumed including squirrel, pheasant and other upland birds, turkey and deer; however, the deer is the species most likely to contribute meaningfully to the diet. Therefore, the evaluation was limited to a deer hunter.

Data were not located regarding the rate of venison ingestion; therefore, a hypothetical scenario was adapted from the assumptions applied to a similar site in West Virginia (IT, 2000c). A highly conservative but plausible scenario consists of a hunter who kills a deer each year. It was assumed that the hunter eats 10 pounds (4.5 kg) of venison per year (Sharp, 1995). This consumption rate corresponds to 0.013 kg/day (0.186 g/kg-day) of venison for each of the 350 days per year (U.S. EPA, 1991a) that the hunter spends at home.

It is likely that the successful hunter would share his venison with the rest of the family, which may include small children. The hunter's child was referred to as a child venison consumer for the purposes of this evaluation. Data regarding the rate of venison ingestion by small children were not located. It was assumed that venison replaced beef in the diet, and the differences in beef consumption between adults and children were used to estimate a venison ingestion rate for children. U.S. EPA (1997a) provides per capita beef intake data for less than 1- to 5-year-old children ranging from 0.941 to 1.46 g/kg-day (time-weighted average of 1.296 g/kg-day). U.S. EPA (1997a) provides per capita beef intake data for 12- to 70+-year-old adults ranging from 0.568 to 0.83 g/kg-day (time-weighted average of 0.727 g/kg-day). From these data, it was estimated that the beef consumption of small children, expressed on a BW basis, would be approximately 1.8 times that of an adult. Therefore, a venison ingestion rate of 0.335 g/kg-day was estimated for the young child from the venison ingestion rate of 0.186 g/kg-day for the adult. Assuming that the child is 0 to 6 years old with an average BW of 15 kg (U.S. EPA, 1991a), the child venison ingestion rate may be expressed as 0.005 kg/day.

3.2 Quantification of Exposure-Point Concentrations

The EPC is a conservative estimate of the average concentration of a COPC, statistically calculated from the analytical results of all samples for a particular environmental medium to which a receptor may be exposed over the duration of the exposure. An EPC may be based on media concentrations that have been directly measured or it may be derived based on environmental medium-to-medium transport modeling. The EPCs of COPCs in soil,

groundwater, and sediment at 2BG were statistically derived values based on measured analytical data. Concentrations of COPCs in air were not measured (and in the case of groundwater volatilization, future exposure scenarios cannot reasonably be measured), but were based on models that use the EPCs of COPCs in groundwater as input values.

3.2.1 COPC Concentrations from Dust

Inhalation exposure to particulate (dust) emissions from soil for the groundskeeper and construction worker evaluations results from activities that raise dust. Therefore, the most appropriate approach to estimating chemical concentrations in ambient air is through the use of an activity-based dust loading equation (U.S. Department of Energy [DOE], 1989):

$$C_a = (D)(C_{so})(CF_1) \qquad \textbf{Eq. 3.1}$$

where:

C_a = contaminant concentration in air (milligrams per cubic meter [mg/m^3], calculated)

D = dust loading factor (g of soil/m^3 of air)

C_{so} = contaminant concentration in soil (milligrams per kilogram [mg/kg])

CF_1 = conversion factor (1E-3 kilograms per gram [kg/g])

Plausible values for D include 2E-4 grams per cubic meter (g/m^3) for agricultural activity (DOE, 1989), 6E-4 g/m^3 for construction work (DOE, 1983), and 1E-4 g/m^3 for other activity (National Council on Radiation Protection and Measurements [NCRPM], 1984). The value for D of 1E-4 g/m^3 for other activity was used for the groundskeeper. It was assumed that construction activities requiring intimate contact with soil, for which D = 6E-4 g/m^3 is appropriate, may last for one-half of a construction period. The remaining one-half of the time is more realistically characterized by D = 1E-4 g/m^3. Therefore, a time-weighted average dust loading factor for construction work of 3.5E-4 g/m^3 was estimated for the construction worker.

Airborne concentrations of VOCs estimated by the dust loading model was assumed to sufficiently estimate levels of VOCs that may arise from volatilization, because the dust loading model treats the VOCs as if they were located at the ground surface.

The resident would be more likely to be exposed to dust arising from wind erosion than from dust-raising activities on the site. U.S. EPA (1996a) derived a model for estimating a dust particulate emission factor based on an "unlimited reservoir" model and the assumption that the source area is square:

$$PEF = Q/C \times \frac{3600}{0.036 \times (1-V) \times \left(U_m/U_t\right)^3 \times F(x)}$$ **Eq. 3.2**

where:

PEF = particulate emission factor (cubic meters per kilogram [m^3/kg], calculated)

Q/C = inverse of the mean concentration at center of square source (43.08 g/m^3-second per kg/m^3, site-specific value from Table 3 in EPA [1996a] [Zone 7, Cleveland, 30-acre site])

3600 = seconds/hour

V = fraction of surface covered with vegetation (0.8, unitless, assumed)

U_m = mean annual wind speed (default, 4.69 meters per second [m/sec])

U_t = equivalent threshold value of wind speed at 7 meters (m) (default, 11.32 m/sec)

F(x) = function dependent on U_m/U_t (default, 0.194)

The concentration of COPCs in air is calculated as follows:

$$C_a = \frac{C_{so}}{PEF}$$ **Eq. 3.3**

where:

C_a = contaminant concentration in air (mg/m^3, calculated)

C_{so} = contaminant concentration in soil (mg/kg)

PEF = particulate emission factor (m^3/kg)

Airborne concentrations of VOCs estimated by the wind erosion model were assumed to sufficiently estimate levels of VOCs that may arise from volatilization because the wind erosion model treats the VOCs as if they were located at the ground surface.

3.2.2 Concentrations in Household Air from Groundwater Use

Inhalation of VOCs released from groundwater was evaluated, as applicable, for the on-site resident scenario. Chemicals that have a Henry's Law value exceeding 1E-05 atmospheres per m^3 per mole and a molecular weight less than 200 grams (g) per mole are considered to be VOCs and are subject to evaluation via this pathway. Other groundwater contaminants may be evaluated on a case-by-case basis for their potential contribution to risk via the inhalation

pathway based on the degree of departure from the Henry's Law and molecular weight criteria, groundwater concentration, and toxicity.

The simple whole-house tap water-to-air model described in Part B of the Human Health Evaluation Manual (HHEM) (U.S. EPA, 1991b) was used in the BHHRA. This model was selected based on correspondence between the OEPA and the USACE. Part B of the HHEM recommends a volatilization constant of 0.0005 for the total concentrations of all VOCs detected in groundwater; the conversion is characterized by the following equation:

$$C_a = C_{gw} x 0.001 \, {}^{mg}/_{\mu g} \, x K_{wa} x 1{,}000 \, {}^{L}/_{m^3} \qquad \textbf{Eq. 3.4}$$

where:

C_a = Modeled concentration in air (mg/m^3)

C_{gw} = Groundwater EPC (micrograms per liter [µg/L])

K_{wa} = tap water-to-air volatilization constant (0.0005 [unitless]; [EPA, 1991b])

Implicit in HHEM Part B application of this model are the following: 1) a family of four uses the groundwater as the sole source of household tap water; 2) the volume of the house is 150 m^3; 3) the daily groundwater use is 720 liters per day (L/day); 4) 50 percent of VOCs in tap water volatilize to household air; and 5) the exchange rate of the house is 0.25 cubic meters per hour (m^3/hr) (U.S. EPA, 1991b). The U.S. EPA (1997a) *Exposure Factors Handbook* lists values different from some of these assumed by HHEM Part B. As appropriate, this pathway was evaluated in the BHHRA using alternate values from the *Exposure Factors Handbook*.

3.2.3 Concentrations of VOCs in Groundwater: Resident Dermal Uptake

Volatilization of VOCs from household water reduces the concentration remaining available for dermal contact. As mentioned in Section 3.2.2, the HHEM Part B whole-house tap water-to-air model assumes that 50 percent of the VOC concentrations are released to household air. Thus, the concentrations of VOCs remaining in the water after volatilization occurs are calculated by difference as follows:

$$C_d = C_{gw} x (1 - F_v) \qquad \textbf{Eq. 3.5}$$

where:

C_d = concentration of VOC in household water available for dermal exposure (milligrams per liter [mg/L], calculated)

C_{gw} = concentration of VOC in groundwater (mg/L)

F_v = fraction of VOCs volatilized to air (0.5, unitless)

Only the concentration remaining in tap water after volatilization (C_d), as applicable, was assumed to be available for contact with the skin during bathing/showering.

3.2.4 Concentrations of COPCs in Venison

The hunter was assumed to harvest and consume game and share it with his family, including small children. The game was assumed to be venison because deer is the species hunted most widely and most likely to provide a regular contribution to the diet. Data do not exist to reliably estimate contaminant concentrations in venison, but the following simplifying assumptions permit estimates sufficient for an RA:

- Deer are small ruminants and as such are not unlike cattle; thus, it is reasonable to assume they may have similar physiological processes that could yield similar biotransfer factors. Unlike beef, however, deer meat does not undergo marbling with fat, and deer fat is quite unpalatable and is likely to be trimmed rather than consumed. Therefore, the biotransfer factors for edible venison were derived by adjusting biotransfer factors for beef to account for differences in the fat content of table-ready beef (cooked choice retail cuts trimmed to 0 inches of fat: average 14.4 percent fat) and venison (cooked boneless muscle meats: average 2.9 percent fat) (Nutrient Database, 1997).

- Deer are expected to browse a much larger area than that encompassed by 2BG; therefore the fraction of total browse consumed from the contaminated site would be expected to be small.

- Indirect food-chain pathways may be significant for metals and for those SVOCs that persist in the environment and have the tendency to bioaccumulate. VOCs are generally mobile in the environment and unstable in biological systems and do not tend to bioaccumulate.

To reflect the assumptions previously noted, venison biotransfer factors are estimated by multiplying beef biotransfer factors by 2.9/14.4 (or 0.20), and by a fraction, FI_e, which reflects the areal portion of the site compared to a deer's home range area. These assumptions are captured in the following equation:

$$B_v = 0.20(FI_e)(B_b) \qquad \textbf{Eq. 3.6}$$

where:

B_v = biotransfer factor for venison (unitless, calculated)

0.20 = factor to reflect differences in fat content between beef and venison (0.20, unitless, see above)

FI_e = areal portion of site compared to a deer's home range (0.04, unitless, see below)

B_b = biotransfer factor for beef.

Values for B_b for metals are provided in the toxicity profiles in Appendix C. Toxicity profiles were prepared for each of the chemicals of concern (COCs). The toxicity profiles briefly describe the uses of the chemical, its physical properties, behavior in environmental media, biotransfer capability, and toxicity values.

The 2BG site covers approximately 25 acres. The burn area itself covers approximately 0.5 acre. The home range of a deer is approximately 630 acres. Therefore, FI_e was set equal to 0.04.

Deer were assumed to be exposed to contaminants by ingesting browse growing on contaminated soil. It was assumed that deer consume approximately 1.74 kg of browse per day (Sample, et al., 1996), which is approximately 50 percent dry matter (DM), or 0.87 kg browse DM per day (Mautz, et al., 1976). The contaminant concentration in browse was estimated from the following equation, which was originally developed for estimating the contaminant concentration in forage to which cattle may be exposed (U.S. EPA, 1994a):

$$C_p = (CF_7)(C_{so})(B_p) \qquad \textbf{Eq. 3.7}$$

where:

C_p = concentration of contaminant in (plant) forage DM (mg/kg, calculated)

CF_7 = conversion factor to adjust for soil containing 20 percent moisture (1.25 unitless).

C_{so} = concentration of contaminant in soil (mg/kg)

B_p = soil-to-forage biotransfer factor (mg of chemical per kg of dry plant/mg of chemical per kg of dry soil).

Values for B_p were taken from the toxicity profiles in Appendix C. B_p values for the vegetative parts of plants rather than the reproductive parts of plants were selected, where possible, because deer browse year-round, and the vegetative parts are more available for the greater part of the year.

The concentration of COPC in venison can be estimated from the following equation (adapted from U.S. EPA, 1994a):

$$C_v = (Q_p)(C_p)(B_v) \qquad \textbf{Eq. 3.8}$$

where:

C_v = contaminant concentration in venison (mg/kg, calculated)

Q_p = browse ingestion rate (0.87 kg DM/day)

C_p = contaminant concentration in browse DM (mg/kg)

B_v = biotransfer factor for venison (days/kg).

3.3 Quantification of Chemical Intakes

This section describes the models used to quantify doses or intakes of the COPC by the exposure pathways identified in Section 3.1.3, using the exposure parameter values described in Section 3.1.3. Models are taken or modified from U.S. EPA (1989a) unless otherwise indicated. Intakes were calculated for both cancer and noncancer evaluations. Therefore, the AT variable shown in the following equations is replaced with AT_n for noncancer calculations (365 × ED), and with AT_c (25,550 days) for the cancer calculations. Intake values were based on the EPCs (Section 2.2) and the equations discussed below for the respective exposure pathways.

3.3.1 Inhalation of COPCs in Air

The following equation was used to estimate the inhaled dose of COPC in air for the groundskeeper, construction worker, and on-site resident through inhalation of dust and VOCs in ambient air from surface or total soil; the construction worker through inhalation of VOCs in ambient air from subsurface soil; and the indoor worker and on-site resident through inhalation of VOCs in indoor air from subsurface soil and tap water:

$$I_a = \frac{(C_a)(FI_a)(IR_a)(ET_a)(EF)(ED)}{(BW)(AT)} \qquad \textbf{Eq. 3.9}$$

where:

I_a = inhaled dose of COPC (mg/kg-day, calculated)

C_a = concentration of COPC in air (mg/m^3)

FI_a = fraction of exposure attributed to site media (unitless)

IR_a = inhalation rate (m^3/hour)

ET_a = exposure time (hr/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (days).

3.3.2 Incidental Ingestion of COPCs in Soil and Sediment

The ingested dose of COPCs in soil (groundskeeper, construction worker, on-site resident, indoor worker, hunter) were estimated from the equation:

$$I_{so} = \frac{(C_{so})(FI_{so})(IR_{so})(EF)(ED)(CF_2)}{(BW)(AT)} \quad \textbf{Eq. 3.10}$$

where:

I_{so} = ingested dose of COPC in soil (mg/kg-day, calculated)

C_{so} = concentration of COPC in soil (mg/kg)

FI_{so} = fraction of exposure attributed to site soil or sediment (unitless)

IR_{so} = ingestion rate of soil or sediment (mg/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

CF_2 = conversion factor (1E-6 kg/mg)

BW = body weight (kg)

AT = averaging time (days).

3.3.3 Dermal Contact with COPCs in Soil, Sediment, or Water

Unlike the methodologies for estimating inhaled or ingested doses of COPCs, which quantify the dose presented to the barrier membrane (the pulmonary or gastrointestinal mucosa, respectively), dermal dose is estimated as the dose that crosses the skin and is systemically absorbed. For this reason, dermal toxicity values are also based on absorbed dose. The absorbed dose of a COPC is estimated from the equation (U.S. EPA, 2004c):

$$DAD = \frac{(DA)(SA)(EF)(ED)}{(BW)(AT)} \quad \textbf{Eq. 3.11}$$

where:

DAD = average dermal absorbed dose of COPC (mg/kg-day, calculated)

DA = dose absorbed per unit body surface area per day (mg/cm^2-day)

SA (SA_{so} for soil, SA_{sd} for sediment, SA_w for water) = surface area of the skin exposed (cm^2)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (days).

DA is calculated differently for dermal uptake from soil or sediment and from water. Dermal uptake of constituents from soil (groundskeeper, construction worker, on-site resident, hunter) or sediment (construction worker, on-site resident) assumes that absorption is a function of the fraction of a dermally applied dose that is absorbed. It is calculated from the equation (U.S. EPA, 2004c):

$$DA = (C)(FI)(CF_2)(AF)(ABS) \qquad \textbf{Eq. 3.12}$$

where:

DA = dose absorbed per unit body surface area per day (mg/cm^2-day, calculated)

C (C_{so} for soil, C_{sd} for sediment) = concentration of COPC in medium (mg/kg)

FI (FI_{so} for soil, FI_{sd} for sediment) = fraction of exposure attributed to site medium (unitless)

CF_2 = conversion factor (1E-6 kg/mg)

AF (AF_{so} for soil, AF_{sd} for sediment) = soil- or sediment-to-skin adherence factor (mg/cm^2-day)

ABS = absorption fraction (unitless, chemical-specific).

ABS values are provided in the toxicity profiles for each COC.

Quantification of dermal absorbed dose was modeled using the spreadsheet model developed by U.S. EPA in conjunction with RAGS Part E (U.S. EPA, 2004c) (Appendix A).

3.3.4 Consumption of Venison

Consumption of venison by the hunter or his child is evaluated by the following equation:

$$I_v = \frac{(C_v)(IR_v)(EF)(ED)}{(BW)(AT)} \qquad \textbf{Eq. 3.13}$$

where:

I_v = ingested dose of COPC in venison (mg/kg-day, calculated)

C_v = concentration of COPC in venison (mg/kg)

IR_v =venison ingestion rate (kg/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (days).

3.3.5 Ingestion of COPCs in Groundwater

The ingested dose of COPCs in groundwater is estimated from the equation:

$$I_w = \frac{(C_w)(IR_w)(EF)(ED)}{(BW)(AT)} \qquad \textbf{Eq. 3.14}$$

where:

I_w = ingested dose of COPC in groundwater (mg/kg-day, calculated)

C_w = concentration of COPC in groundwater (mg/L)

IR_w = drinking water ingestion rate (L/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (days)

4.0 TOXICITY ASSESSMENT

Toxicity is defined as the ability of a chemical to induce adverse effects in biological systems. The purpose of the toxicity assessment is two-fold:

- Identify the cancer and noncancer effects that may arise from exposure of humans to the COPC (hazard assessment).

- Provide an estimate of the quantitative relationship between the magnitude and duration of exposure and the probability or severity of adverse effects (dose response assessment).

The latter is accomplished by the derivation of cancer and noncancer toxicity values, as described in the following section.

4.1 Evaluation of Carcinogenicity

A few chemicals are known, and many more are suspected, to be human carcinogens. The carcinogenic slope factors (SFs), inhalation unit risks, and the accompanying weight-of-evidence classification are used to evaluate potential human carcinogenic risks associated with exposures.

In defining the potential carcinogenicity of a chemical to humans, U.S. EPA first evaluates the sufficiency of evidence of carcinogenicity from available animal and human data. If there are sufficient quantitative data and adequate understanding of the carcinogenic process, a biologically based model may be developed to relate dose and response data on an agent-specific basis. Otherwise, as a default procedure, a standard model can be used to curve-fit the data. Once the data are evaluated, the chemical is assigned a weight-of-evidence classification. The U.S. EPA recognizes six weight-of-evidence group classifications for carcinogenicity, which are as follows:

- Group A – Human Carcinogenic: human data are sufficient to identify the chemical as a human carcinogen.

- Group B1 – Probable Human Carcinogen: human data indicate that a causal association is credible, but alternative explanations cannot be dismissed.

- Group B2 – Probable Human Carcinogen: human data are insufficient to support a causal association, but testing data in animals support a causal association.

- Group C – Possible Human Carcinogen: human data are inadequate or lacking, but animal data suggest a causal association, although the studies have deficiencies that limit interpretation.

- Group D – Not Classifiable as to Human Carcinogenicity: human and animal data are lacking or inadequate.

- Group E – Evidence of Non-Carcinogenicity to Humans: human data are negative or lacking, and adequate animal data indicate no association with cancer.

The weight-of-evidence narrative developed to characterize potential carcinogenic hazard summarizes the results of the hazard assessment and provides a conclusion with regard to human carcinogenic potential. The weight-of-evidence narrative includes both a conclusion about the weight of evidence of carcinogenic potential and a summary of the data on which the conclusion rests. The narrative explains the kinds of evidence available and how they fit together in drawing conclusions, and points out significant issues/strengths/limitations of the data and conclusions.

U.S. EPA derives SF and unit risk values for carcinogens. SFs generally represent an upper bound on the average risk in a population or the risk for a randomly selected individual, but not the risk for a highly susceptible individual or group. Some individuals face a higher risk and some face a lower risk. The use of upper bounds generally is considered to be a health-protective approach for covering the risk to susceptible individuals, although the calculation of upper bounds is not based on susceptibility data. The SF defines quantitatively the relationship between dose and response as the plausible upper-bound estimate of the probability of a response (i.e., development of cancer) per unit intake of a potential carcinogen over a lifetime. In general, an inhalation unit risk is developed directly from a dose response analysis using equivalent human concentrations already expressed in units of $\mu g/m^3$.

The SF is derived by U.S. EPA by selecting the most appropriate data set, extrapolating to lower doses, and determining equivalent human doses for the appropriate route of exposure. A nonlinear extrapolation method can be used for cases with sufficient data to ascertain the mode of action and to conclude that it is not linear at low doses but with insufficient data to support a toxicodynamic model that may be either nonlinear or linear at low doses. Nonlinear extrapolation having a significant biological support may be presented in addition to a linear approach when the available data and a weight-of-evidence evaluation support a nonlinear approach, but the data are not strong enough to ascertain the mode of action. The SF is expressed in terms of risk per unit concentration of the chemical (mg) per unit body weight (kg) per unit time (day) or $(mg/kg/day)^{-1}$. Inhalation unit risk estimates express the SF in terms of $\mu g/m^3$ or parts per million air.

Cancer toxicity values and sources are provided in Table 4-1.

4.2 Evaluation of Noncarcinogenic Effects

Many chemicals, whether or not associated with carcinogenicity, are associated with noncarcinogenic effects. The evaluation of noncancer effects (U.S. EPA, 1989b) involves:

- Qualitative identification of the adverse effect(s) associated with the chemical, which may differ depending on the duration (acute or chronic) or route (oral or inhalation) of exposure.

- Identification of the critical effect for each duration of exposure (i.e., the first adverse effect that occurs as dose is increased).

- Estimation of the threshold dose for the critical effect for each duration of exposure.

- Development of an uncertainty factor (UF); i.e., quantification of the uncertainty associated with interspecies extrapolation, intraspecies variation in sensitivity, severity of the critical effect, slope of the dose-response curve, and deficiencies in the database, in regard to developing a reference dose (RfD) for human exposure.

- Identification of the target organ(s) for the critical effect for each route of exposure.

These information points are used to derive an exposure route- and duration-specific toxicity value called an RfD, expressed as mg/kg-day, which is considered to be the dose for humans at which adverse effects are not expected to occur, and includes uncertainty of an order of magnitude or greater. Mathematically, it is estimated as the ratio of the threshold dose to the UF. For purposes of risk assessment, chronic exposure is defined as equal to or greater than 7 years, or at least 10 percent of expected lifespan; subchronic exposure is defined as 2 weeks to 7 years.

The U.S. EPA Integrated Risk information System (IRIS) expresses the inhalation noncancer reference value as a reference concentration (RfC) in units of mg/m^3. Because noncancer risk characterization requires a reference value expressed as mg/kg-day, the RfC must be converted to an inhalation RfD. Since the inhalation RfC is based on continuous exposure of an adult human (assumed to inhale 20 m^3 of air per day and to weigh 70 kg), the mathematical conversion consists of multiplying the RfC (mg/m^3) by 20 m^3/day and dividing the result by 70 kg.

RfD and RfC values are derived for both chronic and subchronic exposure. Under the assumption of monotonicity (incidence, intensity, or severity of effects can increase, but cannot decrease, with increasing magnitude or duration of exposure), a chronic RfD may be considered sufficiently protective for subchronic exposure, but a subchronic RfD may not be protective for chronic exposure. Currently, subchronic RfD values exist for few chemicals. Subchronic RfD values can be derived from chronic RfD values as follows:

- If the UF applied in the derivation of the chronic RfD does not provide for expansion from subchronic to chronic exposure (e.g., if the chronic RfD was derived from a chronic study), the chronic RfD is adopted as being sufficiently protective for subchronic exposure.

- If the UF applied in the derivation of the chronic RfD contains a component to expand from subchronic to chronic exposure, the subchronic RfD is derived by multiplying the chronic RfD by the factor used to expand from subchronic to chronic exposure (e.g., if a factor of 10 was used to expand from subchronic to chronic exposure, the subchronic RfD will be 10 times larger than the chronic RfD).

Oral and dermal RfDs (discussed in Section 4.3) and inhalation RfDs are provided in the Table 4-1.

4.3 Dermal Toxicity Values

Dermal RfDs and SFs are derived from the corresponding oral values, provided there is no evidence to suggest that dermal exposure induces exposure route-specific effects that are not appropriately modeled by oral exposure data. In the derivation of a dermal RfD, the oral RfD is

multiplied by the gastrointestinal absorption factor (GAF), expressed as a decimal fraction. The resulting dermal RfD, therefore, is based on absorbed dose. The RfD based on absorbed dose is the appropriate value with which to compare a dermal dose because dermal doses are expressed as absorbed rather than exposure doses. The dermal SF is derived by dividing the oral SF by the GAF. The oral SF is divided, rather than multiplied, by the GAF because the SF is expressed as a reciprocal dose.

4.4 Target Organ Toxicity

As a matter of science policy, U.S. EPA assumes dose and effect to be additive for noncarcinogenic effects (U.S. EPA, 1989a). This assumption provides the justification for adding the HQs or hazard indices (HIs) in the risk characterization for noncancer effects (Section 5.2) resulting from exposure to multiple chemicals, pathways, or media. However, U.S. EPA (1989a) acknowledges that adding all HQ or HI values may overestimate hazard because the assumption of additivity is probably appropriate only for those chemicals that exert their toxicity by the same mechanism.

Mechanisms of toxicity data sufficient for predicting additivity with a high level of confidence are available for very few chemicals. In the absence of such data, U.S. EPA (1989a) assumes that chemicals that act on the same target organ may do so by the same mechanism of toxicity; that is, the target organ serves as a surrogate for mechanism of toxicity. When total HI for all media for a receptor exceeds 1 due to the contributions of several chemicals, it is appropriate to segregate the chemicals by route of exposure and mechanism of toxicity (i.e., target organ) and estimate separate HI values for each target organ.

As a practical matter, since human environmental exposures are likely to involve near- or sub-threshold doses, the target organ chosen for a given chemical is the one associated with the critical effect. If more than one organ is affected by a given chemical at the threshold, then the affected target organs are selected for this chemical. The target organ is also selected on the basis of duration of exposure (i.e., the target organ for chronic or subchronic exposure to low or moderate doses is selected rather than the target organ for acute exposure to high doses) and route of exposure. Because dermal RfD values are derived from oral RfD values, the oral target organ is adopted as the dermal target organ. For some chemicals, no target organ is identified. This occurs when no adverse effects are observed or when adverse effects such as reduced longevity or growth rate are not accompanied by recognized organ- or system-specific functional or morphologic alteration. Target organs for the oral and inhalation pathway are provided in the toxicity profiles.

4.5 Sources of Toxicity Information Used in the Risk Assessment

Toxicity values were selected for use in this BHHRA based on the U.S. EPA Office of Solid Waste and Emergency Response Directive 9285.7-53 (U.S. EPA, 2003b) which prescribes the following hierarchy:

- **Tier 1 values**: IRIS (U.S. EPA, 2005) database.
- **Tier 2 values**: U.S. EPA's provisional peer-reviewed toxicity values. The provisional peer-reviewed toxicity values are developed by the Office of Research and Development, the National Center for Environmental Assessment, and the Superfund

Health Risk Technical Support Center on a chemical-specific basis when requested by the Superfund program.

- **Tier 3 values**: Other toxicity values from additional U.S. EPA and non-U.S. EPA sources of toxicity information. As stated in the U.S. EPA Office of Solid Waste and Emergency Response directive, "priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed." Two common examples of Tier 3 values are the U.S. EPA's Health Effects Assessment Summary Tables (U.S. EPA, 1997b) and the California Environmental Protection Agency (2005) Office of Environmental Health Hazard Assessment Toxicity Criteria Database.

GAFs, used to derive dermal RfD values and SFs from the corresponding oral toxicity values, are obtained from the following sources:

- Oral absorption efficiency data compiled by the National Center for Environmental Assessment for the Superfund Health Risk Technical Support Center of EPA.
- Federal agency reviews of the empirical data, such as Agency for Toxic Substances and Disease Registry Toxicological Profiles and various U.S. EPA criteria documents.
- Other published reviews of the empirical data.
- The primary literature.

GAFs obtained from reviews are compared to empirical (especially more recent) data, when possible, and are evaluated for suitability for use for deriving dermal toxicity values from oral toxicity values. The suitability of the GAF increases when the following similarities are present in the oral pharmacokinetic study from which the GAF is derived and in the key toxicity study from which the oral toxicity value is derived:

- The same strain, sex, age, and species of test animal were used.
- The same chemical form (e.g., the same salt or complex of an inorganic element or organic compound) was used.
- The same mode of administration (e.g., diet, drinking water, or gavage vehicle) was used.
- Similar dose rates were used.
- The most defensible GAF for each chemical was used in the BHHRA.

5.0 RISK CHARACTERIZATION

Risk characterization is the combination of the results of the exposure assessment and toxicity assessment to yield a quantitative expression of risk. Quantitative estimates are developed for individual chemicals, exposure pathways and exposure media for each receptor. The risk characterization is used to guide risk management decisions.

Generally, the risk characterization follows the methodology prescribed by the U.S. EPA (1989a), as modified by more recent information and guidance. The U.S. EPA methods are, appropriately, designed to be health-protective and tend to overestimate rather than underestimate risk. The risk results are generally conservative, because risk characterization involves multiplication of the conservatisms built into the estimation of source-term and EPC, the exposure (intake) estimates, and the toxicity dose-response assessments.

Risk characterization is limited to those site-related chemicals selected as COPCs, i.e., present at concentrations that exceed RBSCs (Section 2.1.3).

Up to this point, the term "risk" has been used generically to mean the potential for the occurrence of adverse effects, either cancer or noncancer, to arise from exposure to chemicals. However, at this point in the discussion, it is helpful to define terms more precisely. Therefore, in this section of the document, "risk" is used to describe the likelihood or probability of the occurrence of cancer. The potential for the occurrence of noncancer effects is referred to as noncancer hazard.

5.1 Cancer Risk

The risk from exposure to potential chemical carcinogens is estimated as the probability of an individual developing cancer over a lifetime, and is called the ILCR. In the low-dose range, which would be expected for most environmental exposures, cancer risk is estimated from the following linear equation (U.S. EPA, 1989a):

$$ILCR = (CDI)(SF) \qquad \textbf{Eq. 5.1}$$

where:

$ILCR$ = incremental lifetime cancer risk, a unitless expression of the probability of developing cancer, adjusted for background incidence, calculated

CDI = chronic daily intake, averaged over 70 years (mg/kg-day)

SF = cancer slope factor (risk per mg/kg-day)

The use of Equation 5.1 assumes that chemical carcinogenesis does not exhibit a threshold and that the dose-response relationship is linear in the low-dose range. Because this equation could generate theoretical cancer risks greater than 1 for high-dose levels, it is considered to be inaccurate at cancer risks greater than 1 E-2. In these cases, cancer risk may be estimated by the one-hit model (U.S. EPA, 1989a):

$$ILCR = 1 - e^{[(CDI)(SF)]} \qquad \textbf{Eq. 5.2}$$

where:

$ILCR$ = incremental lifetime cancer risk, a unitless expression of the probability of developing cancer, adjusted for background incidence, calculated

$e^{[(CDI)(SF)]}$ = the exponential of the risk calculated using Equation 5.1

As a matter of policy, the U.S. EPA (1986) considers the carcinogenic potency of simultaneous exposure to low doses of carcinogenic chemicals to be additive, regardless of the chemicals' mechanisms of toxicity or sites (organs of the body) of action. Cancer risk arising from exposure to a given chemical in a given medium by multiple pathways is estimated from the following equation:

$$ILCR_p = ILCR_{chem1} + ILCR_{chem2} + ...ILCR_{chemi} \qquad \textbf{Eq. 5.3}$$

where:

$ILCR_p$ = total pathway risk of cancer incidence, calculated

$ILCR_{chemi}$ = individual chemical cancer risk for the pathway

Cancer risk for a given receptor across chemicals and across media is summed in the same manner. For risk management purposes, OEPA considers a total ILCR of 1E-6 to be a point of departure below which cancer risks are considered to be insignificant. ILCR estimates between 1E-6 and 1E-4 are considered to fall within the risk management range. ILCR estimates above 1E-4 are considered to be of concern. The OEPA (2004b) policy is consistent with the U.S. EPA (1990) policy of risk management.

5.2 Noncancer Hazards

The noncancer hazards associated with chemicals are evaluated by comparing an exposure level or intake with an RfD. The HQ, defined as the ratio of intake to RfD, is estimated as (U.S. EPA, 1989a):

$$HQ = I/RfD \qquad \textbf{Eq. 5.4}$$

where:

HQ = hazard quotient (unitless, calculated)

I = intake of chemical averaged over subchronic or chronic exposure period (mg/kg-day)

RfD = reference dose (mg/kg-day)

Chemical noncancer hazards are evaluated using chronic RfD values. This approach is different from the probabilistic approach used to evaluate cancer risks. An HQ of 0.01 does not imply a 1 in 100 chance of an adverse effect, but indicates that the estimated intake is 100 times lower than the RfD. An HQ of unity (1) indicates that the estimated intake equals the RfD. If the HQ is greater than unity, there may be concern for potential adverse health effects.

In the case of simultaneous exposure of a receptor to multiple chemicals, or to a given chemical by multiple pathways, an HI is calculated as the sum of the HQs by:

$$HI = HQ_1 + HQ_2 + HQ_i \qquad \textbf{Eq. 5.5}$$

where:

HI = hazard index (unitless, calculated)

HQ_i = hazard quotient for the Ith chemical, or for the Ith pathway

An HI may be calculated across all exposure pathways for a given chemical, across all chemicals for a given exposure pathway, across all chemicals and exposure pathways for a given exposure medium, or across all media to yield the total HI for a given receptor.

HQ or HI values below or equal to the threshold value of 1 are interpreted to mean that adverse noncancer effects are unlikely. HQ or HI values greater than 1 are interpreted to mean that there is a likelihood of adverse noncancer effects.

Calculating a total HI as the sum of HQ values is based on the assumption that the potential for noncancer effects is additive. U.S. EPA (1989a), however, acknowledges that the assumption of additivity is probably appropriate only for chemicals that induce adverse effects by the same mechanism (Section 4.2). Therefore, if the total HI for a receptor exceeds 1, individual HI values may be calculated for each target organ as follows:

$$Total\ HI_a = HI_{p1-a} + HI_{p2-a} + ...HI_{pi-a} \quad \textbf{Eq. 5.6}$$

where:

$Total\ HI_a$ = total hazard index for target organ "a" (unitless, calculated)

HI_{pi-a} = hazard index for target organ "a" via pathway "i".

Toxicity values are not available for the evaluation of lead. Risk assessment of lead generally consists of estimating blood lead levels in children associated with exposure to the environmental media at the site in question, and comparing the estimate with the threshold level of 10 micrograms per deciliter (µg/dL). Two common exposure scenarios are routinely evaluated. The first is residential, which involves direct exposure of a young child. The U.S. EPA (1994b) integrated exposure-uptake biokinetic (IEUBK) blood lead model for young children is used to predict blood lead levels for children hypothetically exposed at the site. The IEUBK is a self-contained DOS-based computer program. Average lead concentrations in the various media are input in the model; default values provided by the IEUBK are used when site-specific data are not available. Arithmetic mean values, rather than conservative estimates of average, are used because the IEUBK contains a statistical module that addresses individual variation in exposure and physiological parameters. The output is a probability density histogram of predicted blood lead levels. The risk assessment is considered to "pass" if the IEUBK predicts that not more than 5 percent of young children exposed in this manner would experience a mean blood lead level above the 10.4 µg/dL threshold.

An alternative risk assessment for lead in soil for residential site use may consist of comparing the average concentration with the RBRL of 400 mg/kg. The risk assessment is considered to pass if the average concentration of lead in soil does not exceed 400 mg/kg. Development of the RBRL of 400 mg/kg is described in the next section.

The second common exposure scenario addresses adult exposures to lead in soil in nonresidential exposure scenarios (U.S. EPA, 1996b). The method focuses on the estimation of blood lead concentrations in fetuses carried by women exposed to average concentrations of lead in soil (U.S. EPA, 1999). The method is based on a probability model for blood lead levels in adult women exposed to lead in soil coupled with an estimated constant of proportionality between fetal and maternal blood lead levels, a geometric mean fetal blood lead concentration and empirically determined geometric standard deviation (U.S. EPA, 1999). The statistical terms used in the method permit an equation to be used to establish an average adult blood lead concentration such that a fetus has not more than a 5 percent probability of blood lead concentrations exceeding 10 µg/dL (U.S. EPA, 1996b). The risk assessment is considered to pass if the average adult blood lead level does not predict an excess of 5 percent probability that fetal blood lead levels exceed 10 µg/dL, as interpreted by the Technical Review Workgroup (TRW) for the established cleanup goal to limit childhood risk of exceeding 10 µg/dL to 5 percent (U.S. EPA 1994c, 1996b).

An alternative risk assessment for lead in soil for industrial site use may consist of comparing the average concentration with the RBRL of 750 mg/kg. The risk assessment is considered to pass if the average concentration of lead in soil does not exceed 750 mg/kg. Development of the RBRL of 750 mg/kg is described in the following section.

5.3 Risk-Based Remediation Level Development

RBRLs are derived to provide support for risk management decisions. They are developed only for the COCs in media that are associated with unacceptable risk that may potentially warrant corrective action. RBRLs are site-specific risk-based concentrations that reflect the exposure and toxicity assumptions applied in the baseline RA. Consequently, RBRLs are source-, medium-, receptor-, and chemical-specific. The development of RBRLs involves a balance of cancer risk and noncancer hazard estimates. The development of RBRLs is an iterative process with on-going discussion between OEPA and the USACE.

The first step in RBRL development is selection of COCs. Either of two conditions results in designation of a COPC as a COC:

- The concentration of the COPC exceeds its medium-specific ARAR, provided one is available.
- The COPC contributes significantly to cancer risk or hazard as described below.

As presented in U.S. EPA 1991b, COCs based on cancer risks are selected for any medium for which the total ILCR for a given receptor (summed across chemicals and exposure pathways) exceeds 1E-4. For an individual COPC in a given medium to be selected as a cancer-based COC, it must have an ILCR (summed across exposure pathways) exceeding 1E-6. COCs based on noncancer hazards are selected for any receptor for which the total HI (summed across chemicals and exposure pathways) exceeds 1. For an individual COPC in any medium to be selected as a noncancer-based COC, it must have an HI (summed across exposure pathways) exceeding 0.1.

RBRLs are risk- or hazard-specific concentrations of chemicals developed only for the COCs in media selected by the criteria described above. RBRLs for cancer COCs are estimated for a given medium from the following equation (U.S. EPA, 2000):

$$RBRL_{coc} = \frac{ST_{coc} TR}{ILCR_{coc}} \qquad \textbf{Eq. 5.7}$$

where:

$RBRL_{coc}$ = risk-based remediation level for a given COC, receptor and source medium (calculated)

ST_{coc} = source-term concentration of the COC in the given medium

TR = target risk level (1E-5)

$ILCR_{coc}$ = total incremental lifetime cancer risk for a given COC, receptor and source medium

RBRLs for noncancer COCs are estimated as follows (U.S. EPA, 2000):

$$RBRL_{coc} = \frac{ST_{coc} THI}{HI_{coc}} \qquad \textbf{Eq. 5.8}$$

where:

$RBRL_{coc}$ = risk-based remediation level for a given COC, receptor and source medium (calculated)

ST_{coc} = source-term concentration of the COC in the given medium

THI = target hazard index (0.1, 1)

HI_{coc} = total hazard index for a given COC, receptor and source medium

Concentration units are not provided in Equations 5.7 or 5.8; the RBRL units are the same as the concentration units of the EPC. RBRLs are not final remedial concentrations. RBRLs are to be used by risk managers as approximate values to give an idea of the magnitude of remediation that may be needed. Final remedial goals based on toxicity, carcinogenicity, number and variety of COCs, and other factors as appropriate would be developed before a feasibility study is initiated.

The procedure described above is not suitable for developing an RBRL for lead. U.S. EPA (1994c,d, 1998, 2001) has considerable experience using the IEUBK to develop screening levels for lead in soil. The concentration of 400 mg/kg in soil has stood the test of time as a screening level. U.S. EPA (1998) recommends applying site-specific data to the IEUBK to develop site-specific cleanup levels or RBRLs. In general, cleanup levels developed with the IEUBK do not exceed the screening level of 400 mg/kg unless site-specific exposure parameters are available that differ substantially from the defaults provided by the model. The residential scenario developed in this BHHRA was based on standard exposure assumptions. Site-specific information is not available that would permit refinement of these assumptions. Therefore, the IEUBK was not used to develop a site-specific RBRL for lead in soil for residential use. Instead, the 400 mg/kg screening level confirmed by U.S. EPA (1998) is adopted as the RBRL.

U.S. EPA (2004b) provides a PRG of 750 mg/kg for lead in soil for industrial sites, based on the recommendations of the TRW for lead. The PRG is appropriately considered a screening value for lead for industrial site use.

Plausible receptor scenarios for industrial site use include the groundskeeper, the indoor worker and the construction worker. Theoretically, the U.S. EPA (1996b) adult blood lead model could be used to develop RBRLs for lead in soil for these exposure scenarios. However, central tendency (CT) or mid-range exposure variable values, including estimates for incidental soil ingestion rate, are not available for these receptors. Therefore, any attempt to refine the screening level or develop a site-specific RBRL would introduce an inordinate amount of uncertainty. Largely for this reason, the U.S. EPA (2004a) PRG of 750 mg/kg for lead in industrial soil is adopted as the RBRL for the groundskeeper, indoor worker, and construction worker for this BHHRA.

5.4 Risk Characterization Results and Discussion

ILCR and HQ estimates for each receptor, medium, and COPC, including sums across exposure routes for each COPC, are compiled in tables in Appendix B.

Considerable uncertainty is associated with ILCR, HQ and HI estimates; therefore, U.S. EPA (1989a) recommends that they be rounded to one significant figure for presentation in an RA. For example, an HI of 1.49E+0 is rounded to 1 and interpreted to mean that the HI does not exceed the threshold level of 1 and that occurrence of adverse noncancer effects is unlikely. An HI of 1.49E+1, for example, is rounded to 15.

For this discussion, an individual chemical is considered to contribute significantly to the cancer risk estimate if its ILCR summed across all exposure routes exceeds 1E-6. Similarly, an individual chemical is considered to contribute significantly to the noncancer hazard if its HI summed across all exposure routes exceeds 0.1.

When total HI summed across chemicals and/or media exceeds the threshold limit of 1, consideration is given to possible benefit of segregating HI values by target organ, as suggested by U.S. EPA (1989a). Target organ specific HIs were not developed for this BHHRA.

Total HI and ILCR estimates for each receptor and each source medium for 2BG inside and outside the burn area are summarized in Tables 5-1 and 5-2, respectively, and discussed below; detailed results are provided in Appendix B. Soil data were evaluated separately between the burn area and areas outside the burn area. The uncertainties associated with the HI and ILCR estimates are discussed in Section 6.0.

5.4.1 Burn Area Risk Characterization

A risk characterization was completed for the burn area. Surface soil and subsurface soil data collected from the burn area were used to characterize potential human health risk. Bedrock groundwater from across the entire 2BG site was also used to address burn area risks. Sediment data were not used for the assessment of the burn area because no sediment samples were collected from within the burn area.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil inside the burn area. The total HI estimate for the groundskeeper receptor was 12 (Table 5-1). The total ILCR estimate for the groundskeeper receptor was 7.8E-5. The HI exceeds the threshold for noncancer effects. The primary COC for the HI was 2,4,6-TNT. The COCs for the ILCR were 2,4,6-TNT, DNT mixtures, PCB-1260, and 2,3,7,8-TCDD in surface soil. Total HI estimates for the adult hunter, and adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 5.8E-6. The primary COC was 2,4,6-TNT from the ingestion of surface soil. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface and subsurface soil inside the burn area. The total HI estimate summed across all media for the construction worker receptor was 187 (Table 5-1). The COC driving the elevated HI in surface and subsurface soils within the burn area was 2,4,6-TNT. The total ILCR estimate summed across all media for the

construction worker receptor was 2.7E-5. The COCs driving the ILCR were 2,4,6-TNT in surface and subsurface soils and 2,3,7,8- TCDD in subsurface soil.

The indoor worker was evaluated for exposure to surface soil and groundwater. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 5.9, respectively (Table 5-1). The ILCRs for groundwater and surface soil were 1.7E-3 and 3.8E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater, and 2,4,6-TNT, DNT mixtures, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

The adult and child residential receptors were evaluated for exposure to surface and subsurface soil associated with the burn area and groundwater across the site. HI sums for groundwater and surface and subsurface soil were 129 and 892 for the adult and child, respectively (Table 5-1). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface and subsurface soil COCs driving the adult HI were 2,4,6-TNT and 2,4-DNT (subsurface soil only). For the residential child, groundwater COCs driving the HI are total arsenic, total iron, total manganese, total thallium, and benzene. Surface and subsurface soil COCs factoring into the elevated HI include 2,4,6-TNT in surface soil and 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and PCB-1254 in subsurface soils within the burn area.

The total ILCR estimates summed for groundwater and surface and subsurface soil within the burn area for adult and child residential receptors were 5.1E-3 and 2.8E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for both the residential adult and child. The surface soil COCs for the burn area ILCR were 2,4,6-TNT, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the adult and 2,4,6-TNT, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the child. The subsurface soil COCs were 2,4,6-TNT and 2,3,7,8-TCDD for the adult and 2,4,6-TNT, 2,3,7,8-TCDD, and PCB-1254 and PCB-1260 for the child. Vapor intrusion into dwellings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

Figures 5-1 through 5-4 show the distribution of COCs (based on the adult and child residential exposure scenarios) exceeding the PRGs for surface soil, subsurface soil, sediment, and bedrock groundwater, respectively.

5.4.2 Outside Burn Area Risk Characterization

A risk characterization was completed for areas outside the burn area. Surface soil, subsurface soil, and sediment data collected from outside the burn area were used to characterize potential human health risk. Bedrock groundwater data from across the entire 2BG site were also used to address risks outside the burn area.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil from areas outside and adjacent to the burn area. The total HI estimate for the groundskeeper receptor was 1.2 (Table 5-2). The total ILCR estimate for the groundskeeper receptor exposed to soil outside the burn area was 3.0E-5. The primary COC driving the HI for the groundskeeper was 2,4,6-TNT. The COCs for the ILCR were 2,4,6-TNT, DNT mixtures, and PCB-1260. Total HI estimates for the adult hunter, and adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 1.4E-6. The primary COCs were 2,4,6-TNT and PCB-1260 from the ingestion of surface soil

while the adult was hunting. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface, subsurface soil, and sediment outside the burn area. The total HI estimate summed across all media for the construction worker receptor was 4.7 (Table 5-2). The COC driving the elevated HI outside the burn area for surface and subsurface soils was 2,4,6-TNT. The total ILCR estimate summed across all media (soils and sediment) for the construction worker receptor was 2.1E-6. The COC driving the ILCR was arsenic in subsurface soils. Surface soil and sediment COCs did not contribute significantly to the construction worker ILCR.

The indoor worker was evaluated for exposure to surface soil outside the burn area and groundwater across the site. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 0.6, respectively (Table 5-2). The COCs for the groundwater HI include total arsenic and benzene. The ILCR for groundwater and surface soil were 1.7E-3 and 1.0E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater and 2,4,6-TNT, DNT mixtures, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

The adult and child residential receptors were evaluated for exposure to outside the burn area surface soil, subsurface soil, sediment, and groundwater. The total HI estimates summed across all media for the adult and child residential receptors were 46 and 121 respectively (Table 5-2). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface soil COC driving the adult HI was 2,4,6-TNT. The adult residential HI for both subsurface soil and sediment were below 1 and do not contribute significantly to the total HI estimate. For the residential child, groundwater COCs driving the HI are total arsenic, total iron, total manganese, total thallium, and benzene. The surface soil and subsurface soil COCs for the residential child include 2,4,6-TNT in surface soil and arsenic and iron in subsurface soils.

The total ILCR estimates summed for groundwater, surface and subsurface soil, and sediment outside the burn area for adult and child residential receptors were 5.0E-3 and 3.1E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for both the residential adult and child. The ILCR surface soil COCs for the area outside the burn area include 2,4,6-TNT, DNT mixtures, and PCB-1260 for both the residential adult and child. The subsurface soil COC is arsenic. Vapor intrusion into dwellings from subsurface soil was not evaluated because there were no VOCs detected in the subsurface soil.

Figures 5-1 through 5-4 show the distribution of COCs (based on the adult and child residential exposure scenarios) exceeding the PRGs for surface soil, subsurface soil, sediment, and bedrock groundwater, respectively.

6.0 UNCERTAINTY ANALYSIS

This section evaluates the uncertainties inherent in the RA process. Uncertainty is a factor in each step of the data evaluation and exposure and toxicity assessments presented in the preceding sections. Uncertainties associated with early stages of the RA become magnified when they are concatenated with other uncertainties in the latter stages. It is not possible to eliminate all uncertainty, and sometimes not even to reduce it; however, a recognition of the uncertainties is fundamental to the understanding and reasonable use of the RA results.

Generally, risk assessments carry two types of uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements such as instrument uncertainty (accuracy and precision) associated with contaminant concentrations. The results of the RA incorporate the accumulated variances of the individual measured values. A different kind of uncertainty stems from data gaps, i.e., additional information needed to complete the database for the assessment. Often the data gap is significant, such as imprecision regarding the number of days that a hunter might visit the site or the absence of information on the effects of human exposure to a chemical (U.S. EPA, 1992c).

U.S. EPA (1992c) guidance urges risk assessors to address or provide descriptions of individual risk to include the "high end" portions and "central tendency" of the risk distribution. One way of fulfilling this preference, if either cancer or noncancer risk exceeds cancer risk greater than 1E-4 or target organ-specific HI greater than 1, is to re-calculate the ILCRs or HIs using CT values for as many intake model variables as possible. In contrast to the RME evaluation, which prevails in RAs and uses upper-end values for intake or contact rates, exposure frequency and exposure duration, the CT evaluation uses average or midrange values for these variables (U.S. EPA, 1991a). The intent is to present a quantified risk/hazard estimate more typical for the receptor of interest.

Another method of quantifying uncertainty, called Monte Carlo simulation, provides a more graphic illustration of the uncertainty associated with a risk/hazard estimate, because it presents the risk as a range with probability densities. To be meaningful, however, Monte Carlo simulation requires that the nature of the distributions of the variables that drive the risk assessment be well characterized. However, well characterized distributions are available for few exposure or toxicological variables, in which case the Monte Carlo simulation provides an incomplete or potentially misleading illustration of the magnitude or the distribution of the uncertainty.

Because of the limitations of the CT and Monte Carlo procedures, the uncertainty analysis consists of a qualitative discussion of the sources of uncertainty and their impact on the estimated risk results and their interpretation, as described below.

Sampling and Analytical Limitations. It is not possible to completely characterize the nature and extent of contamination on any site. Uncertainties arise from limits on the number of locations that can be sampled. The sampling protocol used at 2BG, however, was designed to optimize efficiency of the sampling effort and reduce uncertainty by focusing on areas around former process buildings, storage structures, and potential transfer piping. The sampling appears to be sufficient to show that the contamination is largely limited to soil.

The major contaminants in deep groundwater are metals and volatile organic compounds to include benzene, toluene, ethyl benzene, total xylenes, (BTEX), acetone, and bromomethane. Detection of metals in groundwater appears to be associated with sediment entrained in the samples. Specifically, samples with elevated turbidity had higher metals detections, while concentrations of metals in samples with low turbidity levels and filtered samples had low concentrations or were nondetect. BTEX may also be associated with background due to the presence of natural petroleum-derived compounds present in the vicinity of PBOW. Acetone, and bromomethane may be an artifact of the analytical process caused by laboratory equipment (off-gasing of o-rings), but could not be eliminated during data validation.

Selection and Quantification of Chemicals of Potential Concern. Uncertainty associated with the processes used to identify COPCs and estimate EPCs arises from the following:

1. Identifying background chemicals. Metals are judged to be present at concentrations comparable to background if the MDC does not exceed the BSC, or if statistical testing demonstrates that the site data and background data are drawn from the same population. Statistical testing of site data versus background was not performed for this RA. All inorganic constituents detected in environmental media were carried through the risk assessment to provide a conservative estimate of potential risks associated with exposure to site media. The MDCs or UCL_{95} for all metals in soils were generally below their respective background criteria for all risk drivers with the exception of lead. Some organic chemicals, such as PAHs, may be considered to be anthropogenic background. A limited number of PAHs were identified in soil and sediment at 2BG. There are no site-specific background data for the PAHs, and several were selected as COCs. PAH concentrations at 2BG fall within global background levels for urban areas compiled by the Agency for Toxic Substances and Disease Registry (ATSDR) (1997). Given the rationale for their presence, PAHs may be considered site-related compounds in soil at 2BG. However, PAHs were not risk drivers at Site 2BG.

2. Estimated EPCs are uncertain. For statistical purposes, if a constituent was positively identified at a site and had at least a single positive hit, all the samples with nondetects were assumed to have a value equal to half the reporting limit and were included in the data set. These procedures may introduce a conservative bias into the risk assessment. Computed UCL_{95} values are only estimates of the actual upper confidence limits associated with each data set. Examples of factors affecting the uncertainty of these estimates include the number of samples, proportion of nondetects, conformance with an assumed mathematical distribution, imprecision of laboratory data, elevated detection limits (from dilutions, matrix interference, etc.), and statistical methodology. The confidence of computed UCLs for this project have been qualitatively evaluated and identified as high, moderate, low and indeterminate. For indeterminate data sets, the MDC was used for the UCL.

3. A limited number of samples may not completely characterize the site because they provide less information about the population from which they are drawn than do larger sample sets. Accordingly, small sets tend to have a greater variability, which results in the calculation of wide confidence intervals on the mean concentration and high EPCs. In some cases, the UCL_{95} was greater than the maximum value; thus, the maximum value was chosen as the EPC. High confidence limits may introduce a conservative bias into the risk assessment.

4. Laboratory analytical techniques have a degree of uncertainty associated with them. These uncertainties are documented by using data qualifiers to reflect the degree of certainty of measurement. For example, some data were estimated (e.g., J-qualified), while other data were rejected (i.e., R-qualified). The direction of bias is unclear.

5. Per U.S. EPA (1992a) guidance, the UCL_{95} was used for the EPC. Therefore, the exposure assessment is likely to underestimate the EPCs in 5 percent of the cases and overestimate exposures in 95 percent of cases, imparting an overall conservative bias to the risk assessment.

Selection of Hypothetical Receptors and Potential Exposure Pathways. The exposure scenarios chosen for evaluation address plausible receptors for the current and projected future site uses previously described. Although the specific uses to which the sites may be put are not entirely certain, the general categories (industrial, recreational, residential) are comprehensive and fairly standard. The receptor scenarios selected for evaluation include the most intensely exposed for each general site-use category; therefore, uncertainty regarding the specific uses has no meaningful effect on interpretation of the RA. For example, the groundskeeper represents the upper bound on exposure for any industrial application. The indoor worker represents the upper bound on any worker indoor exposure, particularly relevant for VOCs that may gain entrance to a building from subsurface soil. The construction worker represents the upper bound on short-term exposure to soil, regardless of the nature of a construction project. The hunter represents a plausible scenario for recreational site use and indirect (food-chain) exposure. Finally, the on-site resident represents the upper bound for residential site use. The resident is generally considered to represent the upper bound for any standard site use.

Another source of uncertainty in the receptor scenarios is the decision not to quantify intake or uptake from certain exposure routes. For example, inhalation of VOCs in outdoor air that volatilized from subsurface soil by the groundskeeper, indoor worker, and hunter is not quantified. It is assumed that overlying soil would attenuate emissions and that the large volume of outdoor air and natural air currents would dilute concentrations in the breathing zone to toxicologically insignificant levels. This assumption is based on considerable experience with volatilization models, and is consistent with the assumption applied by U.S. EPA (2004b) in developing PRGs for soil. VOCs were generally not detected in surface or subsurface soil at 2BG. Where VOCs were detected, their concentrations were below the Region 9 PRGs (U.S. EPA 2004a) and none were selected as COPCs, further reducing concern that a potentially significant exposure pathway was not evaluated.

As another example, the groundskeeper and hunter were not evaluated for exposure to sediment, even though these receptors spend most of their time outdoors. Since contact with surface water would not be part of their normal activities, it is assumed that any exposure would be sporadic and would not readily lend itself to quantification. Also, such exposures should be viewed as repeated acute rather than chronic, which does not fit the U.S. EPA (1989a) paradigm or the toxicity values developed for an RA.

The indoor worker was not evaluated for inhalation of airborne dust or VOCs from surface soil or for dermal contact with surface soil because these exposure routes are expected to be less significant than incidental ingestion which is quantified. The decision not to quantify inhalation and dermal exposure imparts a non-conservative bias to the RA. However, inhalation and dermal contact were quantified for the groundskeeper, who would be more intensely exposed by

these routes. Risk estimates for the groundskeeper from inhalation exposure were negligible. Similarly, as stated above, VOCs were generally not detected in surface or subsurface soil at 2BG. Where VOCs were detected, their concentrations were below the Region 9 PRGs (U.S. EPA 2004a) and none were selected as COPCs, further reducing the possibility that a potentially significant exposure pathway was not evaluated. Therefore, it is assumed that inhalation exposure would be negligible for the indoor worker as well, and that the decision not to quantify this route had no meaningful effect on the outcome of the RA or its interpretation.

Other plausible receptors include office workers, delivery personnel, and resident farmers. These receptors would be less intensively exposed to soil than the groundskeeper; therefore, their exposures were not evaluated. Much of the land around PBOW is used for agriculture, and it is possible that areas of PBOW could be farmed in the future. However, experience has shown that risk from ingestion of home-grown grains, fruits, meat, poultry, eggs, or milk is generally insignificant compared with direct exposure pathways, except for dioxin/furan compounds; therefore, indirect food-chain exposures are not evaluated. Additionally, the increased exposure to soil and ingestion of beef are adequately represented by the evaluations of groundskeeper and ingestion of venison scenarios, respectively.

The uncertainty associated with dermal exposure is not as clear. Dermal risk estimates for the groundskeeper were at the low end of the cancer risk range of 1E-6 to 1E-4 at 2BG. It is expected that the intensity of dermal exposure to soil would be much less for an indoor worker than an outdoor worker. However, dermal exposure parameters were not developed for the indoor worker to test this assumption. Therefore, the decision not to evaluate dermal exposure represents a source of uncertainty that has not been quantified.

The hunter was not evaluated for inhalation of dust from surface soil because this receptor would be expected to spend most of his time on vegetated soil, and because inhalation exposure would be expected to be far less than incidental ingestion of soil, which was quantified. However, inhalation is quantified for the groundskeeper, who would be more intensely exposed. Estimated risk for the groundskeeper from inhalation exposure was negligible. Therefore, it was assumed that inhalation exposure would be negligible for the hunter as well and that the decision not to quantify this route had no meaningful effect on the outcome of the RA or its interpretation.

Quantification of Intakes. Ingestion rates, inhalation rates, EDs, and EFs were based on upper-bound values (U.S. EPA, 1989a, 1991a), even though it is likely that serial multiplication of conservative variable values leads to gross overestimation of COPC intakes (Cogliano, 1997).

Toxicity Assessment. Considerable uncertainty is associated with the qualitative (hazard assessment) and quantitative (dose-response) evaluations of a toxicity assessment. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination (U.S. EPA, 1986). Positive animal cancer test data suggest that humans also contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of noncancer effects, positive animal data suggest the nature of the effects (i.e., the target tissues and type of effects) anticipated in humans (U.S. EPA, 1989b).

There are many sources of uncertainty in the dose-response evaluation for cancer (i.e., computation of an SF or unit risk) and noncancer effects (i.e., computation of an RfD). First, there is uncertainty regarding interspecies (animal-to-human) extrapolation which, in the absence of quantitative pharmacokinetic, dosimetric, or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Second, there is uncertainty regarding intraspecies or individual variation. Most toxicity experiments are performed with animals that are very similar in age and genotype, so that intragroup biological variation is minimal, but the human population of concern may reflect wide heterogeneity including unusual sensitivity to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly and those not unusually sensitive to the COPC are likely to be occupationally exposed. Third, uncertainty arises from expansion from short-term to lifetime exposure such as the construction worker and child on-site resident. Additional uncertainty arises from the potential for children to be more sensitive than adults. Finally, the quality of the key study from which the quantitative estimate is derived and of the database contributes to uncertainty. For cancer studies, the uncertainty associated with some quality factors (e.g., study group size) is expressed within the 95 percent upper-bound of the SF. For noncancer effects, additional uncertainty factors may be applied in the derivation of the RfD to reflect poor quality of the key study or gaps in the database.

Another source of uncertainty regarding quantitative risk estimation for carcinogenicity is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in most quantitative estimates of human cancer risk from animal data (e.g., PAHs, PCBs), is based on a non-threshold assumption of carcinogenesis. An impressive body of evidence, however, suggests that epigenetic carcinogens as well as many genotoxic carcinogens, have a threshold below which they are noncarcinogenic (Gold, et al., 1992). Therefore, the use of the linearized multistage model is ultraconservative for chemicals that exhibit a threshold for carcinogenicity.

A further source of uncertainty for noncancer effects arises from use of an effect level in the estimation of an RfD or RfC, because this estimation is predicated on the assumption of a threshold below which adverse effects are not expected. Therefore, an additional uncertainty factor is usually applied to estimate a no-effect level. Additional uncertainty arises from estimating RfD values for chronic exposure from less-than-chronic data. Unless empirical data indicate that effects do not worsen with increasing duration of exposure, an additional uncertainty factor is applied to the no-effect level in the less-than-chronic study. Uncertainty also arises from the presence of chemicals (e.g., lead) for which there are no U.S. EPA-approved toxicity values, and for which quantitative risk characterization is not possible. However, the adult blood-lead model and the IEUBK are supported by a considerable body of empirical data, and are considered to be among the best validated of the various models used in risk assessment. In summary, the U.S. EPA methodology for both cancer and noncancer toxicity evaluation is intentionally designed to be protective. However, the extent to which toxicity values may overestimate toxic potency is not clear, and it is possible that the toxicity values for some compounds may not be adequately protective.

Risk Characterization. Risk characterization is the process of quantifying the risk of cancer due to exposure to carcinogens, as well as quantitatively evaluating hazards potentially posed by exposure to noncarcinogenic toxicants. Cancer risk is assumed to be additive for all carcinogens. Noncancer risk is assumed to be additive for chemicals with similar sites of

toxicological action. In the event that any combination of these chemicals results in synergistic effects, risk might be underestimated. Conversely, the assumption of additivity would overestimate risk if a combination of these chemicals acted antagonistically or had no combined toxic effect at all.

7.0 SUMMARY AND CONCLUSIONS

This section briefly summarizes the RA protocol and results and interprets the results, in light of the uncertainty associated with their estimation, to draw realistic conclusions regarding risk to human health.

PBOW is currently classified for industrial use, but future residential use was considered in the risk assessment to support evaluation of all plausible receptor scenarios. Groundskeeper, construction worker, and hunter scenarios were evaluated under the current site-use assumptions. Groundskeeper, construction worker, indoor worker, hunter (including a child venison consumer), and on-site residential scenarios were evaluated as plausible future exposure scenarios. The groundskeeper was evaluated for exposure to surface soil. The construction worker was evaluated for exposure to surface and subsurface soil, and sediment. The adult hunter was evaluated for exposure to surface soil by direct contact and indirectly by ingestion of venison (deer graze vegetation growing on contaminated soil). The indoor worker was evaluated for exposure to surface and subsurface soil, and groundwater. The on-site resident was evaluated as the upper bound on exposure to surface and subsurface soil, groundwater, and sediment.

7.1 Sampling and Analysis

Surface and subsurface soil samples were taken from the areas around each of the former process buildings where contamination was thought to have been possible. Sediment samples were taken from the drainage ditches that border the site. Surface water samples were not collected as the drainage ditches were dry at the time of sampling. Groundwater samples were collected from monitoring wells at the site.

The analytical results revealed that the soil contains explosives, 2,3,7,8-TCDD (inside the burn area only), metals, PCBs, and PAHs at concentrations exceeding the Region 9 PRGs (U.S. EPA 2004a); consequently, they were selected as COPCs. Pesticides, VOCS, and SVOCs were not selected as COPCs in soils.

Contaminants detected in deep groundwater were metals and a limited number of PAHs and VOCs (BTEX and few other VOCs). Explosives and PCBs were not detected in groundwater. Detection of metals in groundwater appears to be associated with sediment entrained in the samples. Specifically, samples with elevated turbidity had higher metals concentrations while samples with low turbidity levels had low concentrations or were nondetects. Certain VOCs (primarily BTEX) may be associated with background due to the presence of natural petroleum-derived compounds present in the vicinity of PBOW. Other VOCs may be artifacts of the analytical process at the laboratory, but they could not be eliminated during data validation.

Sediment samples at 2BG had elevated concentrations of 2,3,7,8-TCDD and PAHs.

7.2 Risk Assessment Results

Risk assessment results are presented for the burn area (Section 7.2.1), outside the burn area (Section 7.2.2), and for groundwater and sediments.

7.2.1 Risk Results for the Burn Area

A risk characterization was completed for the burn area. Surface soil and subsurface soil data collected from within the burn area were used to characterize potential human health risk. Bedrock groundwater from across the entire 2BG site was also used to address burn area risks. Sediment data was not used for the assessment of the burn area because no sediment data was collected from within the burn area.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil inside the burn area. The total HI estimate for the groundskeeper receptor was 12. (Table 5-1). The HI exceeds the threshold for noncancer effects with the primary COC driving the HI being 2,4,6-trinitrotoluene. The total ILCR estimate for the groundskeeper receptor was 7.8E-5. The COCs for the ILCR were 2,4,6-trinitrotoluene, DNT mixtures, polychlorinated biphenyl (PCB)-1260, and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in surface soil.

Total HI estimates for the adult hunter and the adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 5.8E-6. The primary COC for the ILCR was 2,4,6-trinitrotoluene from the ingestion of surface soil. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface and subsurface soil inside the burn area. The total HI estimate summed across all media for the construction worker receptor was 187 (Table 5-1). The COC driving the elevated HI in surface and subsurface soils within the burn area was 2,4,6-trinitrotoluene. The total ILCR estimate summed across all media for the construction worker was 2.7E-5. The COCs driving the ILCR were 2,4,6-trinitrotoluene in surface and subsurface soils and 2,3,7,8- TCDD in subsurface soil.

The indoor worker was evaluated for exposure to surface soil and groundwater. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 5.9, respectively (Table 5-1). The ILCR for groundwater and surface soil were 1.7E-3 and 3.8E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater, and 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8- TCDD, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in subsurface soils.

The adult and child residential receptors were evaluated for exposure to surface and subsurface soil associated within the burn area and groundwater across the site. HI sums for groundwater and surface and subsurface soil were 129 and 892 for the adult and child, respectively (Table 5-1). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface and subsurface soil COCs driving the adult HI were 2,4,6-trinitrotoluene and 2,4-dinitrotoluene (subsurface soil only). For the residential child, groundwater COCs driving the HI are total arsenic, total iron, total manganese, total thallium, and benzene. Surface and subsurface soil COCs factoring into the elevated HI include 2,4,6-trinitrotoluene in surface soil and 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2,4,6-trinitrotoluene, and PCB-1254 in subsurface soils within the burn area.

The total ILCR estimates summed for groundwater and surface and subsurface soil within the burn area for adult and child residential receptors were 5.1E-3 and 2.8E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for

both the residential adult and child. The surface soil COCs for the burn area ILCR were 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the adult and 2,4,6-trinitrotoluene, DNT mixtures, 2,3,7,8-TCDD, and PCB-1260 for the child. The subsurface soil COCs were 2,4,6-trinitrotoluene and 2,3,7,8-TCDD for the adult and 2,4,6-trinitrotoluene, 2,3,7,8-TCDD, and PCB-1254 and PCB-1260 for the child. Vapor intrusion into dwellings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

7.2.2 Outside Burn Area Risk Results

A risk characterization was completed for areas outside the burn area. Surface soil, subsurface soil, and sediment data collected from outside of the burn area were used to characterize potential human health risk. Bedrock groundwater data from across the entire 2BG site were also used to address burn area risks.

The groundskeeper, hunter, and child venison consumer were evaluated for exposure only to surface soil from areas outside and adjacent to the burn area. The total HI estimate for the groundskeeper receptor was 1.2 (Table 5-2). The primary COC driving the HI for the groundskeeper was 2,4,6-trinitrotoluene. The total ILCR estimate for the groundskeeper receptor exposed to soil outside the burn area was 3.0E-5. The COCs for the ILCR were 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260. Total HI estimates for the adult hunter, and adult and child venison consumer receptors were below the threshold limit of 1. The total ILCR estimate for the adult hunter was 1.4E-6. The primary COCs were 2,4,6-trinitrotoluene and PCB-1260 from the ingestion of surface soil while the adult was hunting. Total ILCR estimates for the adult and child venison consumer receptors were below 1E-6, defined as the point of departure for significant contribution to cancer risk.

The construction worker was evaluated for exposure to surface, subsurface soil, and sediment outside the burn area. The total HI estimate summed across all media for the construction worker receptor outside the burn area was 4.7 (Table 5-2). The COC driving the elevated HI outside the burn area for surface and subsurface soils was 2,4,6-trinitrotoluene. The total ILCR estimate summed across all media (soils and sediment) for the construction worker receptor was 2.1E-6. The COC driving the ILCR was arsenic in subsurface soils. Surface soil and sediment COCs did not contribute significantly to the construction worker ILCR.

The indoor worker was evaluated for exposure to surface soil outside the burn area and groundwater across the site. Total HI estimates for the indoor worker for groundwater and surface soil were 15.5 and 0.6, respectively (Table 5-2). The COCs for the groundwater HI include total arsenic and benzene. The ILCR for groundwater and surface soil were 1.7E-3 and 1.0E-5, respectively. The COCs for the ILCR were arsenic and benzene in groundwater and 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260 in surface soil. Vapor intrusion into buildings from subsurface soil was not evaluated, as there were no VOCs detected in the subsurface soil.

The adult and child residential receptors were evaluated for exposure to outside the burn area surface soil, subsurface soil, sediment, and groundwater. The total HI estimates summed across all media for the adult and child residential receptors were 46 and 121 respectively (Table 5-2). The groundwater COCs driving the residential adult HI were total arsenic, total iron, and benzene. The surface soil COC driving the adult HI was 2,4,6-trinitrotoluene. The adult residential HI for both subsurface soil and sediment were below 1 and do not contribute significantly to the total HI estimate. For the residential child, groundwater COCs driving the HI

are total arsenic, total iron, total manganese, total thallium, and benzene. The surface soil and subsurface soil COCs for the residential child include 2,4,6-trinitrotoluene in surface soil and arsenic and iron in subsurface soils.

The total ILCR estimates summed for groundwater, surface and subsurface soil, and sediment outside the burn area for adult and child residential receptors were 5.0E-3 and 3.1E-3, respectively. The groundwater COCs driving the ILCR were total arsenic, benzo(a)anthracene, and benzene for both the residential adult and child. The ILCR surface soil COCs for the area outside the burn area include 2,4,6-trinitrotoluene, DNT mixtures, and PCB-1260 for both the residential adult and child. The subsurface soil COC is arsenic. Vapor intrusion into dwellings from subsurface soil was not evaluated as there were no VOCs detected in the subsurface soil.

7.3 Conclusions

Based on analytical results, metals, PAHs, explosives and PCBs appear to be widespread but generally at low concentrations in environmental media at 2BG, with isolated areas of elevated explosives or PCB contamination. 2,3,7,8-TCDD was also detected within the burn area but not outside the burn area.

Burn Area Conclusions

Inside the burn area, HIs for contamination in soil are less than one for an adult hunter, including an adult or child who consumes venison from deer harvested on site, suggesting that adverse effects from exposure are unlikely. Cancer risk for a groundskeeper or hunter, including an adult or child who consumes venison from deer harvested on site are within or below the cancer risk range of 1E-6 to 1E-4.

HIs for the indoor workers were greater than 1 based on exposure to surface soil inside the burn area (HI = 6). HIs also exceeded 1 for the construction worker, and adult and child residential receptors for exposure to surface soil inside the burn area. The primary contributor to the HIs was 2,4,6-TNT. Cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker and indoor worker, and just slightly above 1E-4 for the adult and child residential receptors. The primary contributor to the ILCRs was 2,4,6-TNT 2,3,7,8-TCDD, and PCB-1260.

HIs for construction workers and adult and child residential receptors exceeded 1 for exposure to subsurface soil inside the burn area. The primary contributor to the HIs was 2,4-DNT and 2,4,6-TNT. Cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker exposed to subsurface soil but exceeded the cancer risk range for the adult and child residential receptors. The primary contributor to the elevated ILCRs was 2,4,6-TNT for the adult and 2,4,6-TNT and 2,3,7,8-TCDD for the child resident.

Outside Burn Area Conclusions

Outside the burn area, HIs for contamination in soil are less than one for an adult hunter, including an adult or child who consumes venison from deer harvested on site, suggesting that adverse effects from exposure are unlikely. The HI for the groundskeeper minimally exceeded one. Cancer risk for a groundskeeper or hunter, including an adult or child who consumes venison from deer harvested on site are within or below the cancer risk range of 1E-6 to 1E-4.

HIs for the indoor worker were less than 1 based on exposure to surface soil outside the burn area. HIs exceeded 1 for the construction worker (HI = 3), and adult (HI = 1.6) and child (HI = 14.5) residential receptors for exposure to surface soil outside the burn area. The primary contributor to the HIs for these three receptors was 2,4,6-TNT. For surface soils outside the burn area, cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker, indoor worker, adult resident, and child resident.

HIs for construction workers (HI = 1.3) and resident child (HI = 5.3) exceeded 1 for exposure to subsurface soil outside the burn area. The primary contributor to the HIs was arsenic and iron. The HI for exposure to subsurface soil for adult resident was less than 1. Cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker, adult resident, and child resident exposed to subsurface soil.

Groundwater and Sediment Conclusions

HIs for the indoor workers and adult and child residential receptors exceeded 1 for exposure to groundwater. The primary contributor to the elevated HIs was total arsenic, total iron, and benzene. Cancer risk estimates were outside the cancer risk range of 1E-6 to 1E-4 for the indoor worker and adult and child residential receptors. The primary contributor to the elevated ILCRs was total arsenic and benzene.

Cancer risk estimates were within the cancer risk range of 1E-6 to 1E-4 for the construction worker and adult and child residential receptors for exposures to sediment.

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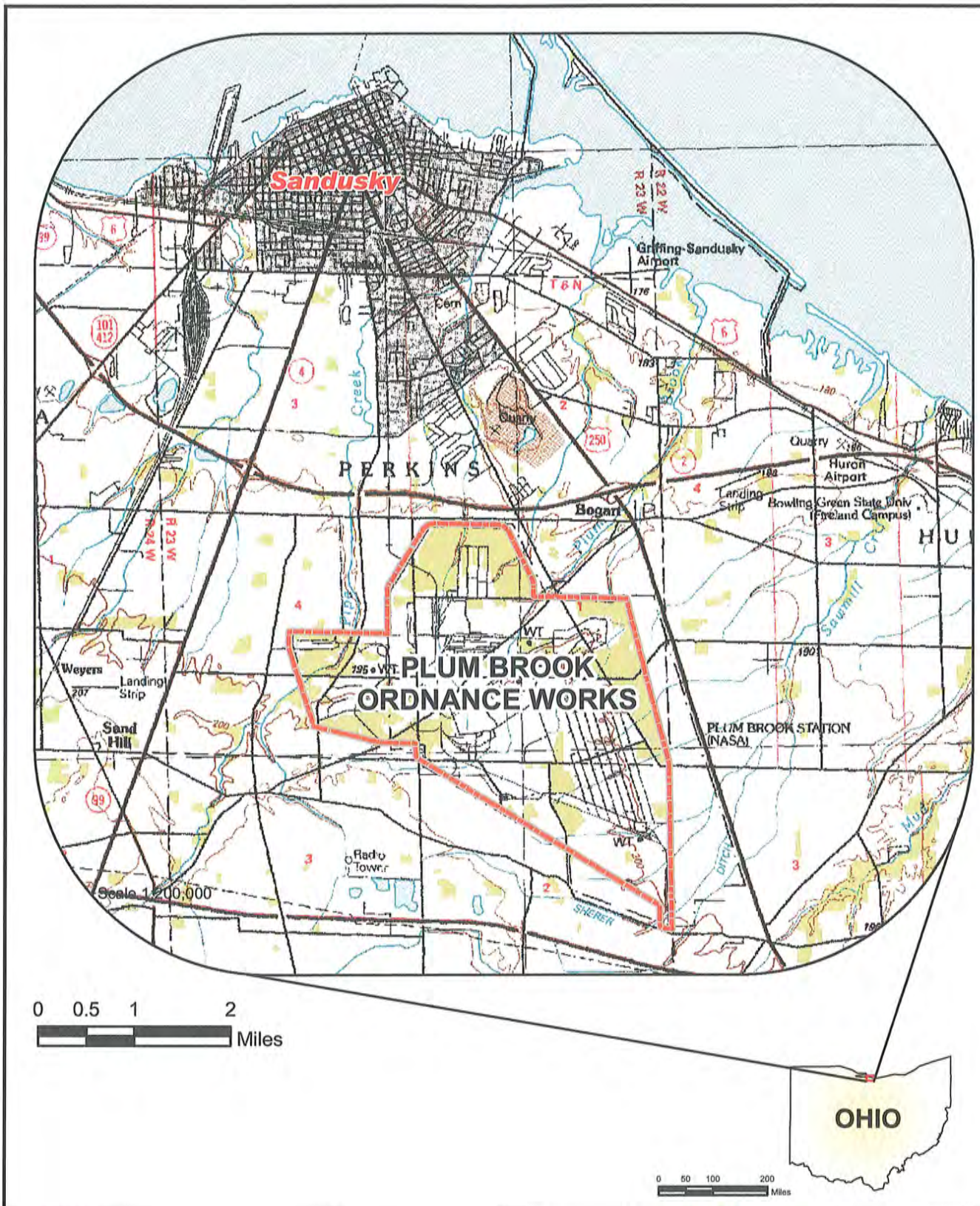
FIGURES



Legend

Plum Brook Ordnance Works Boundary

N

JACOBS

Location Map,
Plum Brook Ordnance Works
Sandusky, Ohio

Plumbrook Ordnance Works
Sandusky, Ohio

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Figure 1-1

1910000 0000 1920000 0000 1930000 0000

630000 0000

620000 0000

PENTOLITE AREA

ACID AREA #3

ACID AREA #2

RESERVOIR #2 BURNING GROUND

MAINTENANCE SHOP AREA

PENTOLITE ROAD RED WATER PONDS

UPPER TOLUENE TANKS AREA

TNT MANUFACTURING AREA A

ACID AREA #1

ADDITIONAL BURNING GROUND AREA

WEST AREA RED WATER PONDS

G-8 BURNING GROUND AREA

LOWER TOLUENE TANKS AREA

TNT MANUFACTURING AREA C

SNAKE ROAD BURNING GROUND AREA

TAYLOR ROAD BURNING GROUND AREA

TNT MANUFACTURING AREA B

PATROL ROAD

BOGART ROAD

PENTOLITE ROAD

MAINTENANCE ROAD

FOX ROAD

MAGAZINE ROAD

CENTER MAGAZINE ROAD

WEST SCHEID ROAD

EAST SCHEID ROAD

SCHEID DITCH

RANSOM BROOK

PLUM BROOK DITCH

LINDSLEY

SANDUSKY - NORWALK ROAD

PIPE CREEK

CAMPBELL STREET

TAYLOR CUT

SHORT ROAD

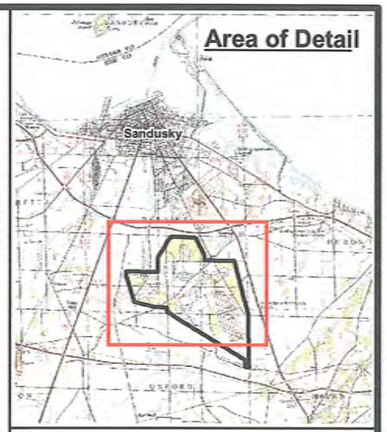
SNAKE ROAD

COLUMBUS AVE.

U.S. 250

TAFT ROAD

Area of Detail



Legend

Area of Concern

Creek, Ditch, Conveyance

N

0 2,000 4,000 Feet

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

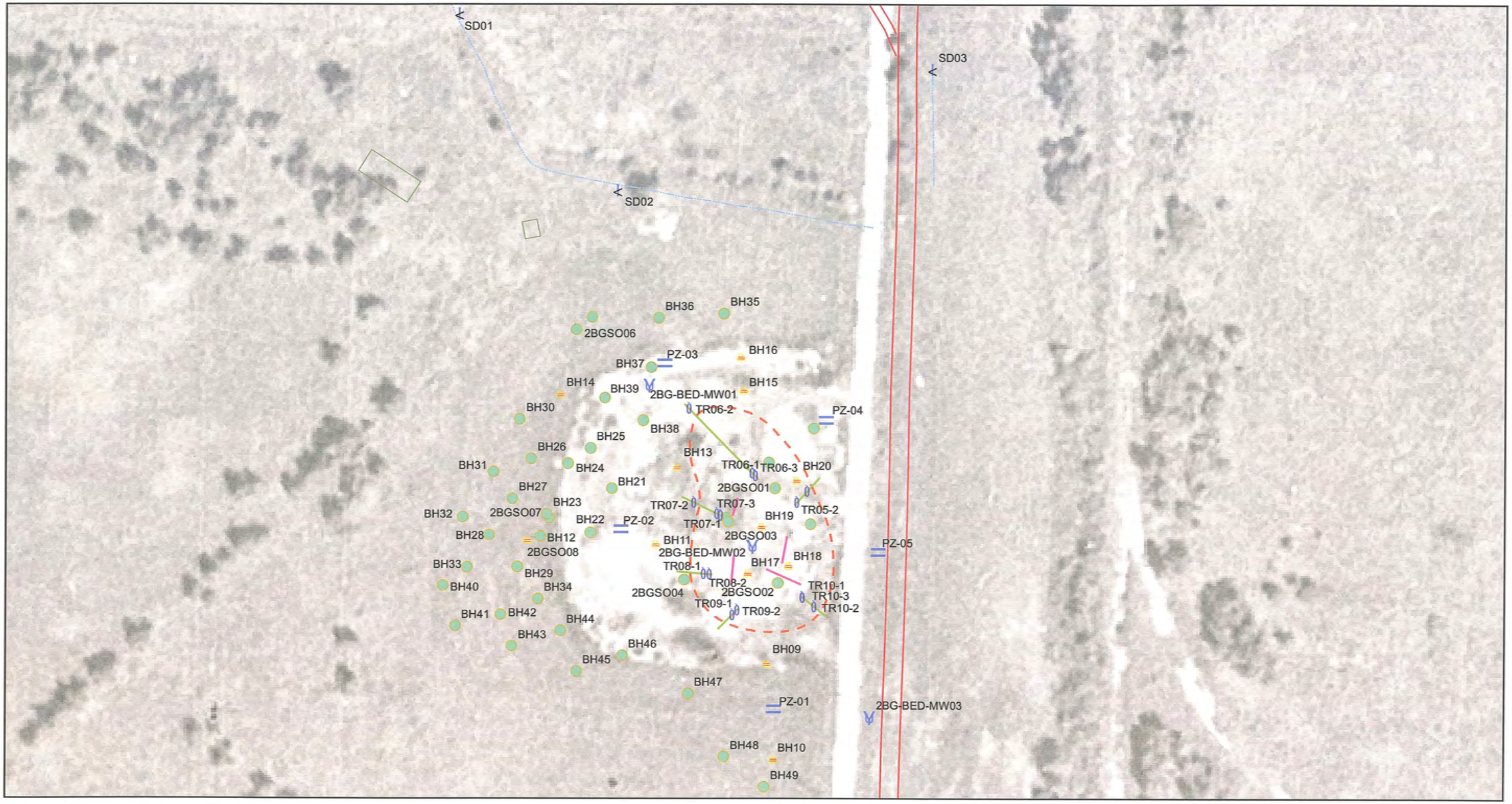
JE JACOBS

Location Map, Reservoir No. 2 Burning Ground

Plum Brook Ordnance Works
Sandusky, Ohio

07/19/07 LD S:/GIS/Projects/Plumbrook/Projects/AA2_3 HHRA/ArcGIS/AA3_Reservoir_2_BG.mxd

Figure 1-2


SD01
SD02
SD03
BH36
BH35
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PZ-03
BH16
BH37
BH14
BH39
2BG-BED-MW01
BH15
BH30
TR06-2
PZ-04
BH38
BH25
BH26
BH13
BH31
BH24
TR06-1
TR06-3
BH20
BH27
BH21
2BGSO01
BH23
TR07-2
TR07-3
BH32
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BH22
PZ-02
TR07-1
BH19
TR05-2
BH28
BH12
BH11
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PZ-05
2BGSO08
2BG-BED-MW02
BH17
BH18
BH33
TR08-1
BH29
TR08-2
TR10-1
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TR10-3
TR09-1
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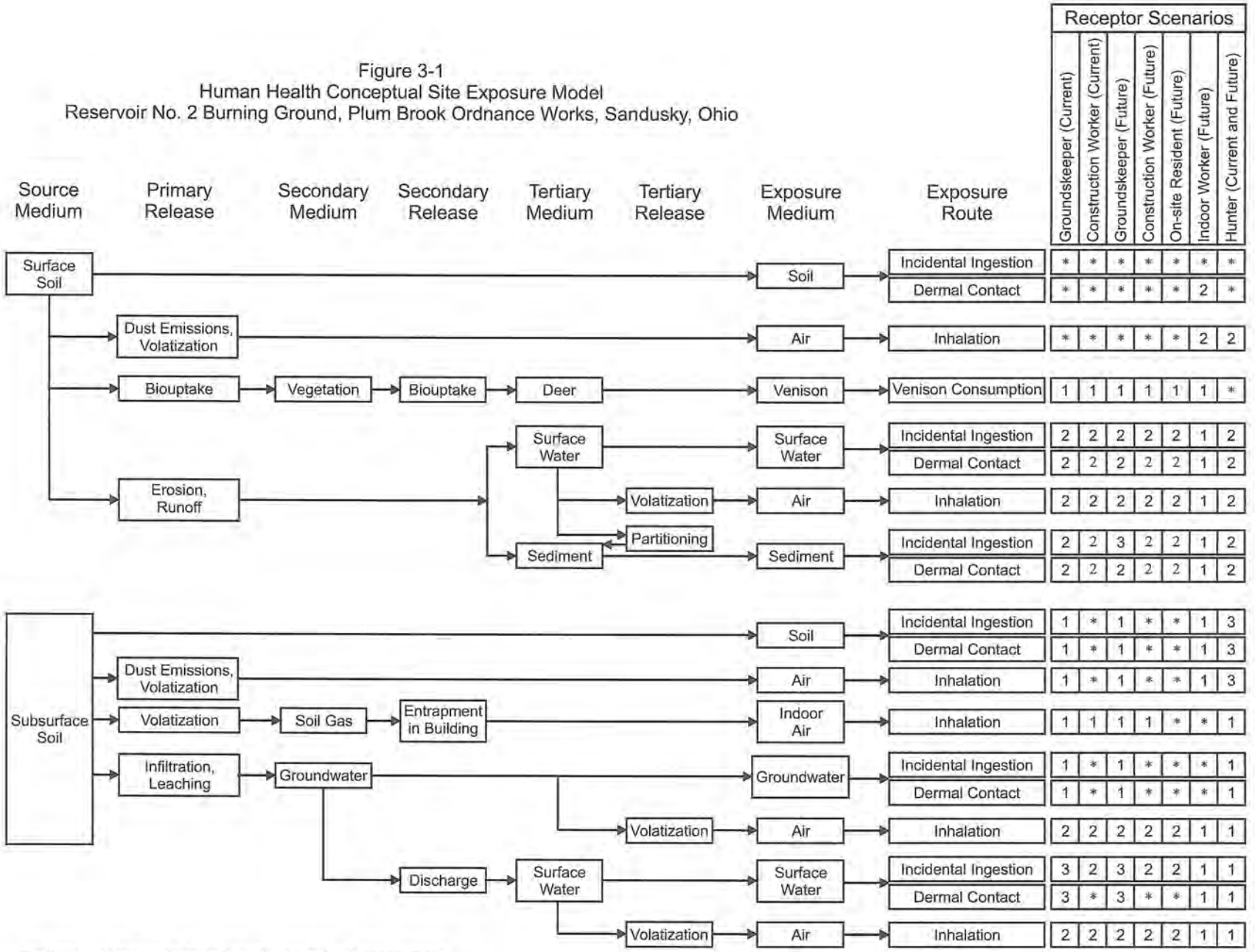
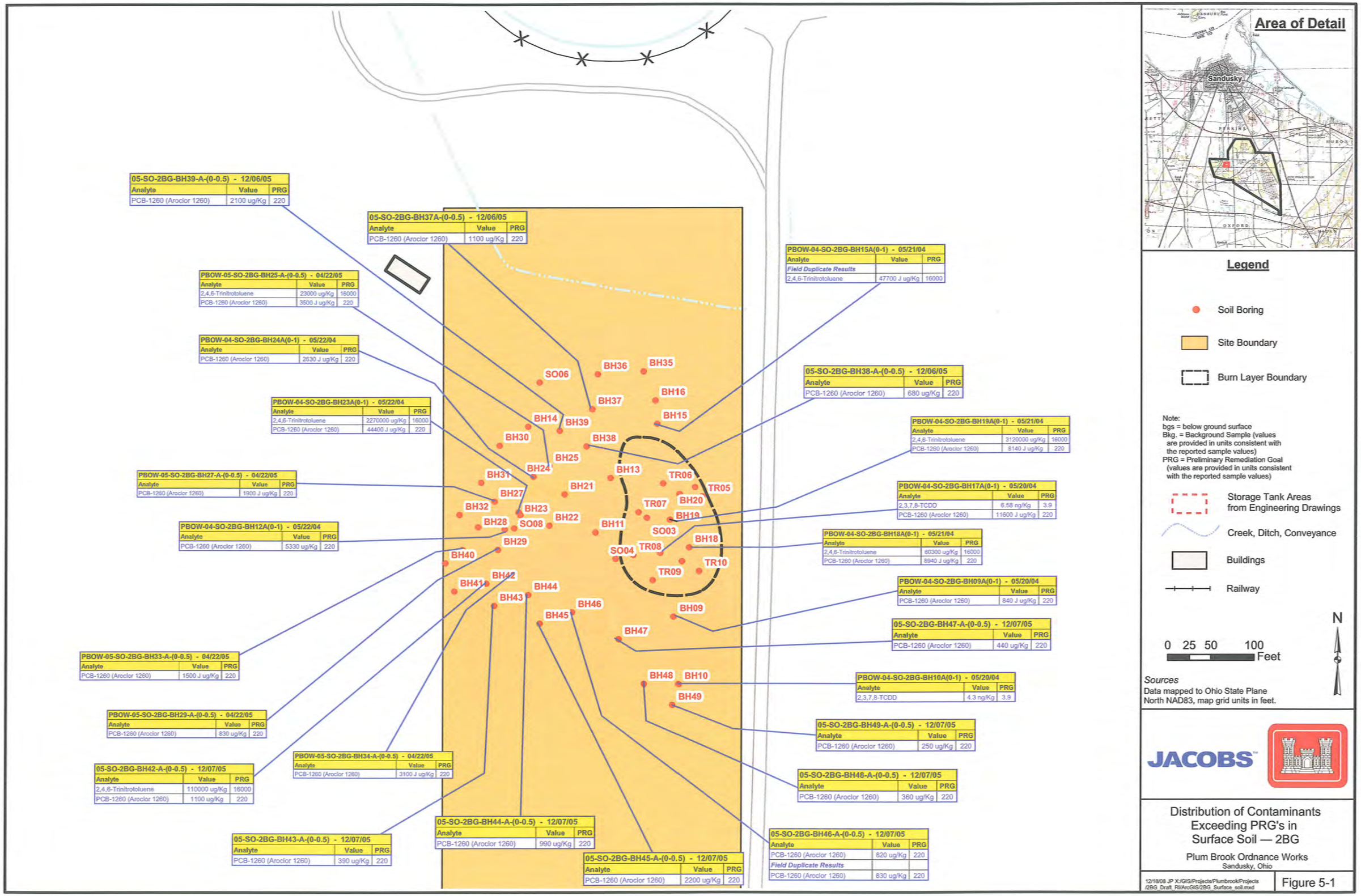
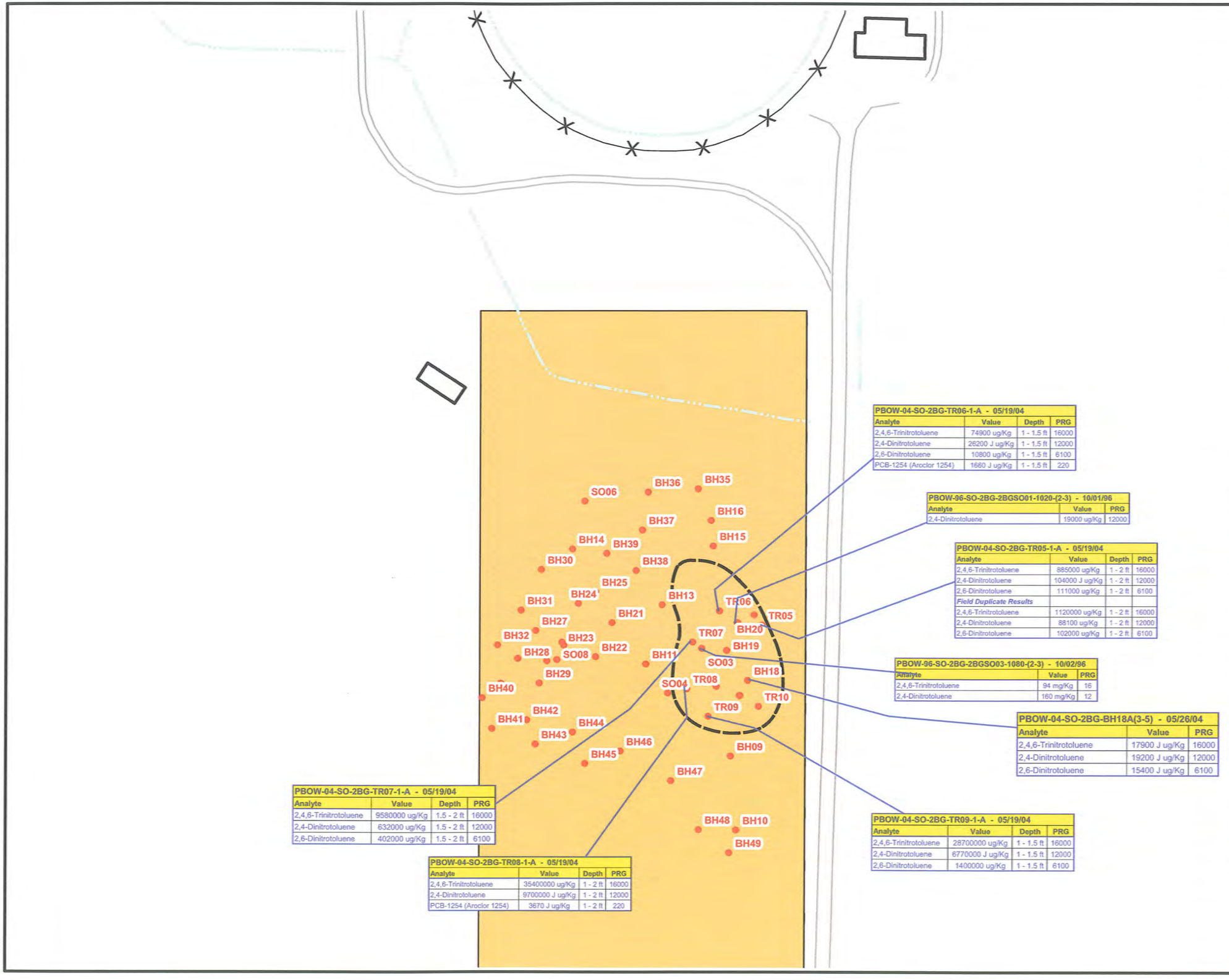
BH41
BH42
TR09-2
BH44
BH43
BH46
BH09
BH45
BH47
PZ-01
2BG-BED-MW03
BH48
BH10
BH49
Area of Detail
Legend
Creek, Ditch, Conveyance
Buildings
1997 Trenches
Jacobs Trenches 2004
Soil Samples
DPT Soil Samples
Soil Samples from Trenches
Monitoring Wells
Piezometers
Surface Water/Sediment Sampling Locations
0
50
100
200
Feet
Notes: Aerial Photography from 2005.
Data mapped to Ohio State Plane North NAD83, map units are feet.
3
JACOBS
Sampling Locations
Burning Ground Reservoir No. 2
Plum Brook Ordnance Works
Sandusky, Ohio
12/19/08 DMF S:/GIS/Projects/Plumbrook/Projects/ResNo2_BurningGround_RI_Report/ArcGIS/ResNo2GB_Sampling_Locs1.mxd
Figure 2-1

Figure 3-1
Human Health Conceptual Site Exposure Model
Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

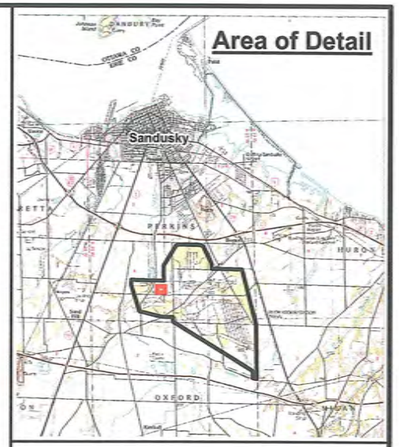


* = Complete exposure route quantified in the risk assessment.
1 = There is no plausible pathway for exposure in this medium.
2 = Although theoretically complete, this pathway in not quantified as explained in text.
3 = Contact with this medium, although plausible, is not part of this receptor's normal or expected activities; therefore, contact would be sporadic and is not quantified.


05-SO-2BG-BH39-A-(0-0.5) - 12/06/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 2100 ug/Kg | 220
05-SO-2BG-BH37A-(0-0.5) - 12/06/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 1100 ug/Kg | 220
PBOW-05-SO-2BG-BH25-A-(0-0.5) - 04/22/05
Analyte | Value | PRG
2,4,6-Trinitrotoluene | 23000 ug/Kg | 16000
PCB-1260 (Aroclor 1260) | 3500 J ug/Kg | 220
PBOW-04-SO-2BG-BH24A(0-1) - 05/22/04
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 2630 J ug/Kg | 220
PBOW-04-SO-2BG-BH23A(0-1) - 05/22/04
Analyte | Value | PRG
2,4,6-Trinitrotoluene | 2270000 ug/Kg | 16000
PCB-1260 (Aroclor 1260) | 44400 J ug/Kg | 220
PBOW-05-SO-2BG-BH27-A-(0-0.5) - 04/22/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 1900 J ug/Kg | 220
PBOW-04-SO-2BG-BH12A(0-1) - 05/22/04
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 5330 ug/Kg | 220
PBOW-05-SO-2BG-BH33-A-(0-0.5) - 04/22/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 1500 J ug/Kg | 220
PBOW-05-SO-2BG-BH29-A-(0-0.5) - 04/22/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 830 ug/Kg | 220
05-SO-2BG-BH42-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
2,4,6-Trinitrotoluene | 110000 ug/Kg | 16000
PCB-1260 (Aroclor 1260) | 1100 ug/Kg | 220
PBOW-05-SO-2BG-BH34-A-(0-0.5) - 04/22/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 3100 J ug/Kg | 220
05-SO-2BG-BH43-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 390 ug/Kg | 220
05-SO-2BG-BH44-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 990 ug/Kg | 220
05-SO-2BG-BH45-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 2200 ug/Kg | 220
PBOW-04-SO-2BG-BH15A(0-1) - 05/21/04
Analyte | Value | PRG
Field Duplicate Results
2,4,6-Trinitrotoluene | 47700 J ug/Kg | 16000
05-SO-2BG-BH38-A-(0-0.5) - 12/06/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 680 ug/Kg | 220
PBOW-04-SO-2BG-BH19A(0-1) - 05/21/04
Analyte | Value | PRG
2,4,6-Trinitrotoluene | 3120000 ug/Kg | 16000
PCB-1260 (Aroclor 1260) | 8140 J ug/Kg | 220
PBOW-04-SO-2BG-BH17A(0-1) - 05/20/04
Analyte | Value | PRG
2,3,7,8-TCDD | 6.58 ng/Kg | 3.9
PCB-1260 (Aroclor 1260) | 11600 J ug/Kg | 220
PBOW-04-SO-2BG-BH18A(0-1) - 05/21/04
Analyte | Value | PRG
2,4,6-Trinitrotoluene | 60300 ug/Kg | 16000
PCB-1260 (Aroclor 1260) | 8940 J ug/Kg | 220
PBOW-04-SO-2BG-BH09A(0-1) - 05/20/04
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 840 J ug/Kg | 220
05-SO-2BG-BH47-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 440 ug/Kg | 220
PBOW-04-SO-2BG-BH10A(0-1) - 05/20/04
Analyte | Value | PRG
2,3,7,8-TCDD | 4.3 ng/Kg | 3.9
05-SO-2BG-BH49-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 250 ug/Kg | 220
05-SO-2BG-BH48-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 360 ug/Kg | 220
05-SO-2BG-BH46-A-(0-0.5) - 12/07/05
Analyte | Value | PRG
PCB-1260 (Aroclor 1260) | 820 ug/Kg | 220
Field Duplicate Results
PCB-1260 (Aroclor 1260) | 830 ug/Kg | 220
SO06
BH36
BH35
BH37
BH16
BH14
BH39
BH15
BH30
BH38
BH25
BH24
BH13
TR06
TR05
BH31
BH21
BH27
TR07
BH20
BH32
BH23
BH19
BH28
SO08
BH22
BH11
SO03
BH18
BH29
SO04
TR08
BH40
TR10
TR09
BH41
BH42
BH44
BH43
BH46
BH09
BH45
BH47
BH48
BH10
BH49
Area of Detail
Sandusky
Legend
Soil Boring
Site Boundary
Burn Layer Boundary
Note:
bgs = below ground surface
Bkg. = Background Sample (values are provided in units consistent with the reported sample values)
PRG = Preliminary Remediation Goal (values are provided in units consistent with the reported sample values)
Storage Tank Areas from Engineering Drawings
Creek, Ditch, Conveyance
Buildings
Railway
N
0 25 50 100 Feet
Sources
Data mapped to Ohio State Plane North NAD83, map grid units in feet.
JACOBS
Distribution of Contaminants Exceeding PRG's in Surface Soil — 2BG
Plum Brook Ordnance Works
Sandusky, Ohio
12/18/08 JP X:/GIS/Projects/Plumbrook/Projects/2BG_Draft_RI/ArcGIS/2BG_Surface_soil.mxd
Figure 5-1



Area of Detail



Legend

- Soil Boring
- Site Boundary
- Burn Layer Boundary

Note:
bgs = below ground surface
Bkg. = Background Sample (values are provided in units consistent with the reported sample values)
PRG = Preliminary Remediation Goal (values are provided in units consistent with the reported sample values)

- Storage Tank Areas from Engineering Drawings
- Creek, Ditch, Conveyance
- Buildings
- Railway

N

0 25 50 100 Feet

Sources
Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS™

Distribution of Contaminants Exceeding PRG's in Subsurface Soil — 2BG

Plum Brook Ordnance Works
Sandusky, Ohio

12/18/08 JP X:/GIS/Projects/Plumbrook/Projects /2BG_Draft_RI/ArcGIS/2BG_Subsurface_soil.mxd

Figure 5-2

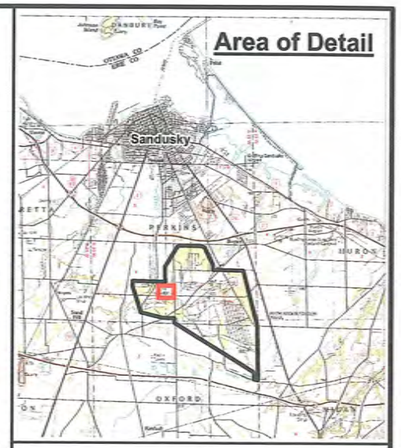
PBOW-04-SD-2BG-SD01-A - 05/23/04		
Analyte	Value	PRG
Benzo(a)pyrene	126 NJ ug/Kg	62

PBOW-04-SD-2BG-SD03-A - 05/23/04		
Analyte	Value	PRG
Benzo(a)pyrene	1590 NJ ug/Kg	62

PBOW-04-SD-2BG-SD02-A - 05/23/04		
Analyte	Value	PRG
Benzo(a)pyrene	178 NJ ug/Kg	62
Field Duplicate Results		
Benzo(a)pyrene	234 NJ ug/Kg	62

SD-01
SD-02
SD-03
PZ-01
PZ-02
PZ-03
PZ-04
PZ-05
MW-01
MW-02
MW-03

Area of Detail



Legend

- Surface Water or Sediment Sampling Locations
- Monitoring Wells
- Piezometers
- Site Boundary
- Burn Layer Boundary

Note:
bgs = below ground surface
Bkg. = Background Sample (values are provided in units consistent with the reported sample values)
PRG = Preliminary Remediation Goal (values are provided in units consistent with the reported sample values)

- Storage Tank Areas from Engineering Drawings
- Creek, Ditch, Conveyance
- Buildings
- Railway

0 50 100 200 Feet

N

Sources
Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS™

Distribution of Contaminants Exceeding PRG's in Sediment — 2BG

Plum Brook Ordnance Works
Sandusky, Ohio

12/18/08 JP X:/GIS/Projects/Plumbrook/Projects/2BG_Draft_RI/ArcGIS/2BG_sediment.mxd

Figure 5-3

SD-01

SD-03

SD-02

PZ-03

PZ-04

MW-01

PZ-02

PZ-05

MW-02

PZ-01

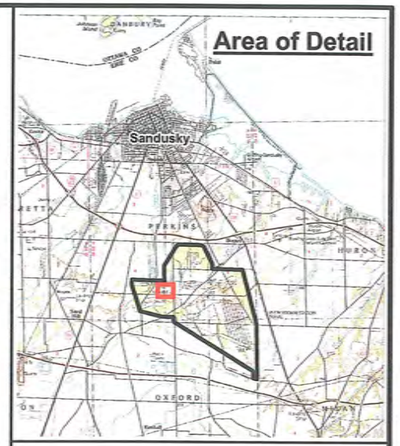
MW-03

2BG-BED-MW01 1/28/2005			
Analyte	Value	PRG	Bkg
Arsenic (total)	221.0000 ug/L	0.045	7.4
Iron (total)	27300.0000 ug/L	1100	1550
Manganese (total)	1020.0000 ug/L	88	636
Thallium (total)	2.3000 J ug/L	0.24	

2BG-BED-MW02 1/31/2005			
Analyte	Value	PRG	Bkg
Arsenic (total)	45.3 ug/L	0.045	7.4
Benzene	2460 ug/L	0.35	
Iron (total)	14900 ug/L	1100	1550
Manganese (total)	678 ug/L	88	636
Thallium (total)	0.36 J ug/L	0.24	

2BG-BED-MW03 1/31/2005			
Analyte	Value	PRG	Bkg
Arsenic (total)	72.6000 ug/L	0.045	7.4
Benzene	1510.0000 ug/L	0.35	
Benzo(a)anthracene	0.293 NJ ug/L	0.092	
Iron (total)	3590.0000 ug/L	1100	1550

Area of Detail



Legend

- Surface Water or Sediment Sampling Locations
- Monitoring Wells
- Piezometers
- Site Boundary
- Burn Layer Boundary

Note:
bgs = below ground surface
Bkg. = Background Sample (values are provided in units consistent with the reported sample values)
PRG = Preliminary Remediation Goal (values are provided in units consistent with the reported sample values)

- Storage Tank Areas from Engineering Drawings
- Creek, Ditch, Conveyance
- Buildings
- Railway

N

0 50 100 200 Feet

Sources
Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS™

Distribution of Contaminants Exceeding PRG's in Groundwater — 2BG

Plum Brook Ordnance Works
Sandusky, Ohio

12/18/08 JP X:/GIS/Projects/Plumbrook/Projects/2BG_Draft_RI/ArcGIS/2BG_groundwater.mxd

Figure 5-4

TABLES

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
Inside the Burn Area												
Surface Soil												
DIO	2,3,7,8-TCDD TEQ	1	1	100	ng/Kg		127	127	127			YES
HE	1,3,5-Trinitrobenzene	7	2	29	ug/Kg	125 - 50000	686	5640	5,707		180,000	
HE	2,4,6-Trinitrotoluene	7	7	100	ug/Kg		4,750	3,120,000	603,477		16,000	YES
HE	2,4-Dinitrotoluene	7	5	71	ug/Kg	5000 - 50000	993	18,750	8,929		12,000	YES
HE	2,6-Dinitrotoluene	7	2	29	ug/Kg	125 - 50000	352	977	7,243		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	4	2	50	ug/Kg	125 - 125	2,960	28,900	7,996			YES
HE	4-Amino-2,6-Dinitrotoluene	7	3	43	ug/Kg	625 - 250000	2,180	4,170	26,275			YES
INO	Aluminum	7	7	100	mg/Kg		6,780	9,750	8,783	15,500	7,600	
INO	Antimony	7	1	14	mg/Kg	0.41 - 7.7	0.963	0.963	1.84	9.3	3.1	
INO	Arsenic	7	7	100	mg/Kg		4.91	9.10	6.48	36.5	0.39	
INO	Barium	7	7	100	mg/Kg		73.4	314	174	826	540	
INO	Beryllium	7	5	71	mg/Kg	0.63 - 0.64	0.548	0.665	0.519	1	15	
INO	Cadmium	7	4	57	mg/Kg	0.61 - 0.64	0.279	0.611	0.409		3.7	
INO	Calcium	7	7	100	mg/Kg		5,830	13,205	8,608	52,300		
INO	Chromium	7	7	100	mg/Kg		11.8	26.6	18.8	29		
INO	Cobalt	7	6	86	mg/Kg	6.3 - 6.3	6.23	10.6	7.52	116	90	
INO	Copper	7	7	100	mg/Kg		23.1	99.0	58.7	56.2	310	
INO	Iron	7	7	100	mg/Kg		15,000	23,170	17,761	234,000	2,300	
INO	Lead	7	7	100	mg/Kg		155	778	486	48.6	40	YES
INO	Magnesium	7	7	100	mg/Kg		2,300	6,600	4,706	10,400		
INO	Manganese	7	7	100	mg/Kg		183	319	266	3,506	180	
INO	Mercury	7	7	100	mg/Kg		0.0780	0.409	0.246	0.1	2.3	
INO	Moisture, Percent	7	7	100	PERCENT		18.4	30.0	21.9			
INO	Nickel	7	7	100	mg/Kg		16.4	56.3	32.0	55.1	160	
INO	Potassium	7	6	86	mg/Kg	626 - 626	985	1540	1,150	3,390		
INO	Selenium	7	7	100	mg/Kg		0.680	1.75	1.19	2	39	
INO	Silver	7	4	57	mg/Kg	0.108 - 1.3	0.132	1.20	0.460	11.1	39	
INO	Sodium	7	4	57	mg/Kg	610 - 639	64.7	250	228			
INO	Thallium	7	4	57	mg/Kg	1.19 - 1.26	1.30	1.95	1.20	1.3	0.52	YES
INO	Tin	3	1	33	mg/Kg	0.467 - 0.472	5.31	5.31	1.93		4,700	
INO	Vanadium	7	7	100	mg/Kg		18.4	25.9	23.0	40.9	7.8	
INO	Zinc	7	7	100	mg/Kg		75.0	489	249	322	2,300	
PAH	Acenaphthene	7	4	57	ug/Kg	400 - 420	772	11,000	2,021		370,000	
PAH	Acenaphthylene	7	4	57	ug/Kg	400 - 420	614	4,140	1,276			YES
PAH	Anthracene	7	4	57	ug/Kg	35.9 - 410	21.4	55.0	78.0		2,200,000	
PAH	Benzo(a)anthracene	7	3	43	ug/Kg	63.5 - 420	31.3	83.8	119		620	
PAH	Benzo(a)pyrene	7	3	43	ug/Kg	78.3 - 420	61.3	108	127		62	YES
PAH	Benzo(b)fluoranthene	7	4	57	ug/Kg	400 - 420	75.9	140	145		620	
PAH	Benzo(g,h,i)perylene	7	3	43	ug/Kg	113 - 420	47.4	103	131			YES
PAH	Benzo(k)fluoranthene	7	3	43	ug/Kg	29.4 - 420	75.5	209	150		6,200	
PAH	Chrysene	7	5	71	ug/Kg	400 - 410	38.9	193	117		62,000	
PAH	Fluoranthene	7	6	86	ug/Kg	400 - 400	56.0	192	138		230,000	

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Fluorene	7	1	14	ug/Kg	44.9 - 420	66.3	66.3	118		270,000	
PAH	Indeno(1,2,3-cd)pyrene	7	3	43	ug/Kg	27.8 - 420	33.9	58.7	109		620	
PAH	Naphthalene	7	4	57	ug/Kg	400 - 420	835	9,930	2,399		5,600	YES
PAH	Phenanthrene	7	4	57	ug/Kg	400 - 420	68.8	404	177			YES
PAH	Pyrene	7	4	57	ug/Kg	58.7 - 400	44.0	203	104		230,000	
PCB	PCB-1260 (Aroclor 1260)	7	6	86	ug/Kg	1260 - 1260	1,950	11,600	5,909		220	YES
VOC	1,1,1-Trichloroethane	7	1	14	ug/Kg	0.52 - 6.4	1.70	1.70	1.71		200,000	
VOC	1,1-Dichloroethene	7	1	14	ug/Kg	0.508 - 6.4	0.660	0.660	1.56		12,000	
VOC	Acetone	7	2	29	ug/Kg	3.58 - 26	8.90	17.8	9.74		1,400,000	
VOC	Benzene	7	3	43	ug/Kg	0.457 - 6.4	1.70	20.6	5.88		640	
VOC	Chloroform	7	1	14	ug/Kg	0.528 - 6.4	2.00	2.00	1.76		220	
VOC	Methylcyclohexane	1	1	100	ug/Kg		1.90	1.90	1.90		260,000	
VOC	Toluene	7	2	29	ug/Kg	0.345 - 6.4	3.50	1,570	226		66,000	
Subsurface Soil												
DIO	2,3,7,8-TCDD TEQ	13	13	100	ng/Kg		0.699	1,187	132			YES
HE	1,3,5-Trinitrobenzene	19	3	16	ug/Kg	125 - 12500	46,100	85,400	10,599		180,000	
HE	1,3-Dinitrobenzene	19	1	5	ug/Kg	125 - 12500	3,545	3,545	1,323		610	YES
HE	2,4,6-Trinitrotoluene	19	13	68	ug/Kg	125 - 250	394	35,400,000	3,941,819		16,000	YES
HE	2,4-Dinitrotoluene	19	11	58	ug/Kg	125 - 250	370	9,700,000	917,202		12,000	YES
HE	2,6-Dinitrotoluene	19	5	26	ug/Kg	125 - 12500	10,800	1,400,000	102,611		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	13	5	38	ug/Kg	125 - 125	4,980	342,000	42,614			YES
HE	2-Nitrotoluene	19	3	16	ug/Kg	125 - 12500	782	7,040	1,760		880	YES
HE	3-Nitrotoluene	19	1	5	ug/Kg	125 - 12500	777	777	1,178		73,000	
HE	4-Amino-2,6-Dinitrotoluene	19	1	5	ug/Kg	125 - 58000	10,600	10,600	3,019			YES
HE	4-Nitrotoluene	13	3	23	ug/Kg	125 - 12500	444	6,670	1,849		12,000	
INO	Aluminum	19	19	100	mg/Kg		4,640	17,390	11,959	15500	7,600	YES
INO	Antimony	19	6	32	mg/Kg	0.404 - 7.6	0.724	5.55	1.96	9.3	3.1	
INO	Arsenic	19	19	100	mg/Kg		4.70	27.8	11.8	36.5	0.39	
INO	Barium	19	19	100	mg/Kg		55.1	3965	438	826	540	YES
INO	Beryllium	19	18	95	mg/Kg	0.59 - 0.59	0.569	1.27	0.724	1	15	
INO	Cadmium	19	14	74	mg/Kg	0.59 - 0.63	0.0657	2.04	0.505		3.7	
INO	Calcium	19	19	100	mg/Kg		2,945	55,790	16,729	52300		
INO	Chromium	19	19	100	mg/Kg		8.86	81.5	23.4	29		YES
INO	Cobalt	19	19	100	mg/Kg		7.26	25.2	12.5	116	90	
INO	Copper	19	19	100	mg/Kg		9.82	1580	146	56.2	310	YES
INO	Iron	19	19	100	mg/Kg		13,130	37,300	26,693	234000	2,300	
INO	Lead	19	19	100	mg/Kg		8.94	8,220	757	48.6	40	YES
INO	Magnesium	19	19	100	mg/Kg		2550	18,310	7,173	10400		
INO	Manganese	19	19	100	mg/Kg		152	1,360	467	3506	180	
INO	Mercury	19	14	74	mg/Kg	0.039 - 0.042	0.0143	0.207	0.0547	0.1	2.3	
INO	Moisture, Percent	19	19	100	PERCENT		15.6	28.4	19.7			
INO	Nickel	19	19	100	mg/Kg		17.1	103	41.7	55.1	160	
INO	Potassium	19	19	100	mg/Kg		928	3,440	2,235	3390		YES
INO	Selenium	19	16	84	mg/Kg	0.59 - 0.63	0.267	4.57	1.72	2	39	

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Silver	19	11	58	mg/Kg	0.108 - 1.3	0.190	1.30	0.520	11.1	39	
INO	Sodium	19	13	68	mg/Kg	592 - 632	75.0	1,390	408			
INO	Thallium	19	13	68	mg/Kg	1.18 - 1.21	1.63	3.32	1.78	1.3	0.52	YES
INO	Vanadium	19	19	100	mg/Kg		10.5	40.8	27.9	40.9	7.8	
INO	Zinc	19	19	100	mg/Kg		48.6	1,540	241	322	2,300	
PAH	Acenaphthene	19	7	37	ug/Kg	68.8 - 420	90.9	67,400	7,194		370,000	
PAH	Acenaphthylene	19	10	53	ug/Kg	39.9 - 420	42.2	131,000	14,362			YES
PAH	Anthracene	19	5	26	ug/Kg	4.55 - 420	4.69	73.2	80.8		2,200,000	
PAH	Benzo(a)anthracene	19	6	32	ug/Kg	7.56 - 420	9.70	501	120		620	
PAH	Benzo(a)pyrene	19	5	26	ug/Kg	9.65 - 420	12.4	108	98.8		62	YES
PAH	Benzo(b)fluoranthene	19	10	53	ug/Kg	3.82 - 420	4.00	212	97.3		620	
PAH	Benzo(g,h,i)perylene	19	4	21	ug/Kg	13.9 - 601	35.7	70.9	112			YES
PAH	Benzo(k)fluoranthene	19	10	53	ug/Kg	13.8 - 420	41.7	469	136		6,200	
PAH	Chrysene	19	9	47	ug/Kg	5.68 - 420	13.9	928	154		62,000	
PAH	Dibenz(a,h)anthracene	19	3	16	ug/Kg	8.09 - 420	16.1	302	105		62	YES
PAH	Fluoranthene	19	6	32	ug/Kg	22.5 - 973	37.0	720	209		230,000	
PAH	Fluorene	19	4	21	ug/Kg	23.2 - 1040	25.6	317	160		270,000	
PAH	Indeno(1,2,3-cd)pyrene	19	5	26	ug/Kg	3.43 - 420	9.59	151	83.7		620	
PAH	Naphthalene	19	10	53	ug/Kg	26 - 420	37.9	51,300	5,070		5,600	YES
PAH	Phenanthrene	19	10	53	ug/Kg	19.2 - 420	24.2	1,550	328			YES
PAH	Pyrene	19	1	5	ug/Kg	25.7 - 1150	96.2	96.2	142		230,000	
PCB	PCB-1254 (Aroclor 1254)	19	2	11	ug/Kg	40 - 14200	1,660	3,670	845		220	YES
PCB	PCB-1260 (Aroclor 1260)	19	7	37	ug/Kg	39 - 8620	53.0	4,010	789		220	YES
SV	bis(2-Ethylhexyl)phthalate	6	1	17	ug/Kg	390 - 420	60.0	60.0	178		35,000	
VOC	1,1,1-Trichloroethane	19	2	11	ug/Kg	0.463 - 31	1.085	140	9.89		200,000	
VOC	1,1-Dichloroethane	19	2	11	ug/Kg	0.411 - 31	1.60	10.1	3.06		51,000	
VOC	1,1-Dichloroethene	19	9	47	ug/Kg	0.47 - 31	0.580	2.55	3.03		12,000	
VOC	2-Butanone (Methyl ethyl ketone)	19	3	16	ug/Kg	3.27 - 120	3.60	54.0	13.0		2,200,000	
VOC	Acetone	19	7	37	ug/Kg	3.07 - 120	8.70	300	40.0		1,400,000	
VOC	Benzene	19	4	21	ug/Kg	0.393 - 31	1.40	2.80	2.85		640	
VOC	Cyclohexane	13	7	54	ug/Kg	0.419 - 1.05	0.630	24.9	4.80		280,000	
VOC	Ethylbenzene	19	1	5	ug/Kg	0.332 - 31	2.30	2.30	2.55		190,000	
VOC	Isopropylbenzene (Cumene)	13	1	8	ug/Kg	0.393 - 1.11	1.30	1.30	0.366		57,000	
VOC	Methylcyclohexane	13	3	23	ug/Kg	0.445 - 1.12	1.10	23.9	2.25		260,000	
VOC	Methylene Chloride	19	1	5	ug/Kg	1.18 - 31	1.90	1.90	2.96		9100	
VOC	Tetrachloroethene (PCE)	19	1	5	ug/Kg	0.332 - 31	0.870	0.870	2.48		480	
VOC	Toluene	19	5	26	ug/Kg	0.297 - 31	0.990	79.5	6.75		66,000	
VOC	Xylenes, Total	19	2	11	ug/Kg	0.341 - 31	0.780	12.5	3.11		27,000	
Outside the Burn Area												
Surface Soil												
HE	1,3,5-Trinitrobenzene	42	13	31	ug/Kg	87 - 5000	210	15,000	728		180,000	
HE	1,3-Dinitrobenzene	42	3	7	ug/Kg	83 - 12000	120	220	272		610	
HE	2,4,6-Trinitrotoluene	42	31	74	ug/Kg	87 - 250	140	2,270,000	65,461		16,000	YES

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
HE	2,4-Dinitrotoluene	42	23	55	ug/Kg	110 - 250	240	200,000	6,892		12,000	YES
HE	2,6-Dinitrotoluene	42	14	33	ug/Kg	110 - 12000	152	78,000	2,458		6,100	YES
HE	2-Amino-4,6-Dinitrotoluene	37	16	43	ug/Kg	125 - 625	150	26,000	1,296			YES
HE	2-Nitrotoluene	42	6	14	ug/Kg	87 - 12000	110	2,000	324		880	YES
HE	4-Amino-2,6-Dinitrotoluene	42	16	38	ug/Kg	87 - 110000	130	27,000	2,759			YES
HE	4-Nitrotoluene	37	1	3	ug/Kg	87 - 625	260	260	70.5		12,000	
HE	HMX	42	4	10	ug/Kg	87 - 25000	150	820	514		310,000	
HE	Nitrobenzene	47	1	2	ug/Kg	92 - 12000	180	180	262		2,000	
HE	RDX	42	2	5	ug/Kg	87 - 25000	270	540	503		4,400	
INO	Aluminum	32	32	100	mg/Kg		8,840	14,900	10,749	15,500	7,600	
INO	Antimony	32	3	9	mg/Kg	0.421 - 7.8	0.534	0.782	1.32	9.3	3.1	
INO	Arsenic	32	32	100	mg/Kg		5.13	11.1	7.45	36.5	0.39	
INO	Barium	32	32	100	mg/Kg		47.1	212	104	826	540	
INO	Beryllium	32	29	91	mg/Kg	0.61 - 0.65	0.515	0.851	0.606	1	15	
INO	Cadmium	32	28	87	mg/Kg	0.26 - 0.65	0.0771	0.78	0.425		3.7	YES
INO	Calcium	32	32	100	mg/Kg		2,320	35,800	7,559	52,300		
INO	Chromium	32	32	100	mg/Kg		10.7	26.7	16.9	29		
INO	Cobalt	32	32	100	mg/Kg		4.02	16.4	6.95	116	90	
INO	Copper	32	32	100	mg/Kg		13.0	534	55.9	56.2	310	YES
INO	Iron	32	32	100	mg/Kg		11,550	29,960	18,522	234,000	2,300	
INO	Lead	42	42	100	mg/Kg		21.1	603	184	48.6	40	YES
INO	Magnesium	32	32	100	mg/Kg		993	6,370	2,993	10,400		
INO	Manganese	32	32	100	mg/Kg		147	600	282	3,506	180	
INO	Mercury	32	32	100	mg/Kg		0.0308	0.518	0.133	0.1	2.3	
INO	Moisture, Percent	17	17	100	PERCENT		17.7	35.7	23.7			YES
INO	Nickel	32	32	100	mg/Kg		11.6	35.7	20.7	55.1	160	
INO	Potassium	32	32	100	mg/Kg		598	2,520	1,421	3,390		
INO	Selenium	32	13	41	mg/Kg	0.202 - 0.83	0.546	2.06	0.641	2	39	
INO	Silver	32	5	16	mg/Kg	0.111 - 1.3	0.138	0.471	0.204	11.1	39	
INO	Sodium	32	13	41	mg/Kg	245 - 646	45.9	402	147			YES
INO	Thallium	32	4	12	mg/Kg	0.31 - 1.42	1.20	1.44	0.503	1.3	0.52	
INO	Tin	4	1	25	mg/Kg	0.474 - 0.486	3.78	3.78	1.12		4700	
INO	Vanadium	32	32	100	mg/Kg		20.3	31.3	25.1	40.9	7.8	
INO	Zinc	32	32	100	mg/Kg		35.7	498	144	322	2,300	
INX	Cyanide	20	12	60	mg/Kg	0.15 - 0.65	0.170	1.00	0.280		120	
PAH	Acenaphthene	42	11	26	ug/Kg	24 - 430	34.2	697	101		370,000	
PAH	Acenaphthylene	42	11	26	ug/Kg	16.7 - 430	26.8	1,960	190			YES
PAH	Anthracene	42	13	31	ug/Kg	4.93 - 430	2.74	55.0	34.1		2,200,000	
PAH	Benzo(a)anthracene	42	21	50	ug/Kg	8.72 - 430	4.08	186	58.7		620	
PAH	Benzo(a)pyrene	42	21	50	ug/Kg	24 - 430	12.5	360	77.7		62	YES
PAH	Benzo(b)fluoranthene	42	21	50	ug/Kg	24 - 430	12.1	820	107		620	YES
PAH	Benzo(g,h,i)perylene	42	18	43	ug/Kg	5.65 - 430	13.1	270	61.5			YES
PAH	Benzo(k)fluoranthene	42	20	48	ug/Kg	24 - 430	30.9	430	93.9		6,200	
PAH	Chrysene	42	25	60	ug/Kg	6.33 - 430	8.30	297	78.4		62,000	

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Dibenz(a,h)anthracene	42	5	12	ug/Kg	3.33 - 430	10.4	124	38.9		62	YES
PAH	Fluoranthene	42	28	67	ug/Kg	24 - 430	21.3	350	98.2		230,000	
PAH	Fluorene	42	9	21	ug/Kg	9.79 - 430	10.7	91.3	41.4		270,000	
PAH	Indeno(1,2,3-cd)pyrene	42	17	40	ug/Kg	1.4 - 430	8.20	230	55.4		620	
PAH	Naphthalene	42	11	26	ug/Kg	24 - 430	23.4	1,738	111		5,600	
PAH	Phenanthrene	42	25	60	ug/Kg	8.03 - 430	12.8	190	67.0			YES
PAH	Pyrene	42	25	60	ug/Kg	11.5 - 430	13.0	295	83.8		230,000	
PCB	PCB-1260 (Aroclor 1260)	42	33	79	ug/Kg	40 - 13300	13.0	44,400	2,066		220	YES
SV	1,4-Dichlorobenzene	17	1	6	ug/Kg	0.349 - 430	0.420	0.420	60.7		3,400	
SV	2-Methylnaphthalene	30	4	13	ug/Kg	24 - 430	36.0	110	52.1			YES
SV	bis(2-Ethylhexyl)phthalate	5	1	20	ug/Kg	400 - 430	61.0	61.0	176.2		35,000	
VOC	1,1,1-Trichloroethane	17	1	6	ug/Kg	0.5 - 32	1.70	1.70	4.12		200,000	
VOC	1,1-Dichloroethene	17	4	24	ug/Kg	0.472 - 32	0.570	0.750	4.11		12,000	
VOC	Acetone	17	3	18	ug/Kg	3.32 - 130	4.60	15.5	17.8		1,400,000	
VOC	Cyclohexane	12	1	8	ug/Kg	0.453 - 0.586	0.720	0.720	0.296		280,000	
VOC	Tetrachloroethene (PCE)	17	4	24	ug/Kg	0.385 - 32	0.390	3.40	4.22		480	
Subsurface Soil												
HE	2,4,6-Trinitrotoluene	26	5	19	ug/Kg	125 - 250	229	817	167		16,000	YES
HE	2,4-Dinitrotoluene	26	4	15	ug/Kg	125 - 250	417	755	166		12,000	YES
HE	4-Amino-2,6-Dinitrotoluene	26	1	4	ug/Kg	125 - 610	1,500	1,500	146			YES
INO	Aluminum	26	26	100	mg/Kg		6,225	233,600	20,972	15,500	7,600	YES
INO	Antimony	26	2	8	mg/Kg	0.401 - 8.35	0.413	0.519	1.69271	9.3	3.1	
INO	Arsenic	26	26	100	mg/Kg		4.10	131	14.5	36.5	0.39	
INO	Barium	26	26	100	mg/Kg		40.7	798	110	826	540	
INO	Beryllium	26	20	77	mg/Kg	0.59 - 0.63	0.388	11.4	1.00	1	15	
INO	Cadmium	26	15	58	mg/Kg	0.0572 - 0.64	0.0779	8.64	0.650		3.7	YES
INO	Calcium	26	26	100	mg/Kg		3,030	1,173,000	74,271	52,300		
INO	Chromium	26	26	100	mg/Kg		10.8	367	32.2	29		YES
INO	Cobalt	26	26	100	mg/Kg		6.30	166	16.8	116	90	YES
INO	Copper	26	26	100	mg/Kg		17.6	504	46.0	56.2	310	YES
INO	Iron	26	26	100	mg/Kg		17,650	412,600	38,804	234,000	2300	
INO	Lead	26	26	100	mg/Kg		7.88	227	21.2	48.6	40	YES
INO	Magnesium	26	26	100	mg/Kg		3,340	363,100	24,747	10,400		
INO	Manganese	26	26	100	mg/Kg		205	8230	905	3,506	180	YES
INO	Mercury	26	17	65	mg/Kg	0.038 - 0.042	0.0137	0.0580	0.0225	0.1	2.3	
INO	Moisture, Percent	25	25	100	PERCENT		12.2	22.4	17.8			YES
INO	Nickel	26	26	100	mg/Kg		17.6	475	46.8	55.1	160	
INO	Potassium	26	26	100	mg/Kg		1,250	58,210	4,397	3,390		
INO	Selenium	26	16	62	mg/Kg	0.57 - 0.64	0.527	51.8	3.39	2	39	YES
INO	Silver	26	6	23	mg/Kg	0.104 - 1.3	0.160	3.21	0.451	11.1	39	
INO	Sodium	26	16	62	mg/Kg	569 - 637	68	3,690	334			
INO	Thallium	26	6	23	mg/Kg	1.15 - 24.3	1.30	2.10	1.71	1.3	0.52	YES
INO	Vanadium	26	26	100	mg/Kg		20.2	536	49.4	40.9	7.8	YES
INO	Zinc	26	26	100	mg/Kg		47.6	1,140	103	322	2,300	

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
PAH	Acenaphthene	25	1	4	ug/Kg	26.9 - 420	169	169	107		370,000	
PAH	Acenaphthylene	25	6	24	ug/Kg	14.7 - 420	59.3	408	122			YES
PAH	Anthracene	25	7	28	ug/Kg	1.67 - 420	4.93	22.8	83.9		2,200,000	
PAH	Benzo(a)pyrene	25	10	40	ug/Kg	3.65 - 420	10.6	28.6	87.3		62	YES
PAH	Benzo(b)fluoranthene	25	9	36	ug/Kg	1.44 - 420	5.13	27.3	86.0		620	YES
PAH	Benzo(g,h,i)perylene	25	1	4	ug/Kg	5.25 - 420	51.9	51.9	85.9			YES
PAH	Benzo(k)fluoranthene	25	13	52	ug/Kg	1.37 - 420	30.9	191	133		6,200	
PAH	Chrysene	25	7	28	ug/Kg	2.15 - 420	12.8	30.5	86.5		62,000	
PAH	Fluoranthene	25	8	32	ug/Kg	8.51 - 420	25.7	298	123		230,000	
PAH	Fluorene	25	1	4	ug/Kg	9.1 - 420	50.1	50.1	88.8		270,000	
PAH	Indeno(1,2,3-cd)pyrene	25	8	32	ug/Kg	1.3 - 420	9.89	23.1	85.3		620	
PAH	Naphthalene	25	6	24	ug/Kg	9.84 - 420	51.2	256	108		5,600	
PAH	Phenanthrene	25	7	28	ug/Kg	7.06 - 420	22.6	175	107			YES
VOC	1,1,1-Trichloroethane	26	6	23	ug/Kg	0.353 - 32	0.770	15.3	3.21		200,000	
VOC	1,1-Dichloroethane	26	4	15	ug/Kg	0.313 - 32	0.660	1.70	1.90		51,000	
VOC	1,1-Dichloroethene	26	9	35	ug/Kg	0.411 - 32	0.480	2.10	2.03		12,000	
VOC	Acetone	26	9	35	ug/Kg	2.89 - 25	6.40	290	24.6		1,400,000	
VOC	Cyclohexane	16	1	6	ug/Kg	0.319 - 0.477	3.90	3.90	0.443		280,000	
VOC	Styrene	26	1	4	ug/Kg	0.259 - 32	1.00	1	1.80		440,000	
VOC	Tetrachloroethene (PCE)	26	3	12	ug/Kg	0.253 - 32	1.20	2.95	1.99		480	
VOC	Toluene	26	4	15	ug/Kg	0.226 - 6.3	1.50	20.0	1.75		66,000	
VOC	Xylenes, Total	26	1	4	ug/Kg	0.259 - 6.3	11.0	11.0	1.57		27,000	
Sediment												
DIO	2,3,7,8-TCDD TEQ	3	3	100	ng/Kg		0.120	6.91	3.45			YES
INO	Aluminum	3	3	100	mg/Kg		7,790	9,980	9,077	15,500	7,600	
INO	Arsenic	3	3	100	mg/Kg		4.30	6.09	5.105	36.5	0.39	
INO	Barium	3	3	100	mg/Kg		51.2	70.3	57.8	826	540	
INO	Beryllium	3	3	100	mg/Kg		0.427	0.566	0.481	1	15	
INO	Cadmium	3	3	100	mg/Kg		0.586	1.91	1.07		3.7	
INO	Calcium	3	3	100	mg/Kg		9,170	82,280	40,363	52,300		
INO	Chromium	3	3	100	mg/Kg		12.0	15.4	13.9	29		
INO	Cobalt	3	3	100	mg/Kg		4.56	6.17	5.52	116	90	
INO	Copper	3	3	100	mg/Kg		19.7	26.7	23.8	56.2	310	
INO	Iron	3	3	100	mg/Kg		12,100	16,430	14,690	234,000	2,300	
INO	Lead	3	3	100	mg/Kg		14.0	24.9	19.4	48.6	40	
INO	Magnesium	3	3	100	mg/Kg		3,385	11,900	7,682	10,400		
INO	Manganese	3	3	100	mg/Kg		107	181	145	3,506	180	
INO	Mercury	3	3	100	mg/Kg		0.0402	0.0725	0.0531	0.1	2.3	
INO	Moisture, Percent	3	3	100	PERCENT		37.3	52.7	43.3			
INO	Nickel	3	3	100	mg/Kg		16.1	19.0	18.0	55.1	160	
INO	Potassium	3	3	100	mg/Kg		1,510	2,295	1,952	3,390		
INO	Selenium	3	3	100	mg/Kg		2.71	3.69	3.34	2	39	
INO	Sodium	3	3	100	mg/Kg		90.3	107	98.6			
INO	Vanadium	3	3	100	mg/Kg		21.5	25.0	23.3	40.9	7.8	

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Zinc	3	3	100	mg/Kg		60.2	92.0	72.4	322	2,300	
PAH	Acenaphthene	3	1	33	ug/Kg	34.3 - 46.9	5,750	5,750	1,930		370,000	
PAH	Acenaphthylene	3	2	67	ug/Kg	18.7 - 18.7	53.0	853	305			YES
PAH	Anthracene	3	3	100	ug/Kg		6.41	288	101		2,200,000	
PAH	Benzo(a)anthracene	3	3	100	ug/Kg		22.5	1,130	393		620	YES
PAH	Benzo(a)pyrene	3	3	100	ug/Kg		126	1,590	641		62	YES
PAH	Benzo(b)fluoranthene	3	3	100	ug/Kg		31.9	1,230	438		620	YES
PAH	Benzo(g,h,i)perylene	3	3	100	ug/Kg		22.3	728	269			YES
PAH	Benzo(k)fluoranthene	3	3	100	ug/Kg		41.5	881	324		6,200	
PAH	Chrysene	3	3	100	ug/Kg		33.4	1,330	468		62,000	
PAH	Dibenz(a,h)anthracene	3	3	100	ug/Kg		16.5	31.6	24.0		62	
PAH	Fluoranthene	3	3	100	ug/Kg		75.5	3,680	1,294		230,000	
PAH	Indeno(1,2,3-cd)pyrene	3	3	100	ug/Kg		13.6	751	266		620	YES
PAH	Naphthalene	3	2	67	ug/Kg	12.5 - 12.5	216	2,660	961		5,600	
PAH	Phenanthrene	3	3	100	ug/Kg		66.8	1,460	583			YES
PAH	Pyrene	3	3	100	ug/Kg		30.9	2,440	845		230,000	
VOC	1,1-Dichloroethane	3	1	33	ug/Kg	0.644 - 1.2	4.50	4.50	1.81		51,000	
VOC	1,1-Dichloroethene	3	2	67	ug/Kg	0.794 - 0.794	1.00	1.55	0.982		12,000	
VOC	2-Butanone (Methyl ethyl ketone)	3	2	67	ug/Kg	5.13 - 5.13	36.5	51.2	30.1		2,200,000	
VOC	Acetone	3	3	100	ug/Kg		13.8	234	145		1,400,000	
VOC	Cyclohexane	3	2	67	ug/Kg	0.762 - 0.762	2.30	11.0	4.56		280,000	
VOC	Toluene	3	2	67	ug/Kg	0.865 - 0.865	0.520	0.860	0.604		66,000	
Groundwater												
INO	Aluminum (total)	3	3	100	ug/L		1,290	11,600	6,503	309	3,600	YES
INO	Antimony (total)	3	3	100	ug/L		2.00	3.00	2.53		1.5	YES
INO	Arsenic (total)	3	3	100	ug/L		45.3	221	113	7.4	0.045	YES
INO	Barium (total)	3	3	100	ug/L		286	842	489	11,800	260	
INO	Beryllium (total)	3	3	100	ug/L		0.0850	0.760	0.428		7.3	
INO	Cadmium (total)	3	2	67	ug/L	0.04 - 0.04	0.240	1.40	0.547		1.8	
INO	Calcium (total)	3	3	100	ug/L		237,000	743,000	559,667	316,000		
INO	Chromium (total)	3	2	67	ug/L	0.38 - 0.38	20.0	31.7	17.23333			
INO	Cobalt (total)	3	3	100	ug/L		2.60	9.90	6.40	12.1	73	
INO	Copper (total)	3	3	100	ug/L		4.00	17.7	11.8	19.8	150	
INO	Hardness (as CACO3)	2	2	100	mg/L		936	1,440	1,188			
INO	Iron (total)	3	3	100	ug/L		3,590	27,300	15,263	1,550	1,100	YES
INO	Lead (total)	3	3	100	ug/L		2.90	17.9	11.1			
INO	Magnesium (total)	3	3	100	ug/L		118,000	263,000	181,333	217,000		
INO	Manganese (total)	3	3	100	ug/L		409	1,020	702	636	88	YES
INO	Nickel (total)	3	3	100	ug/L		11.1	36.5	25.2	8.6	73	
INO	Nitrate	2	1	50	mg/L	0.0341 - 0.0341	0.137	0.137	0.0685			
INO	Potassium (total)	3	3	100	ug/L		40,500	56,400	49,000	116,000		
INO	Selenium (total)	3	0	0	ug/L	3.2 - 3.2					18	
INO	Silver (total)	3	2	67	ug/L	0.04 - 0.04	0.0820	0.130	0.0707		18	
INO	Sodium (total)	3	3	100	ug/L		380,000	785,000	623,667	1,390,000		

Table 2-1
Summary Statistics and Identification of COPCs for Constituents Detected in Environmental Media at the Reservoir No. 2 Burning Ground, Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration	Background	Toxicity Screening Level	COPC
INO	Suspended Solids (residue, Non-filterable)	2	2	100	mg/L		298	109,000	54,649			
INO	Thallium (total)	3	2	67	ug/L	0.1 - 0.1	0.36	2.30	0.88667		0.24	YES
INO	Total Dissolved Solids	2	2	100	mg/L		2,870	3,310	3,090			
INO	Turbidity	2	2	100	NTU		101	1,910	1,006			
INO	Vanadium (total)	3	2	67	ug/L	5.44 - 5.44	8.90	22.4	10.4		3.6	YES
INO	Zinc (total)	3	3	100	ug/L		11.3	47.2	29.6	507	1,100	
INX	Alkalinity, Total (as CaCO3)	2	2	100	mg/L		72.7	457	265			
INX	Chloride (as Cl)	2	2	100	mg/L		1,420	1,810	1,615			
INX	Cyanide	2	1	50	ug/L	1.72 - 1.72	290	290	145		73	YES
INX	Sulfate (as SO4)	2	2	100	mg/L		45.3	78.0	61.7			
PAH	Acenaphthene	1	1	100	ug/L		535	535	535		37	YES
PAH	Acenaphthylene	1	1	100	ug/L		26.2	26.2	26.2			
PAH	Anthracene	1	1	100	ug/L		3.24	3.24	3.24		180	
PAH	Benzo(a)anthracene	1	1	100	ug/L		0.293	0.293	0.293		0.092	YES
PAH	Fluoranthene	1	1	100	ug/L		1.65	1.65	1.65		150	
PAH	Naphthalene	1	1	100	ug/L		8.87	8.87	8.87		0.62	YES
PAH	Phenanthrene	1	1	100	ug/L		1.86	1.86	1.86			
PAH	Pyrene	1	1	100	ug/L		2.34	2.34	2.34		18	
VOC	Acetone	3	3	100	ug/L		27.4	518	339		550	
VOC	Benzene	3	2	67	ug/L	1.65 - 1.65	1,510	2,460	1,323	2.4	0.35	YES
VOC	Carbon Disulfide	3	3	100	ug/L		146	234	184		100	YES
VOC	Chloromethane	3	1	33	ug/L	25 - 25	54.0	54.0	18.0		16	YES
VOC	Cyclohexane	3	3	100	ug/L		295	683	535		1,000	
VOC	Ethylbenzene	3	3	100	ug/L		9.60	137	85.5	0.87	130	
VOC	Isopropylbenzene (Cumene)	3	3	100	ug/L		5.10	37.1	25.4		66	
VOC	Methylcyclohexane	3	3	100	ug/L		132	337	243		520	
VOC	Toluene	3	3	100	ug/L		17.6	403	248	1.7	72	
VOC	Xylenes, Total	3	3	100	ug/L		145	1,610	1,048	5.5	21	YES
VOC	m,p-Xylene (sum of isomers)	3	3	100	ug/L		115	1,160	748			
VOC	o-Xylene (1,2-Dimethylbenzene)	3	3	100	ug/L		29.9	454	303			

COPC - chemical of potential concern
DIO - dioxan/furan
HE
HMX - 1,3,5,7-tetranitro-1,3,5,7-tetrazocane (octogen or High-Molecular-weight rdX)
INO
INX
mg/kg - milligrams per kilogram
ng/kg - nanograms per kilogram
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PCE - tetrachloroethene
RDX - 1,3,5-Trinitroperhydro-1,3,5-triazine (cyclotrimethylenetrinitramine or cyclonite or hexogen or T4)
SV - semivolatile organic compound
TCDD - tetrachlorodibenzo-p-dioxan
TEQ - toxicity equivalent
ug/kg - micrograms per kilogram
VOC - volatile organic compound

Table 3-1
Receptor/Exposure Scenarios
Burning Ground Reservoir No. 2
Plum Brook Ordnance Works, Sandusky, Ohio

Source Medium	Model	Exposure Medium	Exposure Pathway
Groundskeeper			
Surface soil	None	Soil	Incidental ingestion Dermal contact
	Volatilization from soil	Ambient air	Inhalation
	Dust emissions based on activity	Ambient air	Inhalation
Total soil	Not quantified[a]		
Groundwater	Not quantified[a]		
Surface water	Not quantified[b]		
Sediment	Not quantified[b]		
Indoor Worker			
Surface soil	None	Soil	Incidental ingestion Dermal contact
Subsurface soil	Volatilization from soil	Indoor air	Inhalation
Total soil	Not quantified[a]		
Groundwater	None	Groundwater	Ingestion Dermal contact
Surface water	Not quantified[a]		
Sediment	Not quantified[a]		
Construction Worker			
Total soil	None	Soil	Incidental ingestion Dermal contact
	Volatilization from soil	Ambient air	Inhalation
	Dust emissions based on activity	Ambient air	Inhalation
Groundwater	Not quantified[b]		
Surface water	None	Surface water	Incidental ingestion Dermal contact
	Volatilization from water	Ambient air	Inhalation
Sediment	None	Sediment	Incidental ingestion Dermal contact

Table 3-1
Receptor/Exposure Scenarios
Burning Ground Reservoir No. 2
Plum Brook Ordnance Works, Sandusky, Ohio

Source Medium	Model	Exposure Medium	Exposure Pathway
On-Site Resident			
Total soil	None	Soil	Incidental ingestion Dermal contact
	Volatilization from soil	Ambient air	Inhalation
	Dust emissions based on wind erosion	Ambient air	Inhalation
Subsurface soil	Volatilization from soil	Indoor air	Inhalation
Groundwater	None Volatilization from groundwater	Groundwater Ambient air	Ingestion Dermal contact Inhalation
Surface water	None	Surface water	Incidental Ingestion Dermal contact
	Volatilization from water	Ambient air	Inhalation
Sediment	None	Sediment	Incidental ingestion Dermal contact
Hunter			
Surface soil	None	Soil	Incidental ingestion Dermal contact
	Dust, volatilization	Ambient air	Inhalation
	Bio uptake	Venison	Venison consumption
Groundwater	Not quantified[a]		

a There is no plausible pathway for exposure to this medium.

b Although contact with this medium is possible, exposure would be sporadic rather than continuous or predictable. Such exposures do not lend themselves to evaluation under the chronic toxicity paradigm used in a baseline risk assessment. Although theoretically complete, this pathway is not quantified as explained in text.

Table 3-2
Variables Used to Estimate Potential Chemical Intakes and Contact Rates for Receptors
Burning Ground Reservoir No. 2, Plum Brook Ordnance Works, Sandusky, Ohio

Pathway Variable	Grounds-keeper	Construction Worker	On-Site Resident	Indoor Worker	Hunter
General Variables Used in All Intake Models					
Body weight (BW), kg	70[a]	70[a]	Child: 15[b] Adult: 70[a]	70[a]	Child: 15[b] Adult: 70[a]
Averaging time, noncancer (AT), day_{sd}	9125	183	Child: 2190 Adult: 8760	9125	Child: 2190 Adult: 10950
Averaging time, cancer (AT), day_{se}	25550	25550	25550	25550	25550
Inhalation of VOCs and Resuspended Dust from Surface Soil, Total Soil or Subsurface Soil					
Fraction exposed to contaminated medium(FI_a), unitless	1[c]	1[c]	1[c]	NA	NA
Inhalation rate (IR_a), m^3/day	20[a]	20[a]	Child: 10[b] Adult: 20[a]	NA	NA
Exposure frequency (EF), days/year	250[a]	250[a]	350[a]	NA	NA
Exposure duration (ED), years	25[a]	0.5[b]	Child: 6[b] Adult: 24[b]	NA	NA
Inhalation of VOCs in Indoor Air from Subsurface Soil					
Fraction exposed to contaminated medium(FI_a), unitless	NA	NA	1[c]	1[c]	NA
Inhalation rate (IR_a), m^3/day	NA	NA	Child: 6.8[c] Adult: 13.7[c]	20[a]	NA
Exposure frequency (EF), days/year	NA	NA	350[a]	250[a]	NA
Exposure duration (ED), years	NA	NA	Child: 6[b] Adult: 24[b]	25[a]	NA
Incidental Ingestion of Soil					
Fraction exposed to contaminated medium(FI_{so}), unitless	1[c]	1[c]	0.9[c]	1[c]	1[c]
Soil incidental ingestion rate (IR_{so}), mg/day	100[a]	290[c]	Child: 200[b] Adult: 100[a]	50[a]	Child: NA Adult: 100[a]
Exposure frequency (EF), days/year	250[a]	250[a]	350[a]	250[a]	14[c]
Exposure duration (ED), years	25[a]	0.5[c]	Child: 6[b] Adult: 24[b]	25[a]	30[a]

Table 3-2
Variables Used to Estimate Potential Chemical Intakes and Contact Rates for Receptors
Burning Ground Reservoir No. 2, Plum Brook Ordnance Works, Sandusky, Ohio

Pathway Variable	Grounds-keeper	Construction Worker	On-Site Resident	Indoor Worker	Hunter
Incidental Ingestion of Sediment					
Fraction exposed to contaminated medium(FI_{sd}), unitless	NA	1[c]	0.1[c]	NA	NA
Sediment incidental ingestion rate (IR_{sd}),mg/day	NA	290[c]	Child: 200[b] Adult: 100[a]	NA	NA
Exposure frequency (EF), days/year	NA	250[a]	350[a]	NA	NA
Exposure duration (ED), years	NA	0.5[c]	Child: 6[b] Adult: 24[b]	NA	NA
Dermal Contact with Soil					
Fraction exposed to contaminated medium (FI_{so}), unitless	1[c]	1[c]	0.9[c]	NA	1[c]
Body surface area exposed to soil (SA_{so}), cm^2	11,300[f]	11,300[f]	Child: 1750[g] Adult: 4550[g]	NA	Child: NA Adult: 4550[g]
Soil-to-skin adherence factor (AF_{so}),mg/cm^2	0.009[f]	0.08[f]	0.2[g]	NA	0.2[g]
Dermal absorption factor (ABS), unitless	csv	csv	csv	NA	csv
Exposure frequency (EF), days/year	250[a]	250[a]	350[a]	NA	14[c]
Exposure duration (ED), years	25a	0.5[c]	Child: 6[b] Adult: 24[b]	NA	30[a]
Dermal Contact with Sediment					
Fraction exposed to contaminated medium(FI_{sd}), unitless	NA	1[c]	0.1[c]	NA	NA
Body surface area exposed to sediment(SA_{sd}), cm^2	NA	3100[f]	Child: 1750[g] Adult: 4550[g]	NA	NA
Sediment-to-skin adherence factor (AF_{sd}),mg/cm^2	NA	0.24[f]	0.2[g]	NA	NA
Dermal absorption factor (ABS), unitless	NA	csv	csv	NA	NA
Exposure frequency (EF), days/year	NA	250[a]	350[a]	NA	NA
Exposure duration (ED), years	NA	0.5[c]	Child: 6[b] Adult: 24[b]	NA	NA

Table 3-2
Variables Used to Estimate Potential Chemical Intakes and Contact Rates for Receptors
Burning Ground Reservoir No. 2, Plum Brook Ordnance Works, Sandusky, Ohio

Pathway Variable	Grounds-keeper	Construction Worker	On-Site Resident	Indoor Worker	Hunter
Dermal Contact with Surface Water					
Body surface area exposed to surface water (SA_{sw}), cm^2	NA	3100[f]	Child: 2100[g] Adult: 5450[g]	NA	NA
Permeability coefficient (PC), cm/hour	NA	csv	csv	NA	NA
Exposure time (ET_{sw}), hour/day	NA	4[c]	3[c]	NA	NA
Exposure frequency (EF), days/year	NA	250[a]	52[c]	NA	NA
Exposure duration (ED), years	NA	0.5[c]	Child: 6[b] Adult: 24[b]	NA	NA
Venison Consumption					
Venison ingestion rate (IR_v), kg/day	NA	NA	NA	NA	Child: 0.005[c] Adult: 0.013[c]
Exposure frequency (EF), days/year	NA	NA	NA	NA	350[a]
Exposure duration (ED), years	NA	NA	NA	NA	Child: 6[b] Adult: 30[a]

a U.S. Environmental Protection Agency (EPA), 1991, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors, Interim Final, Office of Solid Waste and Emergency Response, OSWER Directive: 9285.603.

b U.S. Environmental Protection Agency (EPA), 1999, EPA Region 9: Preliminary Remediation Goals (PRGs) 1999, 3 December, on-line.

C Assumed; see text.

D Calculated as the product of ED (years) x 365 days/year.

E Calculated as the product of 70 years (assumed human lifetime) x 365 days/year.

F U.S. Environmental Protection Agency (EPA), 1997b, Exposure Factors Handbook, Final, National Center for Environmental Assessment, Washington, DC, EPA/600/P-95/002Fa, August.

G U.S. Environmental Protection Agency (EPA), 1992b, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, including Supplemental Guidance dated August 18, 1992.

NA = not applicable to this receptor; csv = chemical-specific value.

Table 3-3
Variables Used to Estimate Potential Chemical Intake
and Contact Rates from Groundwater
Burning Ground Reservoir No. 2, Plum Brook Ordnance Works, Sandusky, Ohio

Pathway Variable	On-site Worker	Resident
General Variables		
Exposure duration (ED), years	25[a]	Child: 6[b] Adult: 24[b]
Body weight (BW), kg	70[a]	Child: 15[b] Adult: 70[a]
Averaging time, noncancer (AT), days[c]	9125	Child: 2190 Adult: 8760
Averaging time, cancer (AT), days[c]	25550	25550
Inhalation of VOCs from Groundwater		
Exposure time (ET), hours/day	NA	24[d]
Inhalation rate (IR_a), m^3/hour	NA	Child: 0.416[b] Adult: 0.833[b]
Exposure frequency (EF), days/year	250[a]	350[a]
Drinking Water Ingestion of Groundwater		
Fraction exposed to contaminated medium (FI_{gw}), unitless	1[f]	1[f]
Drinking water ingestion rate (IR_{gw}), L/day	1[a]	Child: 1[b] Adult: 2[a]
Exposure frequency (EF), days/year	250[a]	350[a]
Dermal Contact with Groundwater		
Fraction exposed to contaminated medium (FI_{gw}), unitless	1[e]	1[e]
Body surface area exposed to water (Sa_{gw}), cm^2	3300[g]	Child: 6600[f] Adult: 20000[f]
Permeability coefficient (PC), cm/hour	csv	csv
Exposure time (ET_{gw}), hours/day	1[f]	Child: 0.333[g] Adult: 0.2[d]
Exposure frequency (EF), days/year	250[a]	350[a]

cm - Centimeter.
cm^2 - Square centimeter.
csv - Chemical-specific value.
kg - Kilogram.
L - Liters.
m^3 - Cubic meters.
NA - Not applicable to this receptor.
VOC - Volatile organic compound.

[a] U.S. Environmental Protection Agency (EPA), 1991a, *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors* , Interim Final, Office of Solid Waste and Emergency Response, OSWER Directive: 9285.603.

[b] U.S. Environmental Protection Agency (EPA), 2004c, *User's Guide and Background Technical Document for EPA Region 9 Preliminary Remediation Goals (PRG) Table* , Region 9, San Francisco, California, October.

Table 3-3

Variables Used to Estimate Potential Chemical Intake and Contact Rates from Groundwater Burning Ground Reservoir No. 2, Plum Brook Ordnance Works, Sandusky, Ohio

[c] Calculated as the product of ED (years) x 365 days/year.

[d] The *Exposure Factors Handbook* (see reference g) indicates that the 90th percentile for the amount of time spent at a residence is more than 23 hours per day.

[e] Assumed; see text.

[f] U.S. Environmental Protection Agency (EPA), 2004a, *Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E - Supplemental Guidance for Dermal Risk Assessment)* , Final, Office of Superfund Remediation and Technology Innovation, Washington, D.C., July, EPA/540/R-99/005.

[g] U.S. Environmental Protection Agency, (EPA), 1997a, *Exposure Factors Handbook* , Final, National Center for Environmental Assessment, Washington, D.C., EPA/600/P-95/002Fa, August.

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U.S. Environmental Protection Agency (EPA), 2004b, ***User's Guide and Background Technical Document for Region 9 Preliminary Remediation Goals (PRG) Table***, Region 9, San Francisco, California, October, http://www.epa.gov/region09/waste/sfund/prg/files/04usersguide.pdg.

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Table 4-1
Toxicity Values Used in the BHHRA
at the Reservoir No. 2 Burning Ground,
Plum Brook Ordnance Works, Sandusky, Ohio

Analyte	Reference Doses[1]			Cancer Slope Factors[2]		
	Oral	Dermal	Inhalation	Oral	Dermal	Inhalation
2,3,7,8-TCDD (TEQ)	--	--	--	1.50E+05	1.50E+05	1.50E+05
2,4,6-Trinitrotoluene	5.00E-04	5.00E-04	5.00E-04	3.00E-02	3.00E-02	3.00E-02
2,4-Dinitrotoluene	2.00E-03	2.00E-03	2.00E-03	--	--	--
2,6-Dinitrotoluene	1.00E-03	1.00E-03	1.00E-03	--	--	--
2-Nitrotoluene	1.00E-02	1.00E-02	--	2.30E-01	2.30E-01	--
Acenaphthene	6.00E-02	6.00E-02	6.00E-02	--	--	--
Aluminum	1.00E+00	1.00E+00	1.43E-03	--	--	--
Antimony	4.00E-04	4.00E-04	--	--	--	--
Arsenic	3.00E-04	3.00E-04	--	1.50E+00	1.50E+00	1.51E+01
Barium	2.00E-01	2.00E-01	2.00E-01	--	--	--
Benzene	4.00E-03	4.00E-03	8.57E-03	5.50E-02	5.50E-02	2.70E-02
Benzo(a)anthracene	--	--	--	7.30E-01	7.30E-01	3.10E-01
Benzo(a)pyrene	--	--	--	7.30E+00	7.30E+00	3.10E+00
Benzo(b)fluoranthene	--	--	--	7.30E-01	7.30E-01	3.10E-01
Carbon disulfide	1.00E-01	1.00E-01	2.00E-01	--	--	--
Chloromethane	--	--	2.57E-02	--	--	6.30E-03
Chromium	3.00E-03	3.00E-03	2.85E-05	--	--	2.94E+02
Cobalt	2.00E-02	2.00E-02	5.71E-06	--	--	9.80E+00
Copper	3.71E-02	3.71E-02	--	--	--	--
Cyanide	2.00E-02	2.00E-02	--	--	--	--
Dibenz(a,h)anthracene	--	--	--	7.30E+00	7.30E+00	3.10E+00
Ethylbenzene	1.00E-01	1.00E-01	2.90E-01	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	7.30E-01	7.30E-01	3.10E-01
Iron	7.00E-01	7.00E-01	--	--	--	--
Manganese	4.67E-02	4.67E-02	1.40E-05	--	--	--
Naphthalene	2.00E-02	2.00E-02	8.57E-04	--	--	--
Nickel	2.00E-02	2.00E-02	--	--	--	--
PCB-1254	2.00E-05	2.00E-05	2.00E-05	2.00E+00	2.00E+00	2.00E+00
PCB-1260	--	--	--	2.00E+00	2.00E+00	2.00E+00
Selenium	5.00E-03	5.00E-03	--	--	--	--
Thallium	7.00E-05	7.00E-05	--	--	--	--
Toluene	8.00E-02	8.00E-02	1.43E+00	--	--	--
Vanadium	5.00E-03	5.00E-03	--	--	--	--
Xylenes, total	2.00E-01	2.00E-01	2.86E-02	--	--	--

-- = Toxicity value not available

1 mg/kg-day

2 (mg/kg-day)-1

Table 5-1
Summary of Noncancer Hazards and Cancer Risk Estimates
from Potential Exposures at Reservoir 2 Burining Ground Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, OH

Groundskeeper Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+01	8.E-05
Dermal Contact	3.E-05	1.E-06
Inhalation	6.E-04	4.E-09
Total	12	8.E-05

Construction Worker Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	3.E+01	4.E-06
Dermal Contact	2.E-04	2.E-07
Inhalation	5.E-04	7.E-11
Total	33	4.E-06

Adult Hunter Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	7.E-01	5.E-06
Dermal Contact	1.E-05	7.E-07
Inhalation	NA	NA
Total	0.7	6.E-06

Construction Worker Risks From Exposure to Subsurface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	2.E+02	2.E-05
Dermal Contact	1.E-01	4.E-07
Inhalation	NA	NA
Total	154	2.E-05

Adult Hunter Risks From Ingestion of Venison		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	9.E-05	1.E-09
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	9.E-05	1.E-09

Indoor Worker Risks From Exposure to Groundwater		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+01	2.E-03
Dermal Contact	6.E-01	4.E-05
Inhalation	NA	NA
Total	15	2.E-03

Child Risks From Ingestion of Venison		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	2.E-04	5.E-10
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	2.E-04	5.E-10

Indoor Worker Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	6.E+00	4.E-05
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	6	4.E-05

Table 5-1
Summary of Noncancer Hazards and Cancer Risk Estimates
from Potential Exposures at Reservoir 2 Burining Ground Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, OH

Adult Residential Risks From Exposure to Groundwater		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	4.E+01	4.E-03
Dermal Contact	2.E+00	1.E-04
Inhalation	NA	NA
Total	44	5.E-03

Child Residential Risks From Exposure to Groundwater		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+02	3.E-03
Dermal Contact	4.E+00	8.E-05
Inhalation	NA	NA
Total	101	3.E-03

Adult Residential Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+01	1.E-04
Dermal Contact	3.E-04	1.E-05
Inhalation	7.E-04	4.E-09
Total	15	1.E-04

Child Residential Risks From Exposure to Surface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	1.E+02	2.E-04
Dermal Contact	5.E-04	5.E-06
Inhalation	2.E-03	3.E-09
Total	140	2.E-04

Adult Residential Risks From Exposure to Subsurface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E+01	1.E-03
Dermal Contact	2.E-01	3.E-05
Inhalation	NA	NA
Total	70	1.E-03

Child Residential Risks From Exposure to Subsurface Soil		
Exposure Route	Hazard Quotient	Excess Cancer Risk
Ingestion	7.E+02	2.E-03
Dermal Contact	3.E-01	1.E-05
Inhalation	NA	NA
Total	651	3.E-03

Table 5-2
Summary of Noncancer Hazards and Cancer Risk Estimates from Potential Exposures at Reservoir 2 Burning Ground Outside the Plum Brook Ordnance Works, Sandusky, OH

Groundskeeper Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+00	2.E-05
Dermal Contact	NA	9.E-07
Inhalation	6.E-05	1.E-09
Total	1	3.E-05

Construction Worker Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	3.E+00	1.E-06
Dermal Contact	NA	2.E-07
Inhalation	5.E-05	2.E-11
Total	3	2.E-06

Adult Hunter Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	7.E-02	2.E-06
Dermal Contact	NA	5.E-07
Inhalation	NA	NA
Total	0.1	2.E-06

Construction Worker Risks From Exposure to Subsurface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+00	1.E-06
Dermal Contact	3.E-02	1.E-07
Inhalation	NA	NA
Total	1.3	1.E-06

Adult Hunter Risks From Ingestion of Venison		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	9.E-05	1.E-09
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	9.E-05	1.E-09

Construction Worker Risks From Exposure to Sediment		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	NA	1.E-07
Dermal Contact	NA	5.E-08
Inhalation	NA	NA
Total	NA	2.E-07

Child Risks From Ingestion of Venison		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	2.E-04	4.E-10
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	2.E-04	4.E-10

Indoor Worker Risks From Exposure to Groundwater		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+01	2.E-03
Dermal Contact	6.E-01	4.E-05
Inhalation	NA	NA
Total	15	2.E-03

Indoor Worker Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	6.E-01	1.E-05
Dermal Contact	NA	NA
Inhalation	NA	NA
Total	0.6	1.E-05

Table 5-2
Summary of Noncancer Hazards and Cancer Risk Estimates
from Potential Exposures at Reservoir 2 Burning Ground
Outside the Plum Brook Ordnance Works, Sandusky, OH

Adult Residential Risks From Exposure to Groundwater		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	4.E+01	4.E-03
Dermal Contact	2.E+00	1.E-04
Inhalation	NA	NA
Total	44	5.E-03

Child Residential Risks From Exposure to Groundwater		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+02	3.E-03
Dermal Contact	4.E+00	8.E-05
Inhalation	NA	NA
Total	101	3.E-03

Adult Residential Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	2.E+00	3.E-05
Dermal Contact	NA	1.E-05
Inhalation	7.E-05	1.E-09
Total	1.6	4.E-05

Child Residential Risks From Exposure to Surface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	1.E+01	7.E-05
Dermal Contact	NA	4.E-06
Inhalation	2.E-04	8.E-10
Total	15	7.E-05

Adult Residential Risks From Exposure to Subsurface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	6.E-01	2.E-05
Dermal Contact	4.E-02	6.E-06
Inhalation	NA	NA
Total	0.6	3.E-05

Child Residential Risks From Exposure to Subsurface Soil		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	5.E+00	5.E-05
Dermal Contact	7.E-02	3.E-06
Inhalation	NA	NA
Total	5	5.E-05

Adult Residential Risks From Exposure to Sediment		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	NA	7.E-07
Dermal Contact	NA	8.E-07
Inhalation	NA	NA
Total	NA	1.E-06

Child Residential Risks From Exposure to Sediment		
Exposure Route	**Hazard Quotient**	**Excess Cancer Risk**
Ingestion	NA	2.E-06
Dermal Contact	NA	4.E-07
Inhalation	NA	NA
Total	NA	2.E-06

APPENDICES

APPENDIX A
DERMAL ABSORBED DOSE CALCULATIONS

Cancer Dermal Absorbed Dose Calculations
for Adult Residential Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	2.00E+04	cm2
t_event =	2.00E-01	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	3.50E+02	days/yr
ED =	2.40E+01	years
BW =	7.00E+01	kg
AT =	2.56E+04	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/ Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	2.3E-06	2.2E-04	15%	1.33%	N	0.00%
Antimony (total)	1.0E-03	default	3.00E-06	6.0E-10	5.6E-08	15%	1.33%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	4.4E-08	4.2E-06	95%	0.21%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	6.3E-09	6.0E-07	1.3%	15.38%	Y	0.00%
Cyanide	1.0E-03	default	2.90E-04	5.8E-08	5.4E-06	47%	0.43%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	5.5E-06	5.1E-04	6%	3.33%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	2.0E-07	1.9E-05	6%	3.33%	N	0.00%

Cancer Dermal Absorbed Dose Calculations
for Adult Residential Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E+00 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 pi= 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	20000 cm2
Event time (hr/event):	t_event =	0.20 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	350 days/yr
Exposure duration (years):	ED =	24 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	70.0 kg
Averaging time (days):	AT =	25550 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

		CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
		Acenaphthene	83329	154.2	3.92	5.0E-04	8.6E-02		3.1E-01		94%	Y	1%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	5.0E-05	4.7E-03	-3.7E+00	2.14E-04	2.14E-07
	17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		10%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	2.4E-05	2.3E-03	-3.2E+00	5.71E-04	5.71E-07
*	19	Benzo(a)anthracene	56553	228.3	5.66	1.7E-02	4.7E-01		1.3E+01	*	834%	Y	7%	2.8	2.03	8.53	1.0	2.93E-07	4.7E-01	2.4E-07	2.3E-05	-4.1E+00	8.20E-05	8.20E-08
	35	Carbon disulfide	75150	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		12%	Y	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	2.7E-06	2.6E-04	-3.3E+00	5.57E-04	5.57E-07
**	45	Chloromethane	74873	50.5	0.91	1.3E-04	3.3E-03		8.3E-02	**	2%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	9.9E-08	9.3E-06	-3.1E+00	8.16E-04	8.16E-07
	109	Ethylbenzene	100414	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		39%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	5.4E-06	5.1E-04	-3.4E+00	3.97E-04	3.97E-07
	143	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		43%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	3.8E-07	3.6E-05	-3.5E+00	2.99E-04	2.99E-07
	193	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		23%	Y	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	9.2E-06	8.6E-04	-3.3E+00	4.77E-04	4.77E-07
	209	Xylenes, total	1330207	106.2	3.15		4.9E-02		1.4E+00		39%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	6.3E-05	6.0E-03	-3.4E+00	3.97E-04	3.97E-07

Noncancer Dermal Absorbed Dose Calculations
for Adult Residential Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	2.00E+04	cm2
t_event =	2.00E-01	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	3.50E+02	days/yr
ED =	2.40E+01	years
BW =	7.00E+01	kg
AT =	8.76E+03	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/ Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	2.3E-06	6.4E-04	15%	1.33%	N	0.00%
Antimony (Total)	1.0E-03	default	3.00E-06	6.0E-10	1.6E-07	15%	1.33%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	4.4E-08	1.2E-05	95%	0.21%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	6.3E-09	1.7E-06	1.3%	15.38%	Y	0.00%
Cyanide	1.0E-03	default	2.90E-04	5.8E-08	1.6E-05	47%	0.43%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	5.5E-06	1.5E-03	6%	3.33%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	2.0E-07	5.6E-05	6%	3.33%	N	0.00%
Thallium (total)	1.0E-03	default	2.30E-06	4.6E-10	1.3E-07	100%	0.20%	N	0.00%
Vanadium (total)	1.0E-03	default	2.24E-05	4.5E-09	1.2E-06	2.6%	7.69%	N	0.00%

Noncancer Dermal Absorbed Dose Calculations
for Adult Residential Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E-03 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 pi= 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	20000 cm2
Event time (hr/event):	t_event =	0.20 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	350 days/yr
Exposure duration (years):	ED =	24 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	70.0 kg
Averaging time (days):	AT =	8760 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

		CHEMICAL		MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
		Acenaphthene	#	154.2	3.92	5.0E-04	8.6E-02		3.1E-01		94%	Y	1%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	5.0E-05	1.4E-02	-3.7E+00	2.14E-04	2.14E-07
	17	Benzene	#	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		10%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	2.4E-05	6.7E-03	-3.2E+00	5.71E-04	5.71E-07
*	19	Benzo(a)anthracene	#	228.3	5.66	1.7E-02	4.7E-01		1.3E+01	*	834%	Y	7%	2.8	2.03	8.53	1.0	2.93E-07	4.7E-01	2.4E-07	6.7E-05	-4.1E+00	8.20E-05	8.20E-08
	35	Carbon disulfide	#	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		12%	Y	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	2.7E-06	7.4E-04	-3.3E+00	5.57E-04	5.57E-07
**	45	Chloromethane	#	50.5	0.91	1.3E-04	3.3E-03		8.3E-02	**	2%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	9.9E-08	2.7E-05	-3.1E+00	8.16E-04	8.16E-07
	109	Ethylbenzene	#	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		39%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	5.4E-06	1.5E-03	-3.4E+00	3.97E-04	3.97E-07
	143	Naphthalene	#	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		43%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	3.8E-07	1.0E-04	-3.5E+00	2.99E-04	2.99E-07
	193	Toluene	#	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		23%	Y	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	9.2E-06	2.5E-03	-3.3E+00	4.77E-04	4.77E-07
	209	Xylenes, total	#	106.2	3.15		4.9E-02		1.4E+00		39%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	6.3E-05	1.7E-02	-3.4E+00	3.97E-04	3.97E-07

Cancer Dermal Absorbed Dose Calculations
for Child Residential Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	6.60E+03	cm2
t_event =	3.33E-01	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	3.50E+02	days/yr
ED =	6.00E+00	years
BW =	1.50E+01	kg
AT =	2.56E+04	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/r Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	3.9E-06	1.4E-04	15%	0.73%	N	0.00%
Antimony (Total)	1.0E-03	default	3.00E-06	1.0E-09	3.6E-08	15%	0.73%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	7.4E-08	2.7E-06	95%	0.12%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	1.1E-08	3.8E-07	1.3%	8.45%	N	0.00%
Cyanide	1.0E-03	default	2.90E-04	9.7E-08	3.5E-06	47%	0.23%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	9.1E-06	3.3E-04	6%	1.83%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	3.4E-07	1.2E-05	6%	1.83%	N	0.00%
Thallium (total)	1.0E-03	default	2.30E-06	7.7E-10	2.8E-08	100%	0.11%	N	0.00%
Vanadium (total)	1.0E-03	default	2.24E-05	7.5E-09	2.7E-07	2.6%	4.23%	N	0.00%

Cancer Dermal Absorbed Dose Calculations
for Noncancer Dermal Absorbed Dose Calculations
for Child Residential Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E-03 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 ppm = 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	6600 cm2
Event time (hr/event):	t_event =	0.33 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	350 days/yr
Exposure duration (years):	ED =	6 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	15 kg
Averaging time (days):	AT =	25550 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

	CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
	Acenaphthene	83329	154.2	3.92		8.6E-02				40%	Y	0%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	6.5E-05	2.3E-03	-3.7E+00	2.14E-04	2.14E-07
17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		4%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	3.2E-05	1.1E-03	-3.2E+00	5.71E-04	5.71E-07
* 19	Benzo(a)anthracene	56553	228.3	5.66	1.7E-02	4.7E-01		1.3E+01 *		355%	Y	2%	2.6	2.02	8.63	1.0	2.93E-07	4.7E-01	3.2E-07	1.1E-05	-4.1E+00	8.20E-05	8.20E-08
35	Carbon disulfide	75150	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		5%	N	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	3.5E-06	1.3E-04	-3.3E+00	5.57E-04	5.57E-07
** 45	Chloromethane	74873	50.5	0.91	1.3E-04	3.3E-03		8.3E-02 **		1%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	1.3E-07	4.6E-06	-3.1E+00	3.16E-04	3.16E-07
109	Ethylbenzene	100414	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		17%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	7.0E-06	2.5E-04	-3.4E+00	3.97E-04	3.97E-07
143	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		18%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	4.9E-07	1.8E-05	-3.5E+00	2.99E-04	2.99E-07
193	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		10%	N	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	1.2E-05	4.3E-04	-3.3E+00	4.77E-04	4.77E-07
209	Xylenes, total	1330207	106.2	3.15		4.9E-02		1.4E+00		17%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	8.2E-05	3.0E-03	-3.4E+00	3.97E-04	3.97E-07

Noncancer Dermal Absorbed Dose Calculations
for Child Residential Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	6.60E+03	cm2
t_event =	3.33E-01	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	3.50E+02	days/yr
ED =	6.00E+00	years
BW =	1.50E+01	kg
AT =	2.19E+03	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/r Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	3.9E-06	1.6E-03	15%	0.73%	N	0.00%
Antimony (Total)	1.0E-03	default	3.00E-06	1.0E-09	4.2E-07	15%	0.73%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	7.4E-08	3.1E-05	95%	0.12%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	1.1E-08	4.5E-06	1.3%	8.45%	N	0.00%
Cyanide	1.0E-03	default	2.90E-04	9.7E-08	4.1E-05	47%	0.23%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	9.1E-06	3.8E-03	6%	1.83%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	3.4E-07	1.4E-04	6%	1.83%	N	0.00%
Thallium (total)	1.0E-03	default	2.30E-06	7.7E-10	3.2E-07	100%	0.11%	N	0.00%
Vanadium (total)	1.0E-03	default	2.24E-05	7.5E-09	3.1E-06	2.6%	4.23%	N	0.00%

Noncancer Dermal Absorbed Dose Calculations
for Child Residential Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E-03 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 ppi= 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	6600 cm2
Event time (hr/event):	t_event =	0.33 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	350 days/yr
Exposure duration (years):	ED =	6 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	15.0 kg
Averaging time (days):	AT =	2190 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

		CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
		Acenaphthene	83329	154.2	3.92	5.0E-04	8.6E-02		3.1E-01		40%	Y	0%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	6.5E-05	2.7E-02	-3.7E+00	2.14E-04	2.14E-07
	17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		4%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	3.2E-05	1.3E-02	-3.2E+00	5.71E-04	5.71E-07
*	19	Benzo(a)anthracene	56553	228.3	5.66	1.7E-02	4.7E-01		1.3E+01	*	355%	Y	2%	2.8	2.03	8.53	1.0	2.93E-07	4.7E-01	3.2E-07	1.3E-04	-4.1E+00	8.20E-05	8.20E-08
	35	Carbon disulfide	75150	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		5%	N	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	3.5E-06	1.5E-03	-3.3E+00	5.57E-04	5.57E-07
**	45	Chloromethane	74873	50.5	0.91	1.3E-04	3.3E-03		8.3E-02	**	1%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	1.3E-07	5.4E-05	-3.1E+00	8.16E-04	8.16E-07
	109	Ethylbenzene	100414	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		17%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	7.0E-06	2.9E-03	-3.4E+00	3.97E-04	3.97E-07
	143	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		18%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	4.9E-07	2.1E-04	-3.5E+00	2.99E-04	2.99E-07
	193	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		10%	N	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	1.2E-05	5.0E-03	-3.3E+00	4.77E-04	4.77E-07
	209	Xylenes, total	1330207	106.2	3.15		4.9E-02		1.4E+00		17%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	8.2E-05	3.5E-02	-3.4E+00	3.97E-04	3.97E-07

Cancer Dermal Absorbed Dose Calculations
for Indoor Worker Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	3.30E+03	cm2
t_event =	1.00E+00	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	2.50E+02	days/yr
ED =	2.50E+01	years
BW =	7.00E+01	kg
AT =	2.56E+04	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/ Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	1.2E-05	1.3E-04	15%	1.10%	N	0.00%
Antimony (Total)	1.0E-03	default	3.00E-06	3.0E-09	3.5E-08	15%	1.10%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	2.2E-07	2.5E-06	95%	0.17%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	3.2E-08	3.7E-07	1.3%	12.69%	Y	0.00%
Cyanide	1.0E-03	default	2.90E-04	2.9E-07	3.3E-06	47%	0.35%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	2.7E-05	3.1E-04	6%	2.75%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	1.0E-06	1.2E-05	6%	2.75%	N	0.00%
Thallium (total)	1.0E-03	default	2.30E-06	2.3E-09	2.7E-08	100%	0.17%	N	0.00%
Vanadium (total)	1.0E-03	default	2.24E-05	2.2E-08	2.6E-07	2.6%	6.35%	N	0.00%

Cancer Dermal Absorbed Dose Calculations
for Indoor Worker Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E-03 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 pi= 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	3300 cm2
Event time (hr/event):	t_event =	1.00 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	250 days/yr
Exposure duration (years):	ED =	25 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	70.0 kg
Averaging time (days):	AT =	25550 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

		CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
		Acenaphthene	83329	154.2	3.92	5.0E-04	8.6E-02		3.1E-01		35%	Y	0%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	1.1E-04	1.3E-03	-3.7E+00	2.14E-04	2.14E-07
	17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		4%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	5.7E-05	6.6E-04	-3.2E+00	5.71E-04	5.71E-07
*	19	Benzo(a)anthracene	56553	228.3	5.66	1.7E-02	4.7E-01		1.3E+01	*	308%	Y	1%	2.8	2.03	8.53	1.0	2.93E-07	4.7E-01	5.5E-07	6.3E-06	-4.1E+00	8.20E-05	8.20E-08
	35	Carbon disulfide	75150	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		4%	N	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	6.3E-06	7.3E-05	-3.3E+00	5.57E-04	5.57E-07
**	45	Chloromethane	74873	50.5	0.91	1.3E-04	3.3E-03		8.3E-02	**	1%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	2.5E-07	2.9E-06	-3.1E+00	8.16E-04	8.16E-07
	109	Ethylbenzene	100414	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		15%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	1.2E-05	1.4E-04	-3.4E+00	3.97E-04	3.97E-07
	143	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		16%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	8.5E-07	9.8E-06	-3.5E+00	2.99E-04	2.99E-07
	193	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		9%	N	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	2.1E-05	2.4E-04	-3.3E+00	4.77E-04	4.77E-07
	209	Xylenes, total	1330207	106.2	3.15		4.9E-02		1.4E+00		15%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	1.4E-04	1.6E-03	-3.4E+00	3.97E-04	3.97E-07

Noncancer Dermal Absorbed Dose Calculations
for Indoor Worker Exposures to Inorganics in Reservoir No. 2 Burning Ground Groundwater

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT (Given are default values from Table 8-6)

Conc =	1.00E-03	mg/cm3 (default value for purpose of illustration)
SA=	3.30E+03	cm2
t_event =	1.00E+00	hr/event (35 minutes/event)
EV =	1.00E+00	event/day
EF =	2.50E+02	days/yr
ED =	2.50E+01	years
BW =	7.00E+01	kg
AT =	9.13E+03	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water IR = 2.00E+03 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/I Q = 1.14E+06 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Aluminum (total)	1.0E-03	default	1.16E-02	1.2E-05	3.7E-04	15%	1.10%	N	0.00%
Antimony (Total)	1.0E-03	default	3.00E-06	3.0E-09	9.7E-08	15%	1.10%	N	0.00%
Arsenic (total)	1.0E-03	default	2.21E-04	2.2E-07	7.1E-06	95%	0.17%	N	0.00%
Chromium (total)	1.0E-03	experimental	3.17E-05	3.2E-08	1.0E-06	1.3%	12.69%	Y	0.00%
Cyanide	1.0E-03	default	2.90E-04	2.9E-07	9.4E-06	47%	0.35%	N	0.00%
Iron (total)	1.0E-03	default	2.73E-02	2.7E-05	8.8E-04	6%	2.75%	N	0.00%
Manganese (total)	1.0E-03	default	1.02E-03	1.0E-06	3.3E-05	6%	2.75%	N	0.00%
Thallium (total)	1.0E-03	default	2.30E-06	2.3E-09	7.4E-08	100%	0.17%	N	0.00%
Vanadium (total)	1.0E-03	default	2.24E-05	2.2E-08	7.2E-07	2.6%	6.35%	N	0.00%

Noncancer Dermal Absorbed Dose Calculations
for Indoor Worker Exposures to Organics in Reservoir No. 2 Burning Ground Groundwater

FOR ORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Organic Chemicals from Aqueous Media (latest version 04/01)

Enter the Following Exposure Conditions: for site specific conditions, change values in Cells I8-I18
The default exposure conditions used in this spreadsheet assume exposure duration for carcinogenic effects of chemicals in water through showering

Concentration (mg/L*L/1000 cm3):	Conc =	1E-03 mg/cm3 (default value for purpose of illustration)
Input site specific concentrations in Column marked "Conc"		= 1 mg/L (1 pi= 1 ug/cm3 = 1000 ppb)
Area exposed (cm2):	SA =	3300 cm2
Event time (hr/event):	t_event =	1.00 hr/event (35 minutes/event)
Event frequency (events/day):	EV =	1 event/day
Exposure frequency (days/year):	EF =	250 days/yr
Exposure duration (years):	ED =	25 years
for carcinogenic effects, ED = 30 years (used in this spreadsheet)		
for noncarcinogenic effects, ED = 9 years		
Body weight (kg):	BW =	70.0 kg
Averaging time (days):	AT =	9125 days
for carcinogenic effects, AT=70 years (25,550 days)		
for noncarcinogenic effects, AT=ED (in days)		
Skin thickness (assumed to be 10 um):	lsc =	1.00E-03 cm

Default conditions for screening purposes:

Compare Dermal to Drinking: Adults showering for 35 minutes/day, compared to drinking 2L water/day

Dermal (mg/day) = DA_event * A * EV	IR =	2000 (cm3/day = L/day * 1000 cm3/L)
Drinking (mg/day) = Conc * IR * ABSIG	ABSGI =	1.0 (assumed 100% GI absorption)

IR: Ingestion rate of drinking water
ABSIG: Absorption fraction in GI tract

Refer to Appendix A for equations to evaluate DA_event and DAD

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500.0 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

(*): outside of the Effective Prediction Domain (EPD) determined by the Flynn's measured Kp data as evaluated using MLAB (Civilized Software, Bethesda, MD)
95% LCI and UCI are evaluated using STATA

(**): halogenated chemicals.
Note:

		CHEMICAL	CAS No.	MWT	logKow	Kp 95% LCI	Kp (cm/hr) predicted	Kp (cm/hr) measured	Kp 95% UCI	Special Chemicals (*) or (**)	Derm/ Drink	Chem Assess	Derm/ Total Dose	B	tau (hr)	t_star (hr)	FA	Conc (mg/cm3)	Kp used in DA_event	DA_event (mg/cm2-evt)	DAD (mg/kg-day)	log(Ds/lsc)	Dsc/lsc	Dsc
		Acenaphthene	83329	154.2	3.92	5.0E-04	8.6E-02		3.1E-01		35%	Y	0%	0.4	0.78	1.87	1.0	5.35E-04	8.6E-02	1.1E-04	3.6E-03	-3.7E+00	2.14E-04	2.14E-07
	17	Benzene	71432	78.1	2.13	5.9E-04	1.5E-02		3.7E-01		4%	N	0%	0.1	0.29	0.70	1.0	2.46E-03	1.5E-02	5.7E-05	1.8E-03	-3.2E+00	5.71E-04	5.71E-07
*	19	Benzo(a)anthracene	56553	228.3	5.66	1.7E-02	4.7E-01		1.3E+01	*	308%	Y	1%	2.8	2.03	8.53	1.0	2.93E-07	4.7E-01	5.5E-07	1.8E-05	-4.1E+00	8.20E-05	8.20E-08
	35	Carbon disulfide	75150	80.0	2.24	6.9E-04	1.7E-02		4.3E-01		4%	N	0%	0.1	0.30	0.72	1.0	2.34E-04	1.7E-02	6.3E-06	2.0E-04	-3.3E+00	5.57E-04	5.57E-07
**	45	Chloromethane	74873	50.5	0.91	1.3E-04	3.3E-03		8.3E-02	**	1%	N	0%	0.0	0.20	0.49	1.0	5.40E-05	3.3E-03	2.5E-07	8.0E-06	-3.1E+00	8.16E-04	8.16E-07
	109	Ethylbenzene	100414	106.2	3.15	1.9E-03	4.9E-02		1.2E+00		15%	Y	0%	0.2	0.42	1.01	1.0	1.37E-04	4.9E-02	1.2E-05	3.9E-04	-3.4E+00	3.97E-04	3.97E-07
	143	Naphthalene	91203	128.2	3.30	1.8E-03	4.7E-02		1.2E+00		16%	Y	0%	0.2	0.56	1.34	1.0	8.87E-06	4.7E-02	8.5E-07	2.8E-05	-3.5E+00	2.99E-04	2.99E-07
	193	Toluene	108883	92.1	2.73	1.2E-03	3.1E-02		7.8E-01		9%	N	0%	0.1	0.35	0.84	1.0	4.03E-04	3.1E-02	2.1E-05	6.8E-04	-3.3E+00	4.77E-04	4.77E-07
	209	Xylenes, total	1330207	106.2	3.15		4.9E-02		1.4E+00		15%	Y	0%	0.2	0.42	1.01	1.0	1.61E-03	4.9E-02	1.4E-04	4.6E-03	-3.4E+00	3.97E-04	3.97E-07

APPENDIX B
RISK CALCULATIONS

Table B-1. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	1.17E-05	5.84E-03	4.17E-06	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	8.61E-07	8.61E-04	3.08E-07	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	8.41E-06	NA	3.00E-06	6.80E-01	2.04E-06
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	5.92E-03	1.18E+01	2.11E-03	3.00E-02	6.34E-05
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	1.24E-10	NA	4.44E-11	1.50E+05	6.66E-06
Copper	8.05E+01	3.71E-02	7.87E-05	2.12E-03	2.81E-05	No toxicity value	NA
Lead	6.73E+02	No toxicity value	6.58E-04	NA	2.35E-04	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	1.79E-06	2.55E-02	6.38E-07	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.06E-07	NA	3.77E-08	7.30E+00	2.76E-07
Naphthalene	5.41E+00	2.00E-02	5.29E-06	2.65E-04	1.89E-06	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	8.71E-06	NA	3.11E-06	2.00E+00	6.22E-06
Hazard Index				1.19E+01			
Total Cancer Risk							7.86E-05

kg = kilogram
mg = milligram

RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-2. Risks and Hazards from Dermal contact with Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	ND	NA	ND	6.80E-01	NA
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	3.80E-12	NA	1.36E-12	1.50E+05	2.03E-07
Copper	8.05E+01	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	6.73E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.40E-08	NA	4.99E-09	7.30E+00	3.64E-08
Naphthalene	5.41E+00	2.00E-02	5.38E-07	2.69E-05	1.92E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.24E-06	NA	4.43E-07	2.00E+00	8.86E-07
Hazard Index				2.69E-05			
Total Cancer Risk							1.13E-06

kg = kilogram
mg = milligram

RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-3. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	5.46E-10	2.73E-07	1.95E-10	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	4.02E-11	4.02E-08	1.44E-11	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	3.93E-10	NA	1.40E-10	6.80E-01	9.55E-11
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	2.77E-07	5.53E-04	9.88E-08	3.00E-02	2.96E-09
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	5.81E-15	NA	2.08E-15	1.50E+05	3.11E-10
Copper	8.05E+01	No toxicity value	3.68E-09	NA	1.31E-09	No toxicity value	NA
Lead	6.73E+02	No toxicity value	3.08E-08	NA	1.10E-08	No toxicity value	NA
Thallium	1.83E+00	No toxicity value	8.35E-11	NA	2.98E-11	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	4.94E-12	NA	1.76E-12	3.10E+00	5.47E-12
Naphthalene	5.41E+00	8.57E-04	2.47E-10	2.89E-07	8.84E-11	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	4.07E-10	NA	1.45E-10	2.00E+00	2.91E-10
Hazard Index				5.54E-04			
Total Cancer Risk							3.67E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-4. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Hunter Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	6.54E-07	3.27E-04	2.80E-07	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	4.82E-08	4.82E-05	2.07E-08	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	4.71E-07	NA	2.02E-07	6.80E-01	1.37E-07
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	3.31E-04	6.63E-01	1.42E-04	3.00E-02	4.26E-06
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	6.97E-12	NA	2.99E-12	1.50E+05	4.48E-07
Copper	8.05E+01	3.71E-02	4.41E-06	1.19E-04	1.89E-06	No toxicity value	NA
Lead	6.73E+02	No toxicity value	3.69E-05	NA	1.58E-05	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	1.00E-07	1.43E-03	4.29E-08	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	5.92E-09	NA	2.54E-09	7.30E+00	1.85E-08
Naphthalene	5.41E+00	2.00E-02	2.96E-07	1.48E-05	1.27E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	4.88E-07	NA	2.09E-07	2.00E+00	4.18E-07
Hazard Index				6.65E-01			
Total Cancer Risk							5.28E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-5. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Hunter Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	ND	NA	ND	6.80E-01	NA
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	1.88E-12	NA	8.06E-13	1.50E+05	1.21E-07
Copper	8.05E+01	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	6.73E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	6.92E-09	NA	2.97E-09	7.30E+00	2.17E-08
Naphthalene	5.41E+00	2.00E-02	2.67E-07	1.33E-05	1.14E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	6.15E-07	NA	2.63E-07	2.00E+00	5.27E-07
Hazard Index				1.33E-05			
Total Cancer Risk							6.70E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-6. Risks and Hazards from Ingestion of Venison Harvested from Reservoir 2 Burning Ground Inside the Burning Area for Adult Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Venison (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	8.93E-11	2.00E-03	1.59E-14	7.95E-12	6.82E-15	No toxicity value	NA
2,6-Dinitrotoluene	1.82E-12	1.00E-03	3.25E-16	3.25E-13	1.39E-16	No toxicity value	NA
Dinitrotoluene mixture	6.43E-11	No toxicity value	1.15E-14	NA	4.91E-15	6.80E-01	3.34E-15
2,4,6-Trinitrotoluene	5.50E-08	5.00E-04	9.80E-12	1.96E-08	4.20E-12	3.00E-02	1.26E-13
2,3,7,8-TCDD (TEQ)	2.51E-11	No toxicity value	4.46E-15	NA	1.91E-15	1.50E+05	2.87E-10
Copper	5.60E-03	3.71E-02	9.97E-07	2.69E-05	4.27E-07	No toxicity value	NA
Lead	5.27E-07	No toxicity value	9.38E-11	NA	4.02E-11	No toxicity value	NA
Thallium	2.54E-05	7.00E-05	4.53E-09	6.47E-05	1.94E-09	No toxicity value	NA
Benzo(a)pyrene	2.16E-08	No toxicity value	3.85E-12	NA	1.65E-12	7.30E+00	1.20E-11
Naphthalene	4.08E-09	2.00E-02	7.26E-13	3.63E-11	3.11E-13	No toxicity value	NA
PCB-1260	7.00E-06	No toxicity value	1.25E-09	NA	5.34E-10	2.00E+00	1.07E-09
Hazard Index				9.16E-05			
Total Cancer Risk							1.37E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-7. Risks and Hazards from Ingestion of Venison Harvested from Reservoir 2 Burning Ground Inside the Burning Area for Child Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Venison (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	8.93E-11	2.00E-03	2.85E-14	1.43E-11	2.45E-15	No toxicity value	NA
2,6-Dinitrotoluene	1.82E-12	1.00E-03	5.83E-16	5.83E-13	5.00E-17	No toxicity value	NA
Dinitrotoluene mixture	6.43E-11	No toxicity value	2.06E-14	NA	1.76E-15	6.80E-01	1.20E-15
2,4,6-Trinitrotoluene	5.50E-08	5.00E-04	1.76E-11	3.52E-08	1.51E-12	3.00E-02	4.52E-14
2,3,7,8-TCDD (TEQ)	2.51E-11	No toxicity value	8.01E-15	NA	6.86E-16	1.50E+05	1.03E-10
Copper	5.60E-03	3.71E-02	1.79E-06	4.82E-05	1.53E-07	No toxicity value	NA
Lead	5.27E-07	No toxicity value	1.68E-10	NA	1.44E-11	No toxicity value	NA
Thallium	2.54E-05	7.00E-05	8.13E-09	1.16E-04	6.97E-10	No toxicity value	NA
Benzo(a)pyrene	2.16E-08	No toxicity value	6.91E-12	NA	5.92E-13	7.30E+00	4.32E-12
Naphthalene	4.08E-09	2.00E-02	1.30E-12	6.52E-11	1.12E-13	No toxicity value	NA
PCB-1260	7.00E-06	No toxicity value	2.24E-09	NA	1.92E-10	2.00E+00	3.84E-10
Hazard Index				1.64E-04			
Total Cancer Risk							4.91E-10

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-8. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	3.25E-05	1.63E-02	2.32E-07	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	2.40E-06	2.40E-03	1.71E-08	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	2.34E-05	NA	1.67E-07	6.80E-01	1.14E-07
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	1.65E-02	3.29E+01	1.18E-04	3.00E-02	3.53E-06
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	3.46E-10	NA	2.47E-12	1.50E+05	3.71E-07
Copper	8.05E+01	3.71E-02	2.19E-04	5.90E-03	1.57E-06	No toxicity value	NA
Lead	6.73E+02	No toxicity value	1.83E-03	NA	1.31E-05	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	4.98E-06	7.11E-02	3.55E-08	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	2.94E-07	NA	2.10E-09	7.30E+00	1.53E-08
Naphthalene	5.41E+00	2.00E-02	1.47E-05	7.37E-04	1.05E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	2.43E-05	NA	1.73E-07	2.00E+00	3.47E-07
Hazard Index				3.30E+01			
Total Cancer Risk							4.38E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-9. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	ND	NA	ND	6.80E-01	NA
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	3.24E-11	NA	2.31E-13	1.50E+05	3.47E-08
Copper	8.05E+01	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	6.73E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.19E-07	NA	8.52E-10	7.30E+00	6.22E-09
Naphthalene	5.41E+00	2.00E-02	4.59E-06	2.30E-04	3.28E-08	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.06E-05	NA	7.56E-08	2.00E+00	1.51E-07
Hazard Index				2.30E-04			
Total Cancer Risk							1.92E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-10. Risks and Hazards from inhalation of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	5.24E-10	2.62E-07	3.74E-12	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	3.86E-11	3.86E-08	2.76E-13	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	3.77E-10	NA	2.70E-12	6.80E-01	1.83E-12
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	2.65E-07	5.31E-04	1.90E-09	3.00E-02	5.69E-11
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	5.58E-15	NA	3.99E-17	1.50E+05	5.98E-12
Copper	8.05E+01	No toxicity value	3.53E-09	NA	2.52E-11	No toxicity value	NA
Lead	6.73E+02	No toxicity value	2.95E-08	NA	2.11E-10	No toxicity value	NA
Thallium	1.83E+00	No toxicity value	8.02E-11	NA	5.73E-13	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	4.74E-12	NA	3.39E-14	3.10E+00	1.05E-13
Naphthalene	5.41E+00	8.57E-04	2.38E-10	2.77E-07	1.70E-12	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	3.91E-10	NA	2.79E-12	2.00E+00	5.58E-12
Hazard Index				5.32E-04			
Total Cancer Risk							7.04E-11

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-11. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Carcinogenic Effects: Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	5.38E-03	2.69E+00	3.84E-05	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	6.83E-04	6.83E-01	4.88E-06	No toxicity value	NA
2-Nitrotoluene	2.30E+00	1.00E-02	6.27E-06	6.27E-04	4.48E-08	2.30E-01	1.03E-08
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	7.50E-02	1.50E+02	5.36E-04	3.00E-02	1.61E-05
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	3.23E-09	NA	2.31E-11	1.50E+05	3.47E-06
Aluminum	1.33E+04	1.00E+00	3.63E-02	3.63E-02	2.59E-04	No toxicity value	NA
Barium	2.75E+03	2.00E-01	7.50E-03	3.75E-02	5.36E-05	No toxicity value	NA
Copper	9.59E+02	3.71E-02	2.61E-03	7.03E-02	1.87E-05	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	6.04E-05	2.01E-02	4.32E-07	No toxicity value	NA
Lead	5.30E+03	No toxicity value	1.44E-02	NA	1.03E-04	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	6.42E-06	9.16E-02	4.58E-08	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	1.12E-07	NA	7.99E-10	7.30E+00	5.83E-09
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	8.23E-07	NA	5.88E-09	7.30E+00	4.29E-08
Naphthalene	2.55E+01	2.00E-02	6.94E-05	3.47E-03	4.96E-07	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	5.55E-06	2.78E-01	3.97E-08	2.00E+00	7.93E-08
PCB-1260	1.26E+00	No toxicity value	3.42E-06	NA	2.44E-08	2.00E+00	4.89E-08
Hazard Index				1.54E+02			
Total Cancer Risk							1.97E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-12. Risks and Hazards from Dermal contact with Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	2.23E+03	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	2.30E+00	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	3.02E-10	NA	2.16E-12	1.50E+05	3.24E-07
Aluminum	1.33E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Barium	2.75E+03	2.00E-01	ND	NA	ND	No toxicity value	NA
Copper	9.59E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Lead	5.30E+03	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	4.53E-08	NA	3.24E-10	7.30E+00	2.36E-09
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	3.33E-07	NA	2.38E-09	7.30E+00	1.74E-08
Naphthalene	2.55E+01	2.00E-02	2.16E-05	1.08E-03	1.55E-07	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	2.42E-06	1.21E-01	1.73E-08	2.00E+00	3.46E-08
PCB-1260	1.26E+00	No toxicity value	1.49E-06	NA	1.07E-08	2.00E+00	2.13E-08
Hazard Index				1.22E-01			
Total Cancer Risk							4.00E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-13. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Indoor Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	5.84E-06	2.92E-03	2.09E-06	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	4.31E-07	4.31E-04	1.54E-07	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	4.21E-06	NA	1.50E-06	6.80E-01	1.02E-06
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	2.96E-03	5.92E+00	1.06E-03	3.00E-02	3.17E-05
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	6.22E-11	NA	2.22E-11	1.50E+05	3.33E-06
Copper	8.05E+01	3.71E-02	3.94E-05	1.06E-03	1.41E-05	No toxicity value	NA
Lead	6.73E+02	No toxicity value	3.29E-04	NA	1.18E-04	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	8.94E-07	1.28E-02	3.19E-07	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	5.28E-08	NA	1.89E-08	7.30E+00	1.38E-07
Naphthalene	5.41E+00	2.00E-02	2.65E-06	1.32E-04	9.45E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	4.36E-06	NA	1.56E-06	2.00E+00	3.11E-06
Hazard Index				5.93E+00			
Total Cancer Risk							3.93E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-14. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	1.47E-05	7.36E-03	5.04E-06	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	1.08E-06	1.08E-03	3.72E-07	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	1.06E-05	NA	3.63E-06	6.80E-01	2.47E-06
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	7.46E-03	1.49E+01	2.56E-03	3.00E-02	7.67E-05
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	1.57E-10	NA	5.37E-11	1.50E+05	8.06E-06
Copper	8.05E+01	3.71E-02	9.92E-05	2.67E-03	3.40E-05	No toxicity value	NA
Lead	6.73E+02	No toxicity value	8.29E-04	NA	2.84E-04	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	2.25E-06	3.22E-02	7.72E-07	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.33E-07	NA	4.57E-08	7.30E+00	3.33E-07
Naphthalene	5.41E+00	2.00E-02	6.67E-06	3.34E-04	2.29E-06	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.10E-05	NA	3.76E-06	2.00E+00	7.53E-06
Hazard Index				1.50E+01			
Total Cancer Risk							9.51E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-15. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	ND	NA	ND	6.80E-01	NA
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	4.28E-11	NA	1.47E-11	1.50E+05	2.20E-06
Copper	8.05E+01	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	6.73E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.58E-07	NA	5.40E-08	7.30E+00	3.94E-07
Naphthalene	5.41E+00	2.00E-02	6.07E-06	3.04E-04	2.08E-06	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.40E-05	NA	4.80E-06	2.00E+00	9.59E-06
Hazard Index				3.04E-04			
Total Cancer Risk							1.22E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-16. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/L) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	6.87E-10	3.44E-07	2.36E-10	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	5.07E-11	5.07E-08	1.74E-11	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	4.95E-10	NA	1.70E-10	6.80E-01	1.15E-10
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	3.48E-07	6.97E-04	1.19E-07	3.00E-02	3.58E-09
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	7.33E-15	NA	2.51E-15	1.50E+05	3.77E-10
Copper	8.05E+01	No toxicity value	4.64E-09	NA	1.59E-09	No toxicity value	NA
Lead	6.73E+02	No toxicity value	3.88E-08	NA	1.33E-08	No toxicity value	NA
Thallium	1.83E+00	No toxicity value	1.05E-10	NA	3.61E-11	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	6.22E-12	NA	2.13E-12	3.10E+00	6.61E-12
Naphthalene	5.41E+00	8.57E-04	3.12E-10	3.64E-07	1.07E-10	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	5.13E-10	NA	1.76E-10	2.00E+00	3.52E-10

Hazard Index	6.98E-04

Total Cancer Risk		4.43E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-17. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/L) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	2.43E-03	1.22E+00	8.35E-04	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	3.09E-04	3.09E-01	1.06E-04	No toxicity value	NA
Dinitrotoluene mixture	2.23E+03	No toxicity value	2.74E-03	NA	9.41E-04	6.80E-01	6.40E-04
2-Nitrotoluene	2.30E+00	1.00E-02	2.84E-06	2.84E-04	9.72E-07	2.30E-01	2.24E-07
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	3.40E-02	6.79E+01	1.16E-02	3.00E-02	3.49E-04
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	1.46E-09	NA	5.02E-10	1.50E+05	7.53E-05
Aluminum	1.33E+04	1.00E+00	1.64E-02	1.64E-02	5.63E-03	No toxicity value	NA
Barium	2.75E+03	2.00E-01	3.40E-03	1.70E-02	1.16E-03	No toxicity value	NA
Copper	9.59E+02	3.71E-02	1.18E-03	3.18E-02	4.05E-04	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	2.74E-05	9.12E-03	9.38E-06	No toxicity value	NA
Lead	5.30E+03	No toxicity value	6.54E-03	NA	2.24E-03	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	2.90E-06	4.15E-02	9.95E-07	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	5.06E-08	NA	1.74E-08	7.30E+00	1.27E-07
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	3.72E-07	NA	1.28E-07	7.30E+00	9.32E-07
Naphthalene	2.55E+01	2.00E-02	3.14E-05	1.57E-03	1.08E-05	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	2.51E-06	1.26E-01	8.61E-07	2.00E+00	1.72E-06
PCB-1260	1.26E+00	No toxicity value	1.55E-06	NA	5.31E-07	2.00E+00	1.06E-06
Hazard Index				6.97E+01			
Total Cancer Risk							1.07E-03

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-18. Risks and Hazards from Dermal Contact with Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	2.23E+03	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	2.30E+00	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	4.00E-10	NA	1.37E-10	1.50E+05	2.06E-05
Aluminum	1.33E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Barium	2.75E+03	2.00E-01	ND	NA	ND	No toxicity value	NA
Copper	9.59E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Lead	5.30E+03	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	5.99E-08	NA	2.05E-08	7.30E+00	1.50E-07
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	4.40E-07	NA	1.51E-07	7.30E+00	1.10E-06
Naphthalene	2.55E+01	2.00E-02	2.86E-05	1.43E-03	9.80E-06	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	3.20E-06	1.60E-01	1.10E-06	2.00E+00	2.20E-06
PCB-1260	1.26E+00	No toxicity value	1.97E-06	NA	6.76E-07	2.00E+00	1.35E-06
Hazard Index				1.61E-01			
Total Cancer Risk							2.54E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-19. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	1.37E-04	6.87E-02	1.18E-05	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	1.01E-05	1.01E-02	8.68E-07	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	9.89E-05	NA	8.48E-06	6.80E-01	5.77E-06
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	6.96E-02	1.39E+02	5.96E-03	3.00E-02	1.79E-04
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	1.46E-09	NA	1.25E-10	1.50E+05	1.88E-05
Copper	8.05E+01	3.71E-02	9.26E-04	2.49E-02	7.94E-05	No toxicity value	NA
Lead	6.73E+02	No toxicity value	7.74E-03	NA	6.64E-04	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	2.10E-05	3.00E-01	1.80E-06	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.24E-06	NA	1.07E-07	7.30E+00	7.78E-07
Naphthalene	5.41E+00	2.00E-02	6.23E-05	3.11E-03	5.34E-06	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.02E-04	NA	8.78E-06	2.00E+00	1.76E-05
Hazard Index				1.40E+02			
Total Cancer Risk							2.22E-04

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-20. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	ND	NA	ND	6.80E-01	NA
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	7.68E-11	NA	6.58E-12	1.50E+05	9.88E-07
Copper	8.05E+01	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	6.73E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.83E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	2.83E-07	NA	2.42E-08	7.30E+00	1.77E-07
Naphthalene	5.41E+00	2.00E-02	1.09E-05	5.45E-04	9.34E-07	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	2.51E-05	NA	2.15E-06	2.00E+00	4.30E-06
Hazard Index				5.45E-04			
Total Cancer Risk							5.47E-06

kg = kilogram
mg = milligram

RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-21. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.19E+01	2.00E-03	1.60E-09	8.02E-07	1.37E-10	No toxicity value	NA
2,6-Dinitrotoluene	8.80E-01	1.00E-03	1.18E-10	1.18E-07	1.01E-11	No toxicity value	NA
Dinitrotoluene mixture	8.60E+00	No toxicity value	1.16E-09	NA	9.91E-11	6.80E-01	6.74E-11
2,4,6-Trinitrotoluene	6.05E+03	5.00E-04	8.13E-07	1.63E-03	6.97E-08	3.00E-02	2.09E-09
2,3,7,8-TCDD (TEQ)	1.27E-04	No toxicity value	1.71E-14	NA	1.47E-15	1.50E+05	2.20E-10
Copper	8.05E+01	No toxicity value	1.08E-08	NA	9.27E-10	No toxicity value	NA
Lead	6.73E+02	No toxicity value	9.04E-08	NA	7.75E-09	No toxicity value	NA
Thallium	1.83E+00	No toxicity value	2.46E-10	NA	2.11E-11	No toxicity value	NA
Benzo(a)pyrene	1.08E-01	No toxicity value	1.45E-11	NA	1.24E-12	3.10E+00	3.86E-12
Naphthalene	5.41E+00	8.57E-04	7.27E-10	8.49E-07	6.23E-11	No toxicity value	NA
PCB-1260	8.91E+00	No toxicity value	1.20E-09	NA	1.03E-10	2.00E+00	2.05E-10
Hazard Index				1.63E-03			
Total Cancer Risk							2.59E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-22. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

				Noncarcinogenic Effects:			Carcinogenic Effects:
Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	2.27E-02	1.14E+01	1.95E-03	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	2.88E-03	2.88E+00	2.47E-04	No toxicity value	NA
Dinitrotoluene mixture	2.23E+03	No toxicity value	2.56E-02	NA	2.19E-03	6.80E-01	1.49E-03
2-Nitrotoluene	2.30E+00	1.00E-02	2.65E-05	2.65E-03	2.27E-06	2.30E-01	5.22E-07
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	3.17E-01	6.34E+02	2.72E-02	3.00E-02	8.15E-04
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	1.37E-08	NA	1.17E-09	1.50E+05	1.76E-04
Aluminum	1.33E+04	1.00E+00	1.53E-01	1.53E-01	1.31E-02	No toxicity value	NA
Barium	2.75E+03	2.00E-01	3.17E-02	1.58E-01	2.72E-03	No toxicity value	NA
Copper	9.59E+02	3.71E-02	1.10E-02	2.97E-01	9.46E-04	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	2.55E-04	8.51E-02	2.19E-05	No toxicity value	NA
Lead	5.30E+03	No toxicity value	6.10E-02	NA	5.23E-03	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	2.71E-05	3.87E-01	2.32E-06	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	4.73E-07	NA	4.05E-08	7.30E+00	2.96E-07
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	3.48E-06	NA	2.98E-07	7.30E+00	2.17E-06
Naphthalene	2.55E+01	2.00E-02	2.93E-04	1.47E-02	2.51E-05	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	2.35E-05	1.17E+00	2.01E-06	2.00E+00	4.02E-06
PCB-1260	1.26E+00	No toxicity value	1.45E-05	NA	1.24E-06	2.00E+00	2.48E-06
Hazard Index				6.50E+02			
Total Cancer Risk							2.49E-03

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-23. Risks and Hazards from Dermal Contact with Subsurface Soil at Reservoir 2 Burning Ground Inside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	1.97E+03	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	2.51E+02	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	2.23E+03	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	2.30E+00	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	2.75E+04	5.00E-04	ND	NA	ND	3.00E-02	NA
2,3,7,8-TCDD (TEQ)	1.19E-03	No toxicity value	7.17E-10	NA	6.15E-11	1.50E+05	9.22E-06
Aluminum	1.33E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Barium	2.75E+03	2.00E-01	ND	NA	ND	No toxicity value	NA
Copper	9.59E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	2.22E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Lead	5.30E+03	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	2.36E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	4.11E-02	No toxicity value	1.08E-07	NA	9.22E-09	7.30E+00	6.73E-08
Dibenz(a,h)anthracene	3.02E-01	No toxicity value	7.91E-07	NA	6.78E-08	7.30E+00	4.95E-07
Naphthalene	2.55E+01	2.00E-02	5.13E-05	2.57E-03	4.40E-06	No toxicity value	NA
PCB-1254	2.04E+00	2.00E-05	5.75E-06	2.87E-01	4.92E-07	2.00E+00	9.85E-07
PCB-1260	1.26E+00	No toxicity value	3.54E-06	NA	3.04E-07	2.00E+00	6.07E-07
Hazard Index				2.90E-01			
Total Cancer Risk							1.14E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-24. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	3.66E-05	1.83E-02	1.31E-05	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	1.05E-05	1.05E-02	3.74E-06	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	5.02E-05	NA	1.79E-05	6.80E-01	1.22E-05
2-Nitrotoluene	3.65E-01	1.00E-02	3.57E-07	3.57E-05	1.28E-07	2.30E-01	2.93E-08
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	5.93E-04	1.19E+00	2.12E-04	3.00E-02	6.35E-06
Copper	1.28E+02	3.71E-02	1.25E-04	3.37E-03	4.47E-05	No toxicity value	NA
Lead	2.38E+02	No toxicity value	2.33E-04	NA	8.31E-05	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	1.36E-06	1.95E-02	4.87E-07	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	9.94E-08	NA	3.55E-08	7.30E+00	2.59E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.39E-07	NA	4.96E-08	7.30E-01	3.62E-08
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	4.08E-08	NA	1.46E-08	7.30E+00	1.06E-07
PCB-1260	8.50E+00	No toxicity value	8.32E-06	NA	2.97E-06	2.00E+00	5.94E-06
Hazard Index				1.24E+00			
Total Cancer Risk							2.49E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-25. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	3.65E-01	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	ND	NA	ND	3.00E-02	NA
Copper	1.28E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	2.38E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.31E-08	NA	4.69E-09	7.30E+00	3.43E-08
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.84E-08	NA	6.56E-09	7.30E-01	4.79E-09
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	5.39E-09	NA	1.93E-09	7.30E+00	1.41E-08
PCB-1260	8.50E+00	No toxicity value	1.18E-06	NA	4.23E-07	2.00E+00	8.46E-07
Hazard Index				NA			
Total Cancer Risk							8.99E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-26. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Groundskeeper Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	1.71E-09	8.55E-07	6.11E-10	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	4.89E-10	4.89E-07	1.75E-10	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	2.34E-09	NA	8.37E-10	6.80E-01	5.69E-10
2-Nitrotoluene	3.65E-01	No toxicity value	1.67E-11	NA	5.96E-12	No toxicity value	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	2.77E-08	5.54E-05	9.89E-09	3.00E-02	2.97E-10
Copper	1.28E+02	No toxicity value	5.85E-09	NA	2.09E-09	No toxicity value	NA
Lead	2.38E+02	No toxicity value	1.09E-08	NA	3.88E-09	No toxicity value	NA
Thallium	1.39E+00	No toxicity value	6.37E-11	NA	2.27E-11	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	4.65E-12	NA	1.66E-12	3.10E+00	5.14E-12
Benzo(b)fluoranthene	1.42E-01	No toxicity value	6.49E-12	NA	2.32E-12	3.10E-01	7.18E-13
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	1.91E-12	NA	6.81E-13	3.10E+00	2.11E-12
PCB-1260	8.50E+00	No toxicity value	3.89E-10	NA	1.39E-10	2.00E+00	2.78E-10
Hazard Index				5.67E-05			
Total Cancer Risk							1.15E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-27. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Hunter Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	2.05E-06	1.02E-03	8.78E-07	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	5.86E-07	5.86E-04	2.51E-07	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	2.81E-06	NA	1.20E-06	6.80E-01	8.19E-07
2-Nitrotoluene	3.65E-01	1.00E-02	2.00E-08	2.00E-06	8.57E-09	2.30E-01	1.97E-09
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	3.32E-05	6.64E-02	1.42E-05	3.00E-02	4.27E-07
Copper	1.28E+02	3.71E-02	7.01E-06	1.89E-04	3.00E-06	No toxicity value	NA
Lead	2.38E+02	No toxicity value	1.30E-05	NA	5.58E-06	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	7.63E-08	1.09E-03	3.27E-08	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	5.57E-09	NA	2.39E-09	7.30E+00	1.74E-08
Benzo(b)fluoranthene	1.42E-01	No toxicity value	7.78E-09	NA	3.33E-09	7.30E-01	2.43E-09
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	2.28E-09	NA	9.79E-10	7.30E+00	7.15E-09
PCB-1260	8.50E+00	No toxicity value	4.66E-07	NA	2.00E-07	2.00E+00	3.99E-07
Hazard Index				6.93E-02			
Total Cancer Risk							1.67E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-28. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Hunter Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	3.65E-01	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	ND	NA	ND	3.00E-02	NA
Copper	1.28E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	2.38E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	6.51E-09	NA	2.79E-09	7.30E+00	2.04E-08
Benzo(b)fluoranthene	1.42E-01	No toxicity value	9.10E-09	NA	3.90E-09	7.30E-01	2.85E-09
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	2.67E-09	NA	1.15E-09	7.30E+00	8.36E-09
PCB-1260	8.50E+00	No toxicity value	5.87E-07	NA	2.52E-07	2.00E+00	5.03E-07
Hazard Index				NA			
Total Cancer Risk							5.35E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B29. Risks and Hazards from Ingestion of Venison Harvested at Reservoir 2 Burning Ground Outside the Burning Area for Adult Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Venison (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	2.80E-10	2.00E-03	4.98E-14	2.49E-11	2.14E-14	No toxicity value	NA
2,6-Dinitrotoluene	2.22E-11	1.00E-03	3.95E-15	3.95E-12	1.69E-15	No toxicity value	NA
Dinitrotoluene mixture	3.84E-10	No toxicity value	6.83E-14	NA	2.93E-14	6.80E-01	1.99E-14
2-Nitrotoluene	2.25E-11	1.00E-02	4.00E-15	4.00E-13	1.72E-15	2.30E-01	3.95E-16
2,4,6-Trinitrotoluene	5.51E-09	5.00E-04	9.81E-13	1.96E-09	4.20E-13	3.00E-02	1.26E-14
Copper	8.90E-03	3.71E-02	1.59E-06	4.27E-05	6.79E-07	No toxicity value	NA
Lead	1.86E-07	No toxicity value	3.31E-11	NA	1.42E-11	No toxicity value	NA
Thallium	1.94E-05	7.00E-05	3.45E-09	4.93E-05	1.48E-09	No toxicity value	NA
Benzo(a)pyrene	2.03E-08	No toxicity value	3.62E-12	NA	1.55E-12	7.30E+00	1.13E-11
Benzo(b)fluoranthene	3.51E-08	No toxicity value	6.25E-12	NA	2.68E-12	7.30E-01	1.96E-12
Dibenz(a,h)anthracene	4.01E-08	No toxicity value	7.14E-12	NA	3.06E-12	7.30E+00	2.23E-11
PCB-1260	6.68E-06	No toxicity value	1.19E-09	NA	5.10E-10	2.00E+00	1.02E-09
Hazard Index				9.20E-05			
Total Cancer Risk							1.06E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-30. Risks and Hazards from Ingestion of Venison Harvested at Reservoir 2 Burning Ground Outside the Burning Area for Child Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Venison (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	2.80E-10	2.00E-03	8.95E-14	4.47E-11	7.67E-15	No toxicity value	NA
2,6-Dinitrotoluene	2.22E-11	1.00E-03	7.08E-15	7.08E-12	6.07E-16	No toxicity value	NA
Dinitrotoluene mixture	3.84E-10	No toxicity value	1.23E-13	NA	1.05E-14	6.80E-01	7.15E-15
2-Nitrotoluene	2.25E-11	1.00E-02	7.18E-15	7.18E-13	6.16E-16	2.30E-01	1.42E-16
2,4,6-Trinitrotoluene	5.51E-09	5.00E-04	1.76E-12	3.52E-09	1.51E-13	3.00E-02	4.53E-15
Copper	8.90E-03	3.71E-02	2.85E-06	7.66E-05	2.44E-07	No toxicity value	NA
Lead	1.86E-07	No toxicity value	5.95E-11	NA	5.10E-12	No toxicity value	NA
Thallium	1.94E-05	7.00E-05	6.20E-09	8.85E-05	5.31E-10	No toxicity value	NA
Benzo(a)pyrene	2.03E-08	No toxicity value	6.50E-12	NA	5.57E-13	7.30E+00	4.06E-12
Benzo(b)fluoranthene	3.51E-08	No toxicity value	1.12E-11	NA	9.62E-13	7.30E-01	7.02E-13
Dibenz(a,h)anthracene	4.01E-08	No toxicity value	1.28E-11	NA	1.10E-12	7.30E+00	8.01E-12
PCB-1260	6.68E-06	No toxicity value	2.14E-09	NA	1.83E-10	2.00E+00	3.66E-10
Hazard Index				1.65E-04			
Total Cancer Risk							3.79E-10

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-31. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	1.02E-04	5.09E-02	7.28E-07	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	2.91E-05	2.91E-02	2.08E-07	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	1.40E-04	NA	9.97E-07	6.80E-01	6.78E-07
2-Nitrotoluene	3.65E-01	1.00E-02	9.94E-07	9.94E-05	7.10E-09	2.30E-01	1.63E-09
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	1.65E-03	3.30E+00	1.18E-05	3.00E-02	3.54E-07
Copper	1.28E+02	3.71E-02	3.48E-04	9.38E-03	2.49E-06	No toxicity value	NA
Lead	2.38E+02	No toxicity value	6.48E-04	NA	4.63E-06	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	3.79E-06	5.42E-02	2.71E-08	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	2.77E-07	NA	1.98E-09	7.30E+00	1.44E-08
Benzo(b)fluoranthene	1.42E-01	No toxicity value	3.87E-07	NA	2.76E-09	7.30E-01	2.02E-09
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	1.14E-07	NA	8.11E-10	7.30E+00	5.92E-09
PCB-1260	8.50E+00	No toxicity value	2.32E-05	NA	1.65E-07	2.00E+00	3.31E-07
Hazard Index				3.44E+00			
Total Cancer Risk							1.39E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-32. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	3.65E-01	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	ND	NA	ND	3.00E-02	NA
Copper	1.28E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	2.38E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.12E-07	NA	8.01E-10	7.30E+00	5.85E-09
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.57E-07	NA	1.12E-09	7.30E-01	8.17E-10
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	4.60E-08	NA	3.29E-10	7.30E+00	2.40E-09
PCB-1260	8.50E+00	No toxicity value	1.01E-05	NA	7.22E-08	2.00E+00	1.44E-07
Hazard Index				NA			
Total Cancer Risk							1.53E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-33. Risks and Hazards from Inhalation of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	1.64E-09	8.21E-07	1.17E-11	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	4.69E-10	4.69E-07	3.35E-12	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	2.25E-09	NA	1.61E-11	6.80E-01	1.09E-11
2-Nitrotoluene	3.65E-01	No toxicity value	1.60E-11	NA	1.14E-13	No toxicity value	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	2.66E-08	5.32E-05	1.90E-10	3.00E-02	5.70E-12
Copper	1.28E+02	No toxicity value	5.61E-09	NA	4.01E-11	No toxicity value	NA
Lead	2.38E+02	No toxicity value	1.04E-08	NA	7.45E-11	No toxicity value	NA
Thallium	1.39E+00	No toxicity value	6.11E-11	NA	4.37E-13	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	4.46E-12	NA	3.19E-14	3.10E+00	9.87E-14
Benzo(b)fluoranthene	1.42E-01	No toxicity value	6.23E-12	NA	4.45E-14	3.10E-01	1.38E-14
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	1.83E-12	NA	1.31E-14	3.10E+00	4.05E-14
PCB-1260	8.50E+00	No toxicity value	3.73E-10	NA	2.67E-12	2.00E+00	5.33E-12
Hazard Index				5.45E-05			
Total Cancer Risk							2.21E-11

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-34. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	1.58E-01	1.58E-01	1.13E-03	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	9.54E-05	3.18E-01	6.81E-07	1.50E+00	1.02E-06
Cobalt	4.31E+01	2.00E-02	1.17E-04	5.87E-03	8.39E-07	No toxicity value	NA
Copper	1.26E+02	3.71E-02	3.44E-04	9.27E-03	2.46E-06	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	1.24E-04	4.15E-02	8.89E-07	No toxicity value	NA
Iron	1.04E+05	7.00E-01	2.83E-01	4.05E-01	2.02E-03	No toxicity value	NA
Lead	5.72E+01	No toxicity value	1.56E-04	NA	1.11E-06	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	6.30E-03	1.35E-01	4.50E-05	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	3.34E-04	1.67E-02	2.38E-06	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	4.30E-05	8.60E-03	3.07E-07	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	4.17E-06	5.95E-02	2.98E-08	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	3.66E-04	7.32E-02	2.62E-06	No toxicity value	NA
Hazard Index				1.23E+00			
Total Cancer Risk							1.02E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-35. Risks and Hazards from Dermal Contact with Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	8.92E-06	2.97E-02	6.37E-08	1.50E+00	9.56E-08
Cobalt	4.31E+01	2.00E-02	ND	NA	ND	No toxicity value	NA
Copper	1.26E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Iron	1.04E+05	7.00E-01	ND	NA	ND	No toxicity value	NA
Lead	5.72E+01	No toxicity value	ND	NA	ND	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	ND	NA	ND	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	ND	NA	ND	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	ND	NA	ND	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	ND	NA	ND	No toxicity value	NA

Hazard Index	2.97E-02

Total Cancer Risk	9.56E-08

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-36. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Indoor Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	1.83E-05	9.15E-03	6.53E-06	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	5.23E-06	5.23E-03	1.87E-06	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	2.51E-05	NA	8.96E-06	6.80E-01	6.09E-06
2-Nitrotoluene	3.65E-01	1.00E-02	1.79E-07	1.79E-05	6.38E-08	2.30E-01	1.47E-08
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	2.96E-04	5.93E-01	1.06E-04	3.00E-02	3.17E-06
Copper	1.28E+02	3.71E-02	6.26E-05	1.68E-03	2.23E-05	No toxicity value	NA
Lead	2.38E+02	No toxicity value	1.16E-04	NA	4.15E-05	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	6.82E-07	9.74E-03	2.43E-07	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	4.97E-08	NA	1.78E-08	7.30E+00	1.30E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	6.94E-08	NA	2.48E-08	7.30E-01	1.81E-08
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	2.04E-08	NA	7.28E-09	7.30E+00	5.32E-08
PCB-1260	8.50E+00	No toxicity value	4.16E-06	NA	1.49E-06	2.00E+00	2.97E-06
Hazard Index				6.18E-01			
Total Cancer Risk							1.25E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-37. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	4.61E-05	2.31E-02	1.58E-05	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	1.32E-05	1.32E-02	4.52E-06	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	6.32E-05	NA	2.17E-05	6.80E-01	1.47E-05
2-Nitrotoluene	3.65E-01	1.00E-02	4.50E-07	4.50E-05	1.54E-07	2.30E-01	3.55E-08
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	7.47E-04	1.49E+00	2.56E-04	3.00E-02	7.68E-06
Copper	1.28E+02	3.71E-02	1.58E-04	4.25E-03	5.41E-05	No toxicity value	NA
Lead	2.38E+02	No toxicity value	2.93E-04	NA	1.00E-04	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	1.72E-06	2.45E-02	5.89E-07	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.25E-07	NA	4.29E-08	7.30E+00	3.14E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.75E-07	NA	6.00E-08	7.30E-01	4.38E-08
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	5.14E-08	NA	1.76E-08	7.30E+00	1.29E-07
PCB-1260	8.50E+00	No toxicity value	1.05E-05	NA	3.59E-06	2.00E+00	7.19E-06
Hazard Index				1.56E+00			
Total Cancer Risk							3.01E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-38. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	3.65E-01	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	ND	NA	ND	3.00E-02	NA
Copper	1.28E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	2.38E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.48E-07	NA	5.08E-08	7.30E+00	3.71E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	2.07E-07	NA	7.10E-08	7.30E-01	5.18E-08
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	6.08E-08	NA	2.08E-08	7.30E+00	1.52E-07
PCB-1260	8.50E+00	No toxicity value	1.34E-05	NA	4.58E-06	2.00E+00	9.16E-06
Hazard Index				NA			
Total Cancer Risk							9.73E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-39. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	2.15E-09	1.08E-06	7.39E-10	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	6.16E-10	6.16E-07	2.11E-10	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	2.95E-09	NA	1.01E-09	6.80E-01	6.89E-10
2-Nitrotoluene	3.65E-01	No toxicity value	2.10E-11	NA	7.21E-12	No toxicity value	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	3.49E-08	6.98E-05	1.20E-08	3.00E-02	3.59E-10
Copper	1.28E+02	No toxicity value	7.37E-09	NA	2.53E-09	No toxicity value	NA
Lead	2.38E+02	No toxicity value	1.37E-08	NA	4.70E-09	No toxicity value	NA
Thallium	1.39E+00	No toxicity value	8.03E-11	NA	2.75E-11	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	5.85E-12	NA	2.01E-12	3.10E+00	6.22E-12
Benzo(b)fluoranthene	1.42E-01	No toxicity value	8.18E-12	NA	2.80E-12	3.10E-01	8.69E-13
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	2.40E-12	NA	8.23E-13	3.10E+00	2.55E-12
PCB-1260	8.50E+00	No toxicity value	4.90E-10	NA	1.68E-10	2.00E+00	3.36E-10
Hazard Index				7.15E-05			
Total Cancer Risk							1.39E-09

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-40. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

				Noncarcinogenic Effects:			Carcinogenic Effects:
Chemical	Exposure Point Concentration in Surface Soil (mg/L) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	7.16E-02	7.16E-02	2.46E-02	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	4.32E-05	1.44E-01	1.48E-05	1.50E+00	2.22E-05
Cobalt	4.31E+01	2.00E-02	5.31E-05	2.66E-03	1.82E-05	No toxicity value	NA
Copper	1.26E+02	3.71E-02	1.56E-04	4.20E-03	5.34E-05	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	5.63E-05	1.88E-02	1.93E-05	No toxicity value	NA
Iron	1.04E+05	7.00E-01	1.28E-01	1.83E-01	4.40E-02	No toxicity value	NA
Lead	5.72E+01	No toxicity value	7.05E-05	NA	2.42E-05	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	2.85E-03	6.11E-02	9.78E-04	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	1.51E-04	7.55E-03	5.18E-05	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	1.95E-05	3.89E-03	6.67E-06	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	1.89E-06	2.69E-02	6.46E-07	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	1.66E-04	3.31E-02	5.68E-05	No toxicity value	NA

Hazard Index	5.57E-01

Total Cancer Risk	2.22E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-41. Risks and Hazards from Dermal Contact with Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	1.18E-05	3.93E-02	4.04E-06	1.50E+00	6.06E-06
Cobalt	4.31E+01	2.00E-02	ND	NA	ND	No toxicity value	NA
Copper	1.26E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Iron	1.04E+05	7.00E-01	ND	NA	ND	No toxicity value	NA
Lead	5.72E+01	No toxicity value	ND	NA	ND	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	ND	NA	ND	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	ND	NA	ND	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	ND	NA	ND	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	ND	NA	ND	No toxicity value	NA
Hazard Index				3.93E-02			
Total Cancer Risk							6.06E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-42. Risks and Hazards from Ingestion of Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	4.30E-04	2.15E-01	3.69E-05	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	1.23E-04	1.23E-01	1.05E-05	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	5.90E-04	NA	5.06E-05	6.80E-01	3.44E-05
2-Nitrotoluene	3.65E-01	1.00E-02	4.20E-06	4.20E-04	3.60E-07	2.30E-01	8.28E-08
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	6.97E-03	1.39E+01	5.97E-04	3.00E-02	1.79E-05
Copper	1.28E+02	3.71E-02	1.47E-03	3.96E-02	1.26E-04	No toxicity value	NA
Lead	2.38E+02	No toxicity value	2.74E-03	NA	2.34E-04	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	1.60E-05	2.29E-01	1.37E-06	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.17E-06	NA	1.00E-07	7.30E+00	7.32E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.63E-06	NA	1.40E-07	7.30E-01	1.02E-07
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	4.80E-07	NA	4.11E-08	7.30E+00	3.00E-07
PCB-1260	8.50E+00	No toxicity value	9.78E-05	NA	8.39E-06	2.00E+00	1.68E-05
Hazard Index				1.45E+01			
Total Cancer Risk							7.03E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-43. Risks and Hazards from Dermal Contact with Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	ND	NA	ND	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	ND	NA	ND	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	ND	NA	ND	6.80E-01	NA
2-Nitrotoluene	3.65E-01	1.00E-02	ND	NA	ND	2.30E-01	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	ND	NA	ND	3.00E-02	NA
Copper	1.28E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Lead	2.38E+02	No toxicity value	ND	NA	ND	No toxicity value	NA
Thallium	1.39E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	2.66E-07	NA	2.28E-08	7.30E+00	1.66E-07
Benzo(b)fluoranthene	1.42E-01	No toxicity value	3.71E-07	NA	3.18E-08	7.30E-01	2.32E-08
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	1.09E-07	NA	9.35E-09	7.30E+00	6.83E-08
PCB-1260	8.50E+00	No toxicity value	2.40E-05	NA	2.05E-06	2.00E+00	4.11E-06
Hazard Index				NA			
Total Cancer Risk							4.37E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-44. Risks and Hazards from Inhalation of Particulates from Surface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,4-Dinitrotoluene	3.74E+01	2.00E-03	5.03E-09	2.51E-06	4.31E-10	No toxicity value	NA
2,6-Dinitrotoluene	1.07E+01	1.00E-03	1.44E-09	1.44E-06	1.23E-10	No toxicity value	NA
Dinitrotoluene mixture	5.13E+01	No toxicity value	6.89E-09	NA	5.91E-10	6.80E-01	4.02E-10
2-Nitrotoluene	3.65E-01	No toxicity value	4.91E-11	NA	4.21E-12	No toxicity value	NA
2,4,6-Trinitrotoluene	6.06E+02	5.00E-04	8.14E-08	1.63E-04	6.98E-09	3.00E-02	2.09E-10
Copper	1.28E+02	No toxicity value	1.72E-08	NA	1.47E-09	No toxicity value	NA
Lead	2.38E+02	No toxicity value	3.20E-08	NA	2.74E-09	No toxicity value	NA
Thallium	1.39E+00	No toxicity value	1.87E-10	NA	1.61E-11	No toxicity value	NA
Benzo(a)pyrene	1.02E-01	No toxicity value	1.37E-11	NA	1.17E-12	3.10E+00	3.63E-12
Benzo(b)fluoranthene	1.42E-01	No toxicity value	1.91E-11	NA	1.64E-12	3.10E-01	5.07E-13
Dibenz(a,h)anthracene	4.17E-02	No toxicity value	5.60E-12	NA	4.80E-13	3.10E+00	1.49E-12
PCB-1260	8.50E+00	No toxicity value	1.14E-09	NA	9.80E-11	2.00E+00	1.96E-10
Hazard Index				1.67E-04			
Total Cancer Risk							8.13E-10

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-45. Risks and Hazards from Ingestion of Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	6.69E-01	6.69E-01	5.73E-02	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	4.03E-04	1.34E+00	3.45E-05	1.50E+00	5.18E-05
Cobalt	4.31E+01	2.00E-02	4.96E-04	2.48E-02	4.25E-05	No toxicity value	NA
Copper	1.26E+02	3.71E-02	1.45E-03	3.92E-02	1.25E-04	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	5.26E-04	1.75E-01	4.51E-05	No toxicity value	NA
Iron	1.04E+05	7.00E-01	1.20E+00	1.71E+00	1.03E-01	No toxicity value	NA
Lead	5.72E+01	No toxicity value	6.58E-04	NA	5.64E-05	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	2.66E-02	5.70E-01	2.28E-03	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	1.41E-03	7.05E-02	1.21E-04	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	1.82E-04	3.63E-02	1.56E-05	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	1.76E-05	2.51E-01	1.51E-06	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	1.55E-03	3.09E-01	1.33E-04	No toxicity value	NA
Hazard Index				5.20E+00			
Total Cancer Risk							5.18E-05

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-46. Risks and Hazards from Dermal Contact with Subsurface Soil at Reservoir 2 Burning Ground Outside the Burning Area for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Surface Soil (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum	5.81E+04	1.00E+00	ND	NA	ND	No toxicity value	NA
Arsenic	3.50E+01	3.00E-04	2.12E-05	7.05E-02	1.81E-06	1.50E+00	2.72E-06
Cobalt	4.31E+01	2.00E-02	ND	NA	ND	No toxicity value	NA
Copper	1.26E+02	3.71E-02	ND	NA	ND	No toxicity value	NA
Chromium	4.57E+01	3.00E-03	ND	NA	ND	No toxicity value	NA
Iron	1.04E+05	7.00E-01	ND	NA	ND	No toxicity value	NA
Lead	5.72E+01	No toxicity value	ND	NA	ND	No toxicity value	NA
Manganese	2.31E+03	4.67E-02	ND	NA	ND	No toxicity value	NA
Nickel	1.23E+02	2.00E-02	ND	NA	ND	No toxicity value	NA
Selenium	1.58E+01	5.00E-03	ND	NA	ND	No toxicity value	NA
Thallium	1.53E+00	7.00E-05	ND	NA	ND	No toxicity value	NA
Vanadium	1.34E+02	5.00E-03	ND	NA	ND	No toxicity value	NA
Hazard Index				7.05E-02			
Total Cancer Risk							2.72E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-47. Risks and Hazards from Ingestion of Sediment at Reservoir 2 Burning Ground for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Sediment (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	8.89E-12	NA	6.35E-14	1.50E+05	9.53E-09
Benzo(a)anthracene	1.13E+00	No toxicity value	1.54E-06	NA	1.10E-08	7.30E-01	8.03E-09
Benzo(a)pyrene	1.59E+00	No toxicity value	2.17E-06	NA	1.55E-08	7.30E+00	1.13E-07
Benzo(b)fluoranthene	1.23E+00	No toxicity value	1.68E-06	NA	1.20E-08	7.30E-01	8.74E-09
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	1.02E-06	NA	7.31E-09	7.30E-01	5.33E-09
Hazard Index							
Total Cancer Risk							1.45E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-48. Risks and Hazards from Dermal Contact with Sediment at Reservoir 2 Burning Ground for Construction Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Sediment (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Carcinogenic Effects: Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	6.84E-13	NA	4.89E-15	1.50E+05	7.33E-10
Benzo(a)anthracene	1.13E+00	No toxicity value	5.13E-07	NA	3.67E-09	7.30E-01	2.68E-09
Benzo(a)pyrene	1.59E+00	No toxicity value	7.22E-07	NA	5.16E-09	7.30E+00	3.77E-08
Benzo(b)fluoranthene	1.23E+00	No toxicity value	5.59E-07	NA	3.99E-09	7.30E-01	2.91E-09
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	3.41E-07	NA	2.44E-09	7.30E-01	1.78E-09
Hazard Index							
Total Cancer Risk							4.58E-08

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-49. Risks and Hazards from Ingestion of Sediment at Reservoir 2 Burning Ground for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Sediment (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	8.94E-13	NA	3.07E-13	1.50E+05	4.60E-08
Benzo(a)anthracene	1.13E+00	No toxicity value	1.55E-07	NA	5.31E-08	7.30E-01	3.87E-08
Benzo(a)pyrene	1.59E+00	No toxicity value	2.18E-07	NA	7.47E-08	7.30E+00	5.45E-07
Benzo(b)fluoranthene	1.23E+00	No toxicity value	1.68E-07	NA	5.78E-08	7.30E-01	4.22E-08
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	1.03E-07	NA	3.53E-08	7.30E-01	2.57E-08
Hazard Index							
Total Cancer Risk							6.98E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-50. Risks and Hazards from Dermal Contact with Sediment at Reservoir 2 Burning Ground for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Sediment (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	2.44E-13	NA	8.37E-14	1.50E+05	1.26E-08
Benzo(a)anthracene	1.13E+00	No toxicity value	1.83E-07	NA	6.28E-08	7.30E-01	4.58E-08
Benzo(a)pyrene	1.59E+00	No toxicity value	2.58E-07	NA	8.83E-08	7.30E+00	6.45E-07
Benzo(b)fluoranthene	1.23E+00	No toxicity value	1.99E-07	NA	6.83E-08	7.30E-01	4.99E-08
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	1.22E-07	NA	4.17E-08	7.30E-01	3.05E-08
Hazard Index							
Total Cancer Risk							7.84E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-51. Risks and Hazards from Ingestion of Sediment at Reservoir 2 Burning Ground for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Fish (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	8.35E-12	NA	7.15E-13	1.50E+05	1.07E-07
Benzo(a)anthracene	1.13E+00	No toxicity value	1.44E-06	NA	1.24E-07	7.30E-01	9.04E-08
Benzo(a)pyrene	1.59E+00	No toxicity value	2.03E-06	NA	1.74E-07	7.30E+00	1.27E-06
Benzo(b)fluoranthene	1.23E+00	No toxicity value	1.57E-06	NA	1.35E-07	7.30E-01	9.84E-08
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	9.60E-07	NA	8.23E-08	7.30E-01	6.01E-08
Hazard Index							
Total Cancer Risk							1.63E-06

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-52. Risks and Hazards from Dermal Contact with Sediment at Reservoir 2 Burning Ground for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Fish (mg/kg) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Carcinogenic Effects: Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
2,3,7,8-TCDD (TEQ)	6.53E-06	No toxicity value	4.38E-13	NA	3.76E-14	1.50E+05	5.63E-09
Benzo(a)anthracene	1.13E+00	No toxicity value	3.29E-07	NA	2.82E-08	7.30E-01	2.06E-08
Benzo(a)pyrene	1.59E+00	No toxicity value	4.62E-07	NA	3.96E-08	7.30E+00	2.89E-07
Benzo(b)fluoranthene	1.23E+00	No toxicity value	3.58E-07	NA	3.07E-08	7.30E-01	2.24E-08
Indeno(1,2,3-cd)pyrene	7.51E-01	No toxicity value	2.18E-07	NA	1.87E-08	7.30E-01	1.37E-08
Hazard Index							
Total Cancer Risk							3.52E-07

kg = kilogram
mg = milligram
RfD = reference dose
RME = reasonable maximum exposure
SF = slope factor

Table B-53. Risks and Hazards from Ingestion of Bedrock Groundwater at Reservior 2 Burning Ground for Indoor Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	1.14E-01	1.14E-01	4.05E-02	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	2.94E-05	7.34E-02	1.05E-05	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	2.16E-03	7.21E+00	7.72E-04	1.50E+00	1.16E-03
Chromium (Total)	3.17E-02	3.00E-03	3.10E-04	1.03E-01	1.11E-04	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	2.67E-01	3.82E-01	9.54E-02	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	9.98E-03	2.14E-01	3.56E-03	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	2.25E-05	3.21E-01	8.04E-06	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	2.19E-04	4.38E-02	7.83E-05	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	2.84E-03	1.42E-01	1.01E-03	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	5.23E-03	8.72E-02	1.87E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	2.87E-06	NA	1.02E-06	7.30E-01	7.47E-07
Naphthalene	8.87E-03	2.00E-02	8.68E-05	4.34E-03	3.10E-05	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	2.41E-02	6.02E+00	8.60E-03	5.50E-02	4.73E-04
Carbon Disulfide	2.34E-01	1.00E-01	2.29E-03	2.29E-02	8.18E-04	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	5.28E-04	NA	1.89E-04	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	1.34E-03	1.34E-02	4.79E-04	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	3.94E-03	4.93E-02	1.41E-03	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	1.58E-02	7.88E-02	5.63E-03	No toxicity value	NA
Hazard Index				1.49E+01			
Total Cancer Risk							1.63E-03

RME = reasonable maximum exposure
Sf = slope factor
RfD = reference dose

Table B-54. Risks and Hazards from Dermal Contact with Bedrock Groundwater at Reservior 2 Burning Ground for Indoor Worker Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Dermal Absorbed Dose RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Dermal Absorbed Dose RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	3.75E-04	3.75E-04	1.34E-04	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	9.69E-08	2.42E-04	3.46E-08	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	7.14E-06	2.38E-02	2.55E-06	1.50E+00	3.82E-06
Chromium (Total)	3.17E-02	3.00E-03	1.02E-06	3.41E-04	3.66E-07	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	8.82E-04	1.26E-03	3.15E-04	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	3.29E-05	7.06E-04	1.18E-05	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	7.43E-08	1.06E-03	2.65E-08	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	7.23E-07	1.45E-04	2.58E-07	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	9.36E-06	4.68E-04	3.34E-06	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	3.63E-03	6.05E-02	1.30E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	1.77E-05	NA	6.30E-06	7.30E-01	4.60E-06
Naphthalene	8.87E-03	2.00E-02	2.76E-05	1.38E-03	9.84E-06	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	1.85E-03	4.62E-01	6.60E-04	5.50E-02	3.63E-05
Carbon Disulfide	2.34E-01	1.00E-01	2.05E-04	2.05E-03	7.31E-05	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	8.03E-06	NA	2.87E-06	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	3.90E-04	3.90E-03	1.39E-04	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	6.78E-04	8.47E-03	2.42E-04	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	4.58E-03	2.29E-02	1.64E-03	No toxicity value	NA
Hazard Index				5.90E-01			
Total Cancer Risk							4.47E-05

RME = reasonable maximum exposure
RfD = reference dose
Sf = slope factor

Table B-55. Risks and Hazards from Ingestion of Bedrock Groundwater at Reservior 2 Burning Ground for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	3.18E-01	3.18E-01	1.09E-01	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	8.22E-05	2.05E-01	2.82E-05	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	6.05E-03	2.02E+01	2.08E-03	1.50E+00	3.11E-03
Chromium (Total)	3.17E-02	3.00E-03	8.68E-04	2.89E-01	2.98E-04	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	7.48E-01	1.07E+00	2.56E-01	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	2.79E-02	5.99E-01	9.58E-03	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	6.30E-05	9.00E-01	2.16E-05	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	6.14E-04	1.23E-01	2.10E-04	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	7.95E-03	3.97E-01	2.72E-03	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	1.47E-02	2.44E-01	5.03E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	8.03E-06	NA	2.75E-06	7.30E-01	2.01E-06
Naphthalene	8.87E-03	2.00E-02	2.43E-04	1.22E-02	8.33E-05	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	6.74E-02	1.68E+01	2.31E-02	5.50E-02	1.27E-03
Carbon Disulfide	2.34E-01	1.00E-01	6.41E-03	6.41E-02	2.20E-03	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	1.48E-03	NA	5.07E-04	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	3.75E-03	3.75E-02	1.29E-03	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	1.10E-02	1.38E-01	3.79E-03	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	4.41E-02	2.21E-01	1.51E-02	No toxicity value	NA
Hazard Index				4.16E+01			
Total Cancer Risk							4.39E-03

RME = reasonable maximum exposure
Sf = slope factor
RfD = reference dose

Table B-56. Risks and Hazards from Dermal Contact with Bedrock Groundwater at Reservior 2 Burning Ground for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Dermal Absorbed Dose RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Dermal Absorbed Dose RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	6.36E-04	6.36E-04	2.18E-04	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	1.64E-07	4.11E-04	5.64E-08	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	1.21E-05	4.04E-02	4.15E-06	1.50E+00	6.23E-06
Chromium (Total)	3.17E-02	3.00E-03	1.74E-06	5.79E-04	5.96E-07	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	1.50E-03	2.14E-03	5.13E-04	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	5.59E-05	1.20E-03	1.92E-05	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	1.26E-07	1.80E-03	4.32E-08	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	1.23E-06	2.45E-04	4.21E-07	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	1.59E-05	7.95E-04	5.45E-06	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	1.38E-02	2.30E-01	4.72E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	6.70E-05	NA	2.30E-05	7.30E-01	1.68E-05
Naphthalene	8.87E-03	2.00E-02	1.05E-04	5.23E-03	3.59E-05	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	6.69E-03	1.67E+00	2.29E-03	5.50E-02	1.26E-04
Carbon Disulfide	2.34E-01	1.00E-01	7.44E-04	7.44E-03	2.55E-04	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	2.71E-05	NA	9.31E-06	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	1.48E-03	1.48E-02	5.08E-04	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	2.51E-03	3.14E-02	8.60E-04	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	1.74E-02	8.70E-02	5.96E-03	No toxicity value	NA
Hazard Index				2.10E+00			
Total Cancer Risk							1.49E-04

RME = reasonable maximum exposure
RfD = reference dose
Sf = slope factor

Table B-57. Risks and Hazards from Inhalation of Volatiles from Bedrock Groundwater at Reservior 2 Burning Ground for Adult Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Benzene	2.46E+00	8.57E-03	1.40E-02	NA	4.81E-03	2.70E-02	NA
Carbon Disulfide	2.34E-01	2.00E-01	1.34E-03	NA	4.58E-04	No toxicity value	NA
Chloromethane	5.40E-02	2.57E-02	3.08E-04	NA	1.06E-04	6.30E-03	NA
Ethylbenzene	1.37E-01	2.90E-01	7.82E-04	NA	2.68E-04	No toxicity value	NA
Toluene	4.03E-01	1.43E+00	2.30E-03	NA	7.88E-04	No toxicity value	NA
Xylenes, Total	1.61E+00	2.86E-02	9.19E-03	NA	3.15E-03	No toxicity value	NA
Hazard Index				0.00E+00			
Total Cancer Risk							0.00E+00

RME = reasonable maximum exposure
Sf = slope factor
RfD = reference dose

Table B-58. Risks and Hazards from Ingestion of Bedrock Groundwater at Reservior 2 Burning Ground for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	7.42E-01	7.42E-01	6.36E-02	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	1.92E-04	4.79E-01	1.64E-05	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	1.41E-02	4.71E+01	1.21E-03	1.50E+00	1.82E-03
Chromium (Total)	3.17E-02	3.00E-03	2.03E-03	6.75E-01	1.74E-04	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	1.75E+00	2.49E+00	1.50E-01	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	6.52E-02	1.40E+00	5.59E-03	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	1.47E-04	2.10E+00	1.26E-05	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	1.43E-03	2.86E-01	1.23E-04	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	1.85E-02	9.27E-01	1.59E-03	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	3.42E-02	5.70E-01	2.93E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	1.87E-05	NA	1.61E-06	7.30E-01	1.17E-06
Naphthalene	8.87E-03	2.00E-02	5.67E-04	2.84E-02	4.86E-05	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	1.57E-01	3.93E+01	1.35E-02	5.50E-02	7.41E-04
Carbon Disulfide	2.34E-01	1.00E-01	1.50E-02	1.50E-01	1.28E-03	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	3.45E-03	NA	2.96E-04	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	8.76E-03	8.76E-02	7.51E-04	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	2.58E-02	3.22E-01	2.21E-03	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	1.03E-01	5.15E-01	8.82E-03	No toxicity value	NA
Hazard Index				9.72E+01			
Total Cancer Risk							2.56E-03

RME = reasonable maximum exposure
Sf = slope factor
RfD = reference dose

Table B-59. Risks and Hazards from Dermal Contact with Bedrock Groundwater at Reservior 2 Burning Ground for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Dermal Absorbed Dose RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Dermal Absorbed Dose RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Aluminum (total)	1.16E+01	1.00E+00	1.63E-03	1.63E-03	1.40E-04	No toxicity value	NA
Antimony (total)	3.00E-03	4.00E-04	4.21E-07	1.05E-03	3.61E-08	No toxicity value	NA
Arsenic (total)	2.21E-01	3.00E-04	3.11E-05	1.04E-01	2.66E-06	1.50E+00	3.99E-06
Chromium (Total)	3.17E-02	3.00E-03	4.45E-06	1.48E-03	3.82E-07	No toxicity value	NA
Iron (total)	2.73E+01	7.00E-01	3.84E-03	5.48E-03	3.29E-04	No toxicity value	NA
Manganese (total)	1.02E+00	4.67E-02	1.43E-04	3.07E-03	1.23E-05	No toxicity value	NA
Thallium (total)	2.30E-03	7.00E-05	3.23E-07	4.62E-03	2.77E-08	No toxicity value	NA
Vanadium (total)	2.24E-02	5.00E-03	3.15E-06	6.29E-04	2.70E-07	No toxicity value	NA
Cyanide	2.90E-01	2.00E-02	4.07E-05	2.04E-03	3.49E-06	No toxicity value	NA
Acenaphthene	5.35E-01	6.00E-02	2.74E-02	4.56E-01	2.35E-03	No toxicity value	NA
Benzo(a)anthracene	2.93E-04	No toxicity value	1.33E-04	NA	1.14E-05	7.30E-01	8.33E-06
Naphthalene	8.87E-03	2.00E-02	2.08E-04	1.04E-02	1.78E-05	No toxicity value	NA
Benzene	2.46E+00	4.00E-03	1.33E-02	3.32E+00	1.14E-03	5.50E-02	6.27E-05
Carbon Disulfide	2.34E-01	1.00E-01	1.48E-03	1.48E-02	1.27E-04	No toxicity value	NA
Chloromethane	5.40E-02	No toxicity value	5.39E-05	NA	4.62E-06	No toxicity value	NA
Ethylbenzene	1.37E-01	1.00E-01	2.94E-03	2.94E-02	2.52E-04	No toxicity value	NA
Toluene	4.03E-01	8.00E-02	4.98E-03	6.23E-02	4.27E-04	No toxicity value	NA
Xylenes, Total	1.61E+00	2.00E-01	3.46E-02	1.73E-01	2.96E-03	No toxicity value	NA
Hazard Index				4.19E+00			
Total Cancer Risk							7.50E-05

RME = reasonable maximum exposure
RfD = reference dose
Sf = slope factor

Table B-60. Risks and Hazards from Inhalation of Volatiles from Bedrock Groundwater at Reservior 2 Burning Ground for Child Residential Receptors at Plum Brook Ordnance Works, Sandusky, Ohio

Chemical	Exposure Point Concentration in Groundwater (mg/L) RME	Reference Dose 1/(mg/kg-day)	Noncarcinogenic Effects: Intake Values (mg/kg-day) RME	Noncarcinogenic Effects: Hazard Quotient (Intake/RfD) RME	Carcinogenic Effects: Intake Values (mg/kg-day) RME	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Lifetime Cancer Risk (Intake x sf) RME
Benzene	2.46E+00	8.57E-03	3.27E-02	NA	2.80E-03	2.70E-02	NA
Carbon Disulfide	2.34E-01	2.00E-01	3.11E-03	NA	2.67E-04	No toxicity value	NA
Chloromethane	5.40E-02	2.57E-02	7.18E-04	NA	6.15E-05	6.30E-03	NA
Ethylbenzene	1.37E-01	2.90E-01	1.82E-03	NA	1.56E-04	No toxicity value	NA
Toluene	4.03E-01	1.43E+00	5.36E-03	NA	4.59E-04	No toxicity value	NA
Xylenes, Total	1.61E+00	2.86E-02	2.14E-02	NA	1.83E-03	No toxicity value	NA
Hazard Index				0.00E+00			
Total Cancer Risk							0.00E+00

RME = reasonable maximum exposure
Sf = slope factor
RfD = reference dose

APPENDIX C
TOXICOLOGICAL PROFILES FOR CHEMICALS OF CONCERN

APPENDIX C

TOXICOLOGICAL PROFILES
FOR THE CHEMICALS OF CONCERN

INTRODUCTION

Toxicological profiles are presented for each chemical of concern. The doubly hyphenated number in parentheses following the chemical name is its unique Chemical Abstract Service (CAS) registration number. The CAS number may be located in the profile title, or, in the case of multiple isomers or members of a chemical class, in the introductory text or the table that provides the physical properties.

Toxicological profiles contain brief descriptions of the nature of the potential adverse effects associated with the chemical. It is important to note that a discussion of adverse effects without a discussion of dose is incomplete and potentially misleading, because virtually any chemical may be toxic at some dose, and many chemicals (e.g., nutritionally required minerals, vitamins, amino acids, etc.) enhance human health at some low dose. An ever growing and compelling body of evidence suggests that many environmental contaminants also enhance health at low doses (Hart and Frame, 1996).

When sufficient data are available, the EPA Integrated Risk Information System (IRIS) presents the EPA's verified chronic toxicity values for noncancer effects, and for cancer risk (EPA, 2001). The toxicity values for noncancer effects include a reference dose (RfD) expressed in milligrams per kilogram per day (mg/kg-day) for chronic oral exposure, and a reference concentration (RfC), in milligrams per cubic meter (mg/m^3), for chronic inhalation exposure. The inhalation RfC in units of mg/m^3 may be converted to an equivalent inhalation RfD by assuming continuous chronic exposure of humans with a body weight of 70 kg and an inhalation rate of 20 m^3/day. In other words, the RfC expressed as mg/m^3 is multiplied by the inhalation rate of 20 m^3/day, and the result is divided by the body weight of 70 kg to yield an inhalation RfD expressed as mg/kg-day.

RfDs and RfCs are usually derived from empirical benchmark doses (BMD) or concentrations called no-observed-effect levels (NOEL) or no-observed-adverse-effect levels (NOAEL) from animal toxicity or human epidemiology studies. If the data do not permit identifying a NOEL or NOAEL, a lowest-observed-adverse-effect level (LOAEL) or lowest-effect level (LEL) may be used. A frank-effect level (FEL), e.g., mortality, shortened life span or serious physiologic, neurologic or behavioral disturbances, is generally considered an inappropriate benchmark from which to develop an RfD or RfC. Some RfD and RfC derivations employ a BMD that is a statistically estimated dose for humans at which some low proportion of the population may experience some minimally adverse effect. A BMD at which 10 percent of the population may be expected to respond is expressed as BMD_{10}. The RfD or RfC is derived by dividing the benchmark level (e.g., NOAEL or BMD_{10}) by a series of uncertainty and modifying factors, which collectively are designated the uncertainty factor (UF).

For cancer effects, IRIS presents a verified EPA cancer weight-of-evidence group classification that reflects qualitatively the likelihood that the chemical is carcinogenic to humans. IRIS also presents a slope factor (SF) for oral exposure, expressed as the risk per mg/kg-day ingested dose, and a unit risk factor (URF) for inhalation exposure, expressed as the risk per microgram

per cubic meter (µg/m^3) in ambient air. These quantitative estimates are generally provided for chemicals in EPA weight-of-evidence Groups A and B and C, if the data are adequate. The SF or URF is usually estimated as an upper bound on the slope of the dose- or concentration response curve from animal toxicity or human epidemiology studies. The inhalation URF in units of risk per ~ig/m3 may be converted to an equivalent inhalation SF in units of risk per mg/kg-day by assuming continuous lifetime exposure of humans with a body weight to 70 kg and an inhalation rate of 20 m^3/day. In other words, the URF expressed as risk per µg/m^3 is divided by the inhalation rate of 20 m^3/day, and multiplied by the assumed body weight of 70 kg and a conversion factor of 1000 µg/mg.

Toxicity values are not estimated for acute toxicity and acute exposure is not evaluated in the risk assessment. Nonetheless, the levels associated with acute lethality and data regarding the effects of acute exposure to levels higher than ordinarily observed in chronic environmental exposure provide additional perspective regarding the toxicity of the chemical. Therefore, information regarding acute toxicity, when available, is included in the profiles. Lethality data for laboratory animals are generally expressed as the oral dose associated with lethality of 50 percent of an exposed population (LD50) or the concentration in air associated with lethality of 50 percent of an exposed population (LC_{50}). Occasionally the dose associated with lethality in a low percentage of an exposed population (LD_{LO}) is presented.

The toxicity profiles also provide documentation for physical constants that are important for chemical transport modeling, such as molecular weight (MW) in grams per mole (g/mole), the log of the octanol/water partition coefficient (log K_{ow}), Henry's law constant (H) in atmosphere-cubic meter/mole (atm-m^3/mole), the soil/water partition coefficient (K_d) in liters per kilogram (L/kg) for metals, the log of the soil/organic carbon partition coefficient (log K_{oc} (unitless) for organic chemicals, diffusivity in air (D_a) in square centimeters per second (cm^2/s), diffusivity in water (D_w) in cm^2/s, vapor pressure (VP) in atmospheres (atm), and solubility in water (S) in milligrams per liter (mg/L) . In addition, organic chemicals are designated as volatile organic compounds (VOC) or semivolatile organic compounds (SVOC) based on their propensity to volatilize from environmental media. Chemicals designated as VOCs generally have a MW less than 200 g/mole and H greater than 1 E-5 atm-m^3/mole (EPA, 1991).

The physical constants generally are taken from the most reliable source (i.e., the source that provides the highest level of documentation). Values for interrelated properties are usually taken from the same source (e.g., H is often estimated from VP and S; therefore, the same source is generally used for all three property values). When one source provides several values for a given property, professional judgment is used to select the most appropriate. Obvious outliers may be dropped from consideration. The average or the midpoint of a range of values may be selected. K_d values for metals and K_{oc} values for ionizing organic compound are based on a default pH of 6.8 (EPA, 1996) if the data are available. VP, S and H values are limited to those provided for normal ambient temperatures (0 to 30°C), but the temperatures reported in the original sources are not presented in the toxicity profile, nor is any attempt made to extrapolate K, VP or S to any default temperature.

When values for H were not located, they were calculated as follows, provided the requisite information was available (EPA, 1998):

$$H = \frac{VP \cdot MW}{S} \qquad \text{Eq. 1}$$

where :

H = Henry's law constant (atm-m^3/mole, calculated)

VP = vapor pressure (atm)

MW = molecular weight (g/mole)

S = solubility in water (mg/L).

When values for Da were not located, they were calculated as follows (EPA, 1998):

$$D_a = \frac{1.9}{MW^{2/3}} \qquad \text{Eq. 2}$$

where:

D_a = diffusivity in air (cm2/s, calculated)

MW = molecular weight (g/mole) .

When values for DW were not located, they were calculated as follows (EPA, 1998):

$$D_w = \frac{22E-5}{MW^{2/3}} \qquad \text{Eq. 3}$$

where :

D_W = diffusivity in water (cm'/s, calculated)

MW = molecular weight (g/mole).

When values for Koc were not located, they were calculated as follows for phthalates and polyaromatic aromatic hydrocarbons (PAH) provided log K.,, was available (EPA, 1998):

$$\log K_{oc} = 0.97 \log K_{ow} - 0.094 \qquad \text{Eq. 4}$$

where:

K_{oc} = soil/organic carbon partition coefficient (unitless, calculated)

K_{ow} = octanol/water partition coefficient (unitless).

K_{oc}, for other organic chemicals was calculated as follows provided logK_{ow} was available (EPA, 1998):

$$\log K_{oc} = 0.18 \log K_{ow} + 0.151 \quad \text{Eq. 5}$$

where:

K_{oc} = soil/organic carbon partition coefficient (unitless, calculated)

K_{ow} = octanol/water partition coefficient (unitless).

The toxicity profiles also present the predominant sources of release to the environment as well as a qualitative description of the fate of the chemical in air, surface water and sediment, and soil. No attempt is made to present quantitative data because environmental fate is usually highly dependent on climatic conditions and the characteristics of the medium to which the chemical is released, which may differ from location to location and change from time to time. The source and fate information may provide perspective regarding the likelihood that the chemical's presence is related to site activities, that the chemical will migrate across media, or that the chemical will persist at toxicologically significant levels.

Biotransfer factors are provided for chemicals for which food-chain pathways may be significant, which includes many inorganic chemicals and those organic chemicals that are highly lipophilic and persist in the environment. High lipophilicity is indicated by a log K_{ow} greater than 3 (Lyman et al., 1990). Lipophilicity enhances partitioning to biomedia and passage across biological membranes. Persistence in the environment is evidence that the chemical might resist biotransformation and, therefore, remain in edible tissues at toxicologically significant concentrations. VOCs tend to be mobile and labile (i.e., subject to rapid and extensive biotransformation and excretion), and generally do not participate significantly in food-chain pathways. Therefore, biotransfer factors are not estimated for VOCs. Some of the SVOCs, however, are highly lipophilic. They may persist or yield metabolites that are significant toxicants in their own right. For example, the organochlorine pesticide DDT is metabolized by mammals to DDE, which is similar in carcinogenic potency to the parent compound. Biotransfer factors are generally estimated for SVOCs that have log K_{ow} values greater than 3.

The biotransfer factors of interest are soil-to-plant biotransfer factors (B_p) and cattle ingestion-to-beef factors (B_b). Separate soil-to-plant biotransfer factors are available for the reproductive parts of plants (e.g., fruits, seeds) and the vegetative parts of plants (e.g., stems, leaves) for inorganic and some organic chemicals. Soil-to-plant factors for the reproductive parts of plants are designated B_{pr}; soil-to-plant factors for the vegetative parts of plants are designated B_{pv}.

Soil-to-plant biotransfer factors (Bp) for SVOCs are estimated by a simple model by Travis and Arms (1988), which is based only on log K_{ow}:

$$\log B_p = 1.588 - 0.578 \log K_{ow} \quad \text{Eq. 6}$$

where:

B_p = soil-to-plant biotransfer factor (unitless, calculated)

K_{ow} = octanol/water partition coefficient (unitless).

Separate biotransfer factors are not estimated for the reproductive parts of plants (B_{pr}) and the vegetative parts of plants (B_{pv}).

Cattle ingestion-to-beef factors (Bb) for SVOCs are estimated by a simple model by Travis and Arms (1988), which is based only on log K_{ow}:

$$\log B_p = 7.6 + \log K_{ow} \qquad \text{Eq. 7}$$

where:

B_p = cattle ingestion-to-beef biotransfer factor (days/kg, calculated)

K_{ow} = octanol/water partition coefficient (unitless).

This risk assessment followed EPA's *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E - Supplemental Guidance for Dermal Risk Assessment)* (EPA 2004a). Therefore, oral RfDs and slope factors were used without modification. Additionally, only those constituents identified in the guidance as having sufficient data for dermal uptake from soil were evaluated for soil and sediment. Dermal absorbed doses for surface water and sediment were calculated using the spreadsheet model developed by EPA that accompanies the guidance.

References for Introduction

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INORGANIC CHEMICALS

ARSENIC (7440-38-2)

Arsenic is a natural metalloid that occurs in both inorganic and organic forms (ATSDR, 1998). Inorganic arsenic is more toxic than organic forms. Major uses in the U.S. include its incorporation into wood preservatives and other agricultural chemicals. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
74.92 (element)	NA	NA	2.9e+1[a]	NA	NA	Note 1[b]	Note 2[b]

NA = not applicable

Note 1 : Variable : inorganic arsenic compounds are not likely to volatilize ; some organic arsenic compounds are low-boiling liquids or gases at normal temperatures .

Note 2 : Variable: inorganic arsenic compounds range from practically insoluble to freely miscible in water; most organic arsenic compounds are not readily soluble, most arsenic acid compounds are soluble to freely miscible.

a U.S . Environmental Protection Agency (EPA), 1996, Soil Screening Guidance: Users Guide, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355 .4-23, April.

b Agency for Toxic Substances and Disease Registry, (ATSDR), 1998, Update Toxicological Profile for Arsenic, U.S. Public Health Service, Atlanta, Georgia, April.

The major source of arsenic release to the environment is from copper, zinc and lead smelting operations (HSDB, 2001). Releases also occur from several other industries that use arsenic. Most (approximately 80 percent) anthropogenic releases are initially to soil (ATSDR, 1998).

Arsenic occurs in the air as a combination of trivalent and pentavalent forms almost entirely adsorbed to small particles that permit dispersion over long distances (ATSDR, 1998). Residence time in the atmosphere averages approximately nine days. Removal is largely by wet and dry deposition. Arsenic in surface water can undergo a variety of transformations and exist in several soluble forms. Sorption to sediment is often an important removal process, but biotransformation in sediment may return soluble forms to the water. Arsenic in soil generally exists as insoluble forms sorbed to clay or organic matter or complexed with calcium or iron. Mobility is low and leaching is not generally significant, except that increasing soil pH can dramatically increase mobility.

Biotransfer factors for arsenic are compiled below:

BCF (L/kg)	Bpr (unitless)	BPV (Unitless)	Bb (days/kg)
20[a]	6.0E-3[b]	4.0E-2[b]	2.0E-3[b]

a U .S. Environmental Protection Agency (EPA), 1998, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume Two, Peer Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, EPA530-D-98-001 B, July.

b Baes, C.F., R.D. Sharp, A.L . Sjoreen, R.W. Shor, 1984,AReview and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Data regarding the dermal uptake of arsenic were not located. The default ABS of 0 .01 for metals (OEPA, 1998) is used herein.

Inorganic arsenic may be an essential nutrient, exerting beneficial effects on growth, health and feed conversion efficiency (Underwood, 1977). A lethal dose of arsenic trioxide in humans is 70-180 mg (=50-140 mg arsenic (Ishinishi et al., 1986). Acute oral exposure of humans to high doses of arsenic produces liver swelling, skin lesions, disturbed heart function and neurological effects. The only noncancer effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (EPA, 2001). Similar effects were observed in persons exposed to high levels of arsenic in water in Utah and the northern part of Mexico . EPA (2001) verified an RfD of 3E-4 mg/kg-day for chronic oral exposure, based on a NOAEL of 8E-4 mg/kg-day for hyperpigmentation and kertatosis of the skin from the Chinese data. An uncertainty factor of 3 was applied. An increased incidence of Blackfoot disease was also observed, which may not be related to arsenic alone. Goyer (1991) describes black-foot disease as a peripheral vascular disorder manifested as acrocyanosis and Raynaud's disease, which may progress to gangrene. Confidence in the RfD is medium. EPA (2001) notes that the skin is the more sensitive target organ. Nonetheless, in keeping with EPA (1989) guidance regarding selection of target organ, both the skin and peripheral vascular system are selected as target organs for prolonged oral exposure to arsenic.

Occupational (predominantly inhalation) exposure is also associated with neurological deficits, anemia, and vascular effects (Ishinishi et al., 1986), but concomitant exposure to other chemicals cannot be ruled out. The data are not sufficient for estimation of an inhalation RfC. Inorganic arsenic is clearly a carcinogen in humans. Inhalation exposure is associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant (EPA, 2001). Oral exposure to high levels in well water is associated with increased risk of skin cancer. Extensive animal testing with various forms of arsenic given by many routes of exposure to several species, however, has not demonstrated the carcinogenicity of arsenic. EPA (2001) classified inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen), and recommended an oral SF of 1.5E+0 per mg/kg-day, based on the incidence of skin cancer in the Chinese study. EPA (2001) noted that the uncertainties associated with the oral unit risk are considerably less than those for most carcinogens, so that the unit risk might be reduced an order of magnitude. An inhalation URF of 4E-3 per pg/m3, equivalent to an inhalation SF of

1.5E+1 per mg/kg-day, was derived for inorganic arsenic from the incidence of lung cancer in occupationally exposed men.

References for Arsenic

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U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91 /011 B, January.

U.S. Environmental Protection Agency (EPA), 1993, "Oral and Dermal Absorption Factors for Multiple Chemicals (FEMP O.U. #4/Fernald, OH)," Memorandum from Joan Dollarhide, ECAO, to Pat Van Leeuwen, Region V, dated July 21.

U.S. Environmental Protection Agency (EPA), 2001, Integrated Risk Information System (IRIS), On-line, Environmental Criteria and Assessment Office, Cincinnati, OH.

LEAD (7439-92-1)

Lead is a naturally occurring metal used in the manufacture of batteries, ammunition, and other metal products (ATSDR, 1997). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
207.2 (element)	NA	NA	ND	NA	NA	ND	9.9E-3[a]

NA = not applicable, ND = do data

a Value for lead chloride as a typical lead salt (Agency for Toxic Substances and Disease Registry, [ATSDR], 1997, Update Toxicological Profile for Lead, Draft for Public Comment, U.S . Public Health Service, Atlanta, Georgia, August .)

Lead may enter the environment during mining, ore processing, smelting, refining, use, recycling or disposal (ATSDR, 1997; HSDB, 2001). Emission from automobile exhaust was at one time the largest source of atmospheric lead. Natural sources are minor compared with anthropogenic sources. Generally the form of lead that enters the atmosphere is not known. However, metallic lead may be released from smelting and refining plants. Lead in air exists attached to small particles that may travel great distances before removal by wet or dry deposition. Lead deposited on or released to soil generally remains in the top 2 to 5 cm where it remains relatively immobile, although a small percentage may be present in soluble forms that are subject to leaching. Acid conditions increase the potential for leaching. Lead released to surface water tends to form salts that are only sparingly soluble. Deposition in bed sediment is the primary removal mechanism, although biomethylation may mobilize lead and return it to the water column. Soil and sediment act as sinks for anthropogenic releases of lead.

Lead in fish is localized in the mucus on the epidermis, the dermis, and scales so that the edible portions generally do not pose a hazard to human health (HSDB, 2001). Therefore, the BCF listed below probably overstates the danger to humans. Lead does not biomagnify through the aquatic or terrestrial food chains (ATSDR, 1997). Biotransfer factors for lead are compiled below:

BCF (L/kg)	Bpr (unitless)	BPV (Unitless)	Bb (days/kg)
49[a]	9.0E-3[b]	4.5E-2[b]	3.0E-4[b]

a U.S. Environmental Protection Agency (EPA), 1986, Superfund Public Health Evaluation Manual, Office of Emergency and Remedial Response, Washington, DC, OSWER Directive 9285-4-1, EPA/540/1-86/060, PB87-183125, October .

b Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September .

The noncancer toxicity of lead to humans has been well characterized through decades of medical observation and scientific research (EPA, 2001). The principal effects of acute oral exposure are gastrointestinal colic with diffuse paroxysmal abdominal pain (probably due to vagal irritation), anemia, and, in severe cases, acute encephalopathy, particularly in children (Tsuchiya, 1986). The primary effects of long-term exposure are neurological and

hematological. Limited occupational data indicate that long-term exposure to lead may induce kidney damage. The principal target organs of lead toxicity are the nervous system and the erythrocyte. Some of the effects on the blood, particularly changes in levels of certain blood enzymes, and subtle neurobehavioral changes in children, appear to occur at levels so low as to be considered non-threshold effects. In part for this reason the EPA (1990, 2001) considered inappropriate the derivation of an RfD for chronic oral exposure.

The Integrated Exposure, Uptake Biokinetic Model (IEUBK) Version 0.99D (EPA, 1994a) is generally used to evaluate lead in children, the most sensitive receptor under a residential exposure scenario. The IEUBK model integrates lead uptake from inhalation, drinking water, diet, soil and dust ingestion, and ingestion of incidental sources such as chips of lead-based paint, and estimates blood lead concentrations over the first seven years of a child's life. Generally, it is considered that childhood blood lead levels below 10 µg/dL reflect minimal likelihood of adverse effects from exposure to lead. Since it is plausible that children could be present under most residential site-use scenarios, it is appropriate to use the IEUBK to establish target levels for lead in soil for residential use. EPA (1994b) used the IEUBK to estimate a lead concentration of 400 mg/kg in bare soil to which children might be regularly exposed as the level below which further evaluation and exposure-reduction action is not necessary.

The IEUBK, however, does not address lead concentrations in media to which adults may be exposed in a non-residential site-use scenario. EPA (1996) adopted a model similar to the IEUBK to estimate blood lead concentrations in adult women in an occupational exposure scenario. The pregnant woman is assumed to be the member of the adult population most sensitive to exposure to lead because of the potential for developmental effects on the fetus. The EPA (1996) adult blood lead model estimates a lead concentration in soil of approximately 750 mg/kg (EPA, 2001) as the level below which the 95' percentile fetal blood lead concentration would not exceed 10 µg/dL.

EPA (2001) classified lead in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence in humans and sufficient animal evidence. The human data consist of several epidemiologic occupational studies that yield confusing results. All the studies lacked quantitative exposure date and failed to control for smoking and concomitant exposure to other possibly carcinogenic metals. Rat and mouse bioassays showed statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. Various lead compounds were observed to induce chromosomal alterations in vivo and in vitro, sister chromatid exchange in exposed workers and cell transformation in Syrian hamster embryo cells, to enhance simian adenovirus induction, and to alter molecular processes that regulate gene expression. EPA (2001) declined to estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk.

References for Lead

Agency for Toxic Substances and Disease Registry, (ATSDR), 1997, Update Toxicological Profile for Lead, Draft for Public Comment, U.S. Public Health Service, Atlanta, GA, August.

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Ohio Environmental Protection Agency (OEPA), 1998, U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

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U.S. Environmental Protection Agency (EPA), 1993, "Oral and Dermal Absorption Factors for Multiple Chemicals (FEMP O.U. #4/Femald, OH)," Memorandum from Joan Dollarhide, ECAO, to Pat Van Leeuwen, Region V, dated July 21.

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U.S. Environmental Protection Agency (EPA), 1996, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, Technical Review Workgroup for Lead, December.

U.S. Environmental Protection Agency (EPA), 2004, Region 9 Preliminary Remediation Goals (PRGs) 2004 Update, online, 1 November.

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MANGANESE (7439-96-5)

Manganese is a naturally occurring metal used in the manufacture of steel, and in other metallurgical processes, batteries, and various manganese-containing chemicals including matches, glass and porcelain, fireworks, varnishes, ceramics and fungicides (ATSDR, 1997; Keen and Leach, 1988). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
54.94 (element)	NA	NA	ND	NA	NA	ND	Note 1[a]

NA = not applicable, ND = do data

Note 1: Metallic manganese decomposes in the presence ofwater. Manganous chloride as a typical manganese salt: 7.23E+5.

a Agency for Toxic Substances and Disease Registry, (ATSDR), 1997, Update Toxicological Profle for Manganese, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, September.

Anthropogenic sources of atmospheric manganese include metal processing, disposal of manganese-containing materials, resuspension of manganese-containing soil dust, fly ash emissions from incinerators, and the combustion of gasoline containing manganese anti-knock ingredients (ATSDR, 1997; HSDB, 2001). Manganese may be released to water by discharge from industrial facilities or in leachate from landfills and soil. Landfill disposal of manganese-containing wastes is the predominant source of manganese release to soil.

Manganese exists in the air bound to particles; dry deposition is the primary removal mechanism, although wet deposition may also be significant (ATSDR, 1997). Manganese in fly ash exists as chlorides and oxides that are relatively soluble and mobile in the environment.

Manganese in water exists as any number of sparingly soluble salts that attach to suspended sediment (ATSDR, 1977). Sedimentation is the primary removal process. Soluble forms also exist, depending on pH of the water, and may be released from sediment. The extent of absorption to constituents of soil is highly variable. Low concentrations may occur in an irreversibly "fixed" form to clay, but higher concentrations often manifest considerable mobility.

Biotransfer factors for manganese are compiled below:

BCF (L/kg)	Bpr (unitless)	BPV (Unitless)	Bb (days/kg)
See Below	5.0E-2[a]	2.5E-1[a]	4.0E-4[a]

a Baes, C.F ., R.D. Sharp, A.L . Sjoreen, R.W. Shor, 1984, A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Manganese in aquatic systems tends to bioaccumulate more strongly in plants and lower trophic levels, and less strongly in edible fish. ATSDR (1997) reports BCFs of 10,000 to 20, 000 L/kg for marine and freshwater plants, 2500 to 6300 L/kg for phytoplankton, 300 to 5500 L/kg for marine algae, 800 to 830 L/kg for intertidal mussels, and 100 to 600 L/kg reported for fin fish. The midpoint of the BCF range for intertidal mussels of 815 L/kg is used herein for shellfish. The midpoint of the BCF range for fin fish of 350 L/kg is used herein for fin fish.

Keen and Leach (1988) and ATSDR (1997) reviewed the empirical data and reported that approximately three to five percent of dietary manganese is absorbed, regardless of the amount present in the diet. EPA (2001) selected five percent as a rough approximation of the extent of GI absorption. This value (0.05) is selected as the GAF for manganese.

The ABS of 0.01 is an OEPA (1998) default for metals for which empirical data are lacking.

Manganese is nutritionally required in humans for normal growth and health (EPA, 2001). Humans exposed to approximately 0.8 mg manganese/kg-day in drinking water (28 mg/L) exhibited lethargy, increased muscle tonus, tremor and mental disturbances. The elderly appeared to be more sensitive than children. Oral treatment of laboratory rodents induces biochemical changes in the brain, but rodents do not exhibit the neurological signs exhibited by humans. Occupational exposures to high concentrations in air induce a generally typical spectrum of neurological effects, and increased incidence of pneumonia (ACGIH, 1991).

EPA (2001) derived an oral RfD for manganese of 1.4E-1 mg/kg-day from a NOAEL of I .4E-1 mg/kg-day for neurologic effects from human dietary studies and an uncertainty factor of 1. Confidence in the RfD is medium. The oral RfD of 1 .4E-1 mg/kg-day will be used for dietary items other than drinking water. EPA (2001) recommends that a modifying factor of 3 should be used to adjust the RfD for use when oral exposure involves drinking water and non-dietary ingestion. The oral RfD resulting from application of the modifying factor, 4 .7E-2 mg/kg-day, will be used for drinking water and incidental ingestion of non-dietary items, and will serve as the basis for developing the dermal RfD. The CNS is the target organ for chronic oral exposure to manganese. EPA (2001) presents a verified chronic inhalation RfC of 5E-5 mg/m3 (equivalent to an inhalation RfD of 1 .4E-5 mg/kg-day) based on a LOAEL for neurological effects in occupationally exposed humans and an uncertainty factor of 1000. Confidence in the RfC is medium. The CNS is the target organ for inhalation exposure to manganese.

EPA (2001) classified manganese in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans). Quantitative cancer risk estimates are not derived for Group D chemicals.

References for Manganese

Agency for Toxic Substances and Disease Registry, (ATSDR), 1992, Toxicological Profile for Acetone, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia.

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U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91 /011B, January.

U.S. Environmental Protection Agency (EPA), 2001, Integrated Risk Information System (IRIS), National Center for Environmental Assessment, Cincinnati, OH, on line.

BENZENE (71-43-2)

Benzene is a naturally occurring VOC, present in low levels in many plants and animals, as well as a synthetic compound derived from petroleum (ATSDR, 1995). Benzene is widely used as a solvent and in the manufacturing of other organic compounds such as styrene, phenol, detergents, pesticides, explosives, polychlorinated biphenyls, flavors, perfumes, paints and coatings, nylon intermediates and photographic chemicals, among others. It is also used in food processing and leather tanning and occurs a component of gasoline. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
78.1	2.13[a]	5.56E-3[b]	1.77[b]	8.8E-2[b]	9.8E-6[b]	1.25E-1[c]	1.75E+3[b]

a U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/01113, January.

b U.S . Environmental Protection Agency (EPA), 1996, Soil Screening Guidance: Users Guide, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355 .4-23, April. c U. S. Environmental Protection Agency (EPA), 1994, Technical Background Document for Soil Screening Guidance, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.

Benzene will enter the atmosphere primarily from fugitive emissions and exhaust connected with its use in gasoline (ATSDR, 1995; HSDB, 2001) . Other important sources are emissions associated with its production and use as a solvent, as an industrial intermediate in the production of materials mentioned above, and coke oven blast furnaces and coke by-product recovery plants. In addition, there are discharges into water from industrial effluents and losses during spills. Sources of release to soil include land disposal of benzene-containing wastes, industrial discharge and leaks from underground storage tanks.

Benzene released to the atmosphere will exist almost exclusively in the vapor phase (ATSDR, 1995; HSDB, 2001). It is not subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of approximately 13 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products ofphotooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. Benzene is fairly soluble in water and is removed from the atmosphere in rain.

Benzene released to soil will be subject to rapid volatilization near the surface; that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater (ATSDR, 1995; HSDB, 2001). Benzene may be subject to biodegradation under aerobic conditions. Microbial transformation proceeds through formation of cis-dihydrodiols to catechols, which lead to fission of the aromatic ring.

Benzene may be subject to photooxidation and biodegradation in shallow, aerobic groundwaters, but probably not significantly under deeper or anaerobic conditions (ATSDR, 1995; HSDB, 12001). Benzene released to surface water will be subject to rapid volatilization. It is not expected to sorb to sediment or to hydrolyze significantly. It may be subject to biodegradation, but this is unlikely to be a significant fate process in sediment.

Benzene is not expected to participate significantly in food-chain pathways (HSDB, 2001); therefore, biotransfer factors are not provided.

The OEPA (1998) default ABS of 0.1 for organic chemicals is adopted for this evaluation.

Short-term exposure to benzene induces central nervous system (CNS) effects such as drowsiness, dizziness and headaches; long-term exposure may induce anemia (ATSDR, 1995). Oral dosing in animals induces hematopoietic and immune effects. EPA (1996) derived a provisional RfD for chronic oral exposure of 3E-3 mg/kg-day, based on a LOAEL of 8 mg/kg-day in a 28-day drinking water study in mice. The LOAEL was associated with minor hematologic effects (erythrocytopenia, leucopenia, lymphocytopenia), all associated with decreased cell counts, and increased response in several tests of immunologic activity. Depressed immunologic activity was observed at higher dose levels. An uncertainty factor of 3000 was applied to derive the provisional RfD from the LOAEL. Confidence in the RfD is medium. The hematopoietic mechanism and the immune system are the target organs for chronic oral exposure to benzene.

A provisional chronic inhalation RfC of 6E-3 mg/m^3 for benzene was based on a LOAEL of 32 mg/m^3 for depressed hematopoiesis in a study in which mice were exposed intermittently for up to 178 days (EPA, 1994). The exposure concentration was adjusted to an equivalent human continuous exposure concentration of 5.7 mg/m^3. Application of an uncertainty factor of 1000 to the LOAEL of 5 .7 mg/m^3 yields the RfC of 6E-3. The RfC is equivalent to an RfD of 1.7E-3 mg/kg-day. Confidence in the inhalation RfC is low. The hematopoietic mechanism and the immune system are the target organs for chronic inhalation exposure to benzene.

Benzene is classified as an EPA cancer weight-of-evidence Group A chemical (known human carcinogen) based on epidemiologic studies and case studies that provide clear evidence of a causal association between exposure to benzene and acute nonlymphocytic leukemia, and that also provide supportive evidence for chronic nonlymphocytic leukemia and chronic lymphocytic leukemia (EPA, 2001). Other neoplastic conditions that are associated with an increased risk in humans are hematologic neoplasms, blood disorders such as preleukemia and aplastic anemia, Hodgkin's lymphoma, and myelodysplastic syndrome. Experimental animal data add to the weight of evidence that exposure to benzene increases the risk of cancer in multiple species at multiple organ sites (hematopoietic, oral and nasal, liver, forestomach, preputial gland, lung, ovary, and mammary gland).

A verified URF for inhalation exposure of 2.2E-6 to 7.8E-6 per $\mu g/m^3$ was based on the incidence of leukemia in humans exposed to benzene while employed in the Pliofilm industry (EPA, 2001). A low-dose linearity model utilizing maximum likelihood estimates was used to estimate the URF. The range reflects differences in the exposure assumptions estimated from the study. EPA (2001) concluded that neither any specific URF value nor either end of the range is more defensible than the other. Therefore, the upper end of the range, 7.8E-6 per 4g/m3, is conservatively selected for this evaluation. The URF of 7.8E-6 per ~Lg/m3 is equivalent to an inhalation SF of 2.7E-2 per mg/kg/day.

The occupational data that serve as the basis for the inhalation URF also serve as the basis for a verified oral SF for benzene (EPA, 2001). The inhalation URF range was mathematically converted to an equivalent oral SF range by applying standard inhalation rate and body weight assumptions, and by adjusting for route-specific differences in absorption. EPA (2001) assumed that GI absorption is 100 percent and that respiratory tract uptake is 50 percent. The oral SF range so derived is 1 .5E-2 to 5.5E-2 per mg/kg-day. The upper end of the range, 5.5E-2 per mg/kg-day, is selected as the oral SF for this evaluation.

References for Benzene

Agency for Toxic Substances and Disease Registry, (ATSDR), 1995, Update Toxicological Profile for Benzene, Draft for Public Comment, U.S . Public Health Service, Atlanta, Georgia, August.

Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

Jones, T.D. and BA Owen, 1989, Health Risks from Mixtures of Radionuclides and Chemicals in Drinking Water, Oak Ridge National Laboratory, Oak Ridge, TN, ORNL-6533.

Ohio Environmental Protection Agency (OEPA), 1998, U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22 .

U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/01 1 B, January.

U.S. Environmental Protection Agency (EPA), 1994, Risk Assessment Issue Paper for: Derivation of a Provisional Chronic Inhalation RfC for Benzene (CASRN 71-43-2), National Center for Environmental Assessment, Cincinnati, OH, March 23.

U.S. Environmental Protection Agency (EPA), 1996, Risk Assessment Issue Paper for: Derivation of a Provisional Oral RfD for Benzene (CASRN 71-43-2), National Center for Environmental Assessment, Cincinnati, OH, July 2.

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NITROTOLUENES

The nitrotoluenes consist of three isomers: o-nitrotoluene (2-nitrotoluene), m-nitrotoluene (3-nitrotoluene) and p-nitrotoluene (4-nitrotoluene) (Lewis, 1997). All behave in the environment as VOCs. The nitrotoluenes, especially the o- and p-isomers, are used as intermediates in the synthesis of other organic chemicals, particularly toluidine, tolidine, fuchsine and other synthetic dyes, explosives, petrochemicals, pesticides, pharmaceuticals, rubber and agricultural chemicals, dyes and pigments (HSDB, 2001). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
o-nitrotoluene (88-72-2)							
137.13	2.3[a]	5.56E-5[a]	2.44[a]	7.14E-2[b]	8.0E-6[c]	1.32E-4[c]	6.52E+2[a]
m-nitrotoluene (99-08-1)							
137.13	2.45[a]	7.5E-5[a]	2.16[a]	7.14E-2[b]	8.0E-6[c]	2.72E-4[c]	4.98E+2[c]
p-nitrotoluene (99-99-0							
137.13	2.37[a]	5.0E-5[a]	2.49[a]	7.14E-2[b]	8.1E-6[c]	1.22E-4[c]	4.22E+2[c]

a Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

b Calculated as described in Introduction to the Toxicity Profiles.

c Montgomery, J .H., 1996, Groundwater Chemicals Desk Reference, Second Edition, Lewis Publishers, New York, pp. 790-795 .

The major sources of release of nitrotoluenes to the environment appear to be production and use facilities and plants which produce these compounds as by-products (HSDB, 2001). These include manufacturers of dinitrotoluene, trinitrotoluene, intermediates for rubber and agricultural chemicals, and various azo and sulfur dye intermediates. Nitrotoluenes may also enter the environment from the disposal of waste products which contain these compounds.

Nitrotoluenes released to soil are expected to be resistant to oxidation and chemical hydrolysis (HSDB, 2001). The nitrotoluenes are reported to biodegrade under anaerobic conditions to form toluidine; one study under aerobic conditions in a mixed culture of soil microorganisms resulted in persistence exceeding 64 days. The nitrotoluenes are expected to be moderately to highly mobile in soil and volatilize slowly from dry soil surfaces.

Nitrotoluenes released to water are expected to be susceptible to photolysis, volatilization and aerobic biodegradation, provided suitable acclimation has been achieved (HSDB, 2001). Oxidation, chemical hydrolysis, adsorption to suspended solids and sediments and bioaccumulation in aquatic organisms are not expected to be significant fate processes. Insufficient data were available to indicate the significance of anaerobic biodegradation as a possible removal mechanism. Nitrotoluenes released to the atmosphere are expected to exist entirely in the vapor phase (HSDB, 2001). The dominant removal mechanism is expected to be reaction with photochemically generated hydroxyl radicals (estimated half-life 8 hours) and direct photolysis. Photoproducts include 2-methyl-6-nitrophenol and 2-methyl-4-nitrophenol (o-

isomer), 3-methyl- 4-nitrophenol, 3-methyl-2-nitrophenol and 3-methyl-6-nitrophenol (m-isomer) and 2-methyl-6- nitrophenol (p-isomer).

The nitrotoluenes are not expected to bioconcentrate or bioaccumulate significantly (HSDB, 2001); therefore, biotransfer factors are not estimated.

Data regarding the dermal uptake of the nitrotoluenes from soil were not located in the available literature; the OEPA (1998) default ABS of 0.1 for organic chemicals is selected for this evaluation.

Data regarding the acute toxicity of oral exposure to the nitrotoluenes were not located. A 13-week dietary study with the three nitrotoluene isomers in rats and mice indicated that effects were most notable with o-nitrotoluene (ACGIH, 1991). Effects included biochemical evidence of altered liver function, and splenic and renal lesions. EPA (1997) derived a provisional RfD of 1 E-2 mg/kg-day for chronic oral exposure to all three nitrotoluene isomers from data for o-nitrotoluene. In the key study, rats were treated by gavage for 6 months. The LOAEL was 200 mg/kg-day associated with lesions in the spleen. An uncertainty factor of 10,000 was applied to the LOAEL. The derivation of the provisional RfD is unclear, because dividing the LOAEL of 200 mg/kg-day by an uncertainty factor of 10,000 would be expected to yield an RfD of 2E-2 mg/kg-day, not I E-2 mg/kg-day as reported by EPA (1997). The liver, spleen and kidney are considered to be the target organs for chronic oral exposure to the nitrotoluenes.

Data regarding the toxicity of inhalation exposure to the nitrotoluenes were not located in the available literature. The data are inadequate for developing an inhalation RfC.

Data regarding the potential carcinogenicity of the nitrotoluenes were not located in the available literature. The nitrotoluenes are not assigned to a cancer weight-of-evidence group and URFs and SFs are not available.

References for Nitrotoluenes

Agency for Toxic Substances and Disease Registry, (ATSDR), 1990, Toxicological Profile for Nitrobenzene, U.S. Department of Health and Human Services, Atlanta, GA.

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POLYAROMATIC HYDROCARBONS (PAHs)

The PAHs COCs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. All are SVOCs. PAHs are the products of incomplete combustion of fossil fuels or other organic matter, hence include both natural and anthropogenic sources (ATSDR, 1993a). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
benzo(a)anthracene (56-55-3)							
228.29	5.66[a]	1.6E-6[a]	5.30[a]	5.10E-2[d]	9.0E-6[d]	2.9E-11[c]	I[a]
Benzo(a)pyrene (50-32-8)							
252.3	6.16[e]	4.9E-7[a]	6.74[a]	4.30E-2[d]	9.0E-6[d]	7.4E-12[a]	3.8E+3[a]
Benzo(b)fluoranthene (99-99-0)							
252.3	6.12[e]	1.22-5[a]	5.74[a]	2.26E-2[d]	5.56E-6[d]	1.3E-9[a]	I[a]
Benzo(k)fluoranthene (207-08-9)							
252.3	6.06[a]	3.87-5[a]	5.74[a]	2.26E-2[d]	5.56E-6[d]	6.6E-10[a]	I[a]
Dibenz(a,h)anthracene (53-70-3)							
278.35	6.84[e]	7.3-8[a]	6.52[a]	2.02E-2[d]	5.18E-6[d]	8.2E-12[a]	5E-7[a]
Indeno(1,2,3-cd)pyrene (193-39-5)							
276.3	6.58[e]	6.95-8[a]	6.20[a]	1.90E-2[d]	5.66E-6[d]	1.3E-12[a]	6.23E-2[a]

a Agency for Toxic Substances and Disease Registry (ATSDR), 1993a, Update Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs), Draft for Public Comment, U.S. Department of Health and Human Services, Atlanta, Georgia, October.

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c Calculated as described in Introduction to the Toxicity Profiles. 'U.S. Environmental Protection Agency (EPA), 1996,

d Soil Screening Guidance: Users Guide, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355 .4-23, April.

e U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/01113, January.

f U .S. Environmental Protection Agency (EPA), 1994, Technical Background Document for Soil Screening Guidance, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No . 9355 .4-17, EPA540/R-94/106, PB95-963532, November. 9

g Agency for Toxic Substances and Disease Registry, (ATSDR), 1993b, Update Toxicological Profile for Naphthalene, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, October.

The PAHs are ubiquitous products of incomplete combustion; natural sources include volcanoes and forest fires (ATSDR, 1993a, b; HSDB, 2001). There is some evidence for biosynthesis by plants, bacteria and algae. Some of the PAHs occur naturally in fossil fuels. Anthropogenic releases to the environment, primarily to the atmosphere, greatly outweigh the natural sources and include any processes that involve incomplete combustion of fossil fuels and organic matter, including wood-burning for home heat (the predominant source), cigarette smoke, internal combustion engine exhaust, and fuel oil emissions. Other sources include various crude oils, fresh and used motor oils, gasolines, charcoal-broiled foods, processed foods, various oils, margarine, butter and fats, fruits, vegetables, and cereals, roasted coffee and tea. Naphthalene is released during its manufacture and processes that involve its use (e.g., vaporization from moth balls).

PAHs exist in the atmosphere as bothgases and particulates, the proportion depending on the vapor pressure of the individual chemical (ATSDR, 1993a, b; HSDB, 2001). They may travel short or long distances before removal from the air. Wet and dry deposition accounts for removal of the particulates. Vapor forms are subject to chemical oxidation processes in the air.

The predominant sources of PAHs in surface water are deposition from the atmosphere, industrial and sewage effluent and oil spills (ATSDR, 1993x, b). Runoff and erosion can also contribute PAHs to surface water bodies. Depending on solubility and vapor pressure, volatilization is a significant fate process for some of the PAHs in surface water. Adsorption to sediment is another significant removal process. Low molecular weight PAHs (acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene) are subject to chemical degradation and biodegradation. Naphthalene is relatively water soluble and may remain largely in solution. PAHs in sediment may biodegrade or accumulate in living organisms.

Deposition from the atmosphere is the principal source of PAHs in soil (ATSDR, 1993a, b). Other sources include industrial activities, disposal of sewage sludge, and leaching from coal storage sites. Most PAHs sorb to soil constituents because of their low solubility and high affinity for organic matter. Volatilization is an important removal process for the low molecular weight compounds. Some of the low molecular weight compounds, particularly naphthalene, may leach fairly rapidly to groundwater.

The propensity for the PAHs to participate in food-chain pathways is chemical specific, depending largely on the tendency for biodegradation or biotransformation (ATSDR, 1993a, b; HSDB, 2001). Biotransfer factors for the PAHs are compiled below:

BCF (L/kg)	**B_{pr}[a,b] (unitless)**	**B_{pv}[a,b] (unitless)**	**B_b (days/kg)**
benzo(a)anthracene (56-55-3)			
350[e]	2.07E-2	2.07E-2	1.15E-2
Benzo(a)pyrene (50-32-8)			
480[c]	1.07E-2	1.07E-2	3.63E-2
Benzo(b)fluoranthene (99-99-0)			
2800[f]	1.12E-2	1.12-2	3.31E-2
Benzo(k)fluoranthene (207-08-9)			
17,100[a]	6.78E-3	6.78E-3	2.88E-2

BCF (L/kg)	B_{pr}[a,b] (unitless)	B_{pv}[a,b] (unitless)	B_b (days/kg)
Dibenz(a,h)anthracene (53-70-3)			
10[e]	5.33E-2	5.33E-2	2.24E-3
Indeno(1,2,3-cd)pyrene (193-39-5)			
12,800[a]	6.09E-3	6.09E-3	9.55E-2

a Calculated as described in Introduction to the Toxicity Profiles.

b The methodology for estimating biotransfer of organic chemicals to plants does not differentiate vegetative and reproductive portions .

c Empirical data in Bluegill Sunfish (Lepomis macrochirus) from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

d Estimated value from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

e Empirical data in golden ide fish (Leuciscus idus melanotus) from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line .

f Empirical data in clams from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

f Empirical data in guppies (Poecilia reticulata), from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

f Empirical data in fathead minnows, from Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line .

The BCF for indeno(1,2,3-cd)pyrene may be overestimated because the PAHs are generally readily metabolized by vertebrates, reducing the potential for bioconcentration (ATSDR, 1993a; HSDB, 2001). The BCF for benzo(b)fluoranthene is probably overestimated for fin fish because fin fish biotransform and eliminate PAHs much more readily than invertebrates.

Toxicokinetic studies of several PAHs summarized by ATSDR (1993a) provide limited quantitative information regarding the extent of GI absorption. Qualitatively, these studies indicate that absorption is incomplete. A study of benzo(a)pyrene in rats suggested that GI absorption ranges from 38 to 58 percent. The GAF of 0.5 (Jones and Owen, 1989), near the midpoint of the range from the rat study, is selected for benzo(a)pyrene and the other PAHs for which quantitative data are not available. GI absorption of dibenzo(a,h)anthracene is described as high; a GAF of 0 .8 is assumed for this compound.

Empirical data with pure compound dissolved or suspended in vehicles suggest that dermal uptake of benzo(a)pyrene is extensive (ATSDR, 1993x), but data regarding absorption from soil were not located. Lacking suitable empirical data for dermal uptake from soil, the OEPA (1998) Region IV default ABS of 0.1 for organic chemicals is chosen for the PAHs.

The PAHs are generally divided into two EPA cancer weight-of-evidence groups: Group D - not classifiable as to carcinogenicity to humans, and Group B2 - probable human carcinogens. No Group D PAHs were retained as COCs.

Cancer SFs and URFs are available for the Group B2 compounds but noncancer RfDs or RfCs are not. Therefore, evaluation and RGO development for these compounds are limited to cancer risk. These compounds have the morphologic requirements for carcinogenicity; therefore, it has

been thought that cancer risk is the driver, and that noncancer effects are relatively insignificant, although empirical data were lacking.

Recent data, however, support this assumption. De Jong et al. (1999) reported a study in which male rats were treated by gavage with benzo(a)pyrene 5 days per week for 35 days at dose rates of 0 (control), 3, 10, 30 or 90 mg/kg. Significantly reduced rate of body weight gain and altered organ weights were observed in the 90 mg/kg group. Forestomach lesions were found in the 30 and 90 mg/kg group. Decreased thymus weights and hematological evidence of erythrocyte toxicity were observed in a dose-related manner in rats treated with 10 mg/kg and above. Subtle alterations in measures of immune function were also observed in these groups, establishing 10 mg/kg as the LOAEL and 3 mg/kg as the NOAEL for this study. The 3 mg/kg dose is equivalent to an adjusted NOAEL of 2.1 mg/kg-day. Application of an uncertainty factor of 1000 (factor of 10 to expand from subchronic to chronic exposure, and factors of 10 each to provide additional protection for intra- and interspecies variation) allows development of a preliminary oral RfD of 2E-3 mg/kg-day. Uncertainty surrounding the preliminary oral RfD is very high because the data base for benzo(a)pyrene is essentially limited to one study and several toxicological endpoints (e.g., developmental, reproductive, neurological) were not investigated .

Benzo(a)pyrene is the most extensively studied member of the class, inducing tumors in tissues at the point of contact of virtually all laboratory species tested by all routes of exposure. Although epidemiology studies suggested that complex mixtures that contain PAHs (coal tar, soots, coke oven emissions, cigarette smoke) are carcinogenic to humans, the carcinogenicity cannot be attributed to PAHs alone because of the presence of other potentially carcinogenic substances in these mixtures (ATSDR, 1993a) . In addition, recent investigations showed that the PAH fraction of roofing tar, cigarette smoke and coke oven emissions accounted for only 0.1-8% of the total mutagenic activity in Salmonella of the unfractionated complex mixture (Lewtas, 1988). Aromatic amines, nitrogen heterocyclic compounds, highly oxygenated quinones, diones, and nitrooxygenated compounds, none ofwhich would be expected to arise from in vivo metabolism of PAHs, probably accounts for the majority of the mutagenicity of coke oven emissions and cigarette smoke. Furthermore, coal tar, which contains a mixture of many PAHs, has a long history of use in the clinical treatment of a variety of skin disorders in humans (ATSDR, 1993a).

Because of the lack of human cancer data, assignment of individual PAHs to EPA cancer weight of-evidence groups is based largely on the results of animal studies with large doses of purified compound (EPA, 2001). Frequently, unnatural routes of exposure, including implants of the test chemical in beeswax and trioctanoin in the lungs of female rats, intratracheal instillation, and subcutaneous or intraperitoneal injection, were used.

EPA (2001) verified a SF for oral exposure to benzo(a)pyrene of 7 .3E+0 per mg/kg-day, based on several dietary studies in mice and rats. Recent reevaluations of the carcinogenicity and mutagenicity of the Group B2 PAHs suggest that there are large differences between individual PAHs in cancer potency (Krewski et al., 1989). Based on the available cancer and mutagenicity data, and assuming that there is a constant relative potency between different carcinogens across different bioassay systems and that the PAHs under consideration have similar dose-response curves, EPA (1993b) adopted relative potency values for several PAHs.

Although the EPA has not verified SFs for Group B2 PAHs other than benzo(a)pyrene, the SFs above represent reasonable estimates based on the data available. The relative potency approach employed here meets criteria considered to be desirable for this type of analysis (Lewtas, 1988). For example, the chemicals compared have similar chemical structures and

would be expected to have similar toxicokinetic fate in mammalian systems. In addition, the available data suggest that the Group B2 PAHs have a similar mechanism of action, inducing frameshift mutations in Salmonella and tumor initiation in the mouse skin painting assay. Similar noncancer effects (minor changes in the blood, liver, kidneys) of the Group D PAHs support the hypothesis of a common mechanism of toxicity. Finally, the same endpoints of toxicity, i.e., potency in various cancer assays, and related data, were used to derive the relative potency values (Krewski et al., 1989). The oral SF for benzo(a)pyrene of 7.3E+0 per mg/kg-day, and the SFs presented above for the other Group B2 PAHs are adopted for the purposes of this evaluation.

An EPA (1994) evaluation of the inhalation cancer data suggests adoption of an inhalation SF for benzo(a)pyrene of 3 .1 E+0 per mg/kg-day, based on the incidence ofupper respiratory and digestive tract tumors in hamsters. Applying the relative potency estimates presented above yield the inhalation SFs for the other Group B2 PAHs presented above.

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POLYCHLORINATED BIPHENYLS (PCBs)

The PCBs are a class of SVOCs including 209 possible individual congeners, each consisting of a biphenyl structure and 1 to 10 chlorine atoms (ATSDR, 1995). The PCBs manufactured and used in the U.S. are called Aroclors. The Aroclors are mixtures of several PCB congeners and related compounds. Aroclors were used as dielectric and heat exchange agents in several open and closed systems, but since the middle 1970s, use has been restricted largely to electrical transformers and capacitors.

Analysis of PCBs in environmental media frequently involves "fingerprinting" the mixture, and reporting the result as the Aroclor(s) that most closely reflect the fingerprint(s) (ATSDR, 1995). Recently, however, more attention has been paid to analyzing and reporting individual congeners, because of the possibility that certain congeners may be dioxin-like in their mechanism of toxicity. The Aroclors most commonly identified in environmental media include Aroclor-1016, -1221, -1232, -1242, -1248, -1254, -1260, -1262, and -1268. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
Aroclor-1254 (11097-69-1)							
328[a,b]	6.5[b]	2.0E-3[b]	5.00[c]	3.99E-2[d]	5.6E-6[c]	1.01E-7[b]	3.5E-2[b]
Aroclor-1260 (11096-82-5)							
375.7[a,b]	6.8[b]	4.6E-3[b]	6.42[c]	3.65E-2[d]	5.3E-6[c]	5.33E-8[a]	4.1E-2[b]

a Average molecular mass for the proportions of individual congeners in the commercial product.

b Agency for Toxic Substances and Disease Registry (ATSDR), 1995, Update Toxicological Profile for Polychorinted Biphenyls, Draft for Public Comment, U.S . Department of Health and Human Services, Atlanta, Georgia, August.

c Montgomery, J.H., 1996, Groundwater Chemicals Desk Reference, Second Edition, Lewis Publishers, New York.

d Calculated as described in Introduction to the Toxicity Profiles.

Former PCB releases occurred as a result of their manufacture, use, disposal, and leakage from damaged PCB-containing equipment (ATSDR, 1995) . Currently the major source of PCB release to the environment is recycling of PCBs previously introduced into the environment, which involves volatilization from ground surfaces (water, soil) into the atmosphere with subsequent removal from the atmosphere via wet/dry deposition, followed by volatilization (HSDB, 2001). PCBs are also currently released to the environment from landfills containing PCB waste materials and products, incineration of municipal refuse and sewage sludge, and improper (or illegal) disposal of PCB materials, such as waste transformer fluid, to open areas. Major sources to air include emissions from the overhaul, repair or reuse of PCB-containing items, and the recycling of previously released PCBs described above (ATSDR, 1995; HSDB, 2001). The vapor pressures of the PCBs indicate that they would exist primarily in the vapor phase in the atmosphere; monitoring data have shown that between 87 and 100% of the PCBs in air are in the vapor-phase. Vapor pressure of the PCBs generally decreases with an increase

in the extent of chlorination; therefore, the more highly chlorinated PCBs are more likely to be associated with the particulate-adsorption-phase in air than are the lesser chlorinated PCBs. Physical removal of PCBs in the atmosphere is accomplished by wet and dry deposition; dry deposition occurs only for PCBs in the particulate phase.

Major sources to soil include leaks or discharges from PCB-containing items and deposition from the atmosphere (ATSDR, 1995). PCBs sorb tightly to constituents of soil with adsorption generally increasing with the degree of chlorination. Although the lesser chlorinated biphenyls may exhibit low mobility in soil, PCBs will generally not leach significantly in most aqueous soil systems. In the presence of organic solvents, PCBs may leach quite rapidly through soil. Vapor loss of PCBs from soil surfaces appears to be an important loss mechanism with the rate of volatilization decreasing with increasing chlorination. Although the volatilization rate may be low, the total loss by volatilization over time may be significant because of the persistence and stability of PCBs. In general, the persistence of PCBs increases with an increase in the degree of chlorination (HSDB, 2001). Mono-, di- and trichlorinated biphenyls (Aroclors-1221 and -1232) biodegrade relatively rapidly, tetrachlorinated biphenyls (Aroclors-1016 and -1242) biodegrad slowly, and higher chlorinated biphenyls (Aroclors-1248, 1-254 and -1260) are resistant to biodegradation. The position of chlorination in the isomeric classes also determines the extent of biodegradation. Although biodegradation of higher chlorinated congeners may occur very slowly on an environmental basis, no other degradation mechanisms have been shown to be important in soil systems; therefore, biodegradation may be the ultimate degradation process in soil.

Former sources of PCBs to surface water include waste streams and discharges from waste water treatment plants (ATSDR, 1995). Currently, direct deposition, runoff and erosion probably predominate. Removal from water involves sorption to particles and sedimentation, as well as volatilization.

The PCBs are among the compounds that bioaccumulate in food chain pathways and are of special concern for biomagnification from sediment in benthic fish. Biotransfer factors for the PCBs are compiled below:

BCF (L/kg)	**B_{pr}[a,b] (unitless)**	**B_{pv}[a,b] (unitless)**	**B_b[a] (days/kg)**
Aroclor-1254 (11097-69-1)			
See below	6.78E-3	6.78E-3	7.94E-2
Aroclor-1260 (11096-82-5)			
See below	4.55E-3	4.55E-3	1.58E-1

a Calculated as described in Introduction to the Toxicity Profiles.

b The methodology for estimating biotransfer oforganic chemicals to plants does not differentiate vegetative and reproductive portions .

The acute oral toxicity of the PCBs is low to moderate, as indicated by LD_{50} values in laboratory animals ranging from 750 mg/kg (mink) to 4250 mg/kg (rats) (ATSDR, 1995). Mink appear to be unusually sensitive. Death appears to be due to respiratory depression and dehydration from diarrhea

The best known incident involving oral exposure by humans is the "Yusho" incident in Japan, in which persistent chloracne, gastrointestinal irritation and central nervous symptoms followed ingestion of cooking oil contaminated with PCBs (Gaffey, 1983). Further investigation, however, revealed that concentrations of polychlorinated dibenzofurans (PCDF) and polychlorinated quaterphenyls in the cooking oil were similar to those of PCBs, which confounds interpretation of the reported observations and symptoms.

Prolonged oral exposure of laboratory animals leads to liver damage, signs of chloracne, immunological effects, and neurological impairment, particularly of the young. A verified oral RfD for Aroclor-1254 of 2E-5 mg/kg-day for chronic oral exposure is based on a LOAEL of 5E-3 mg/kg-day associated with chloracne and related signs and immunological effects in monkeys treated with the test material in gelatin capsules for over five years (EPA, 2001). An uncertainty factor of 300 was applied. Confidence in the RfD is medium. The immune system and skin are considered the target organs for prolonged oral exposure to Aroclor-1254.

Occupational exposure to PCBs, which involved both inhalation and dermal exposure, was associated with upper respiratory tract and ocular irritation, loss of appetite, liver enlargement and increased serum concentrations of liver enzymes, skin irritation, rashes and chloracne, and, in heavily exposed female workers, decreased birth weight oftheir infants (ATSDR, 1995). Concurrent exposure to PCB contaminants, such as PCDFs, confounds the interpretation of the occupational exposure studies. Rats, mice, rabbits and guinea pigs intermittently exposed to Aroclor-1254 vapors exhibit moderate liver degeneration, decreased body weight gain and slight renal tubular degeneration; however, the accuracy of the reported exposure concentration is in doubt. Neither verified nor provisional chronic inhalation RfC values arc available.

EPA (2001) classified PCBs in cancer weight-of-evidence Group B2 (probable human carcinogen) based on adequate evidence for liver tumors in laboratory animals and inadequate data in humans. EPA (2001) established a tiered approach for estimating the cancer potency of exposure to the PCBs. For the high risk tier, A SF of 2.0E+0 per mg/kg-day is verified as an upper-bound for exposure to PCBs via ingestion in the food chain, ingestion of soil or sediment, inhalation of dust or aerosol, or dermal contact with soil or sediment if an absorption factor is applied. In addition, the SF of 2.0E+0 per mg/kg-day is used for any congeners considered to be persistent or acting in a dioxin-like manner, and for any early life exposures. The high risk tier SF for central tendency (CT) analyses is 1.0E+0 per mg/kg-day. EPA (2001) verified an upperbound SF of 4.0E-1 per mg/kg-day for the low risk tier, which includes ingestion of watersoluble congeners, inhalation of evaporated congeners, and dermal exposure if no absorption factor is applied. A SF of 3E-1 per mg/kg-day is recommended for the low risk CT evaluation. The SF of 2.0E+0 per mg/kg-day is used for all exposure scenarios and exposure routes in this evaluation because analytical data that demonstrate the absence of dioxin-like or persistent congeners are not available, and the exposure of children or youths is plausible.

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XYLENES, TOTAL

The xylenes (1330-20-7), also known as dimethylbenzenes, are synthetic VOCs derived from coal tar, coal gas, and petroleum distillation (ATSDR, 1993; HSDB, 2001). Natural sources include petroleum, forest fires and volatiles from plants.

Xylenes are used in the manufacture of other organic compounds, dyes, insecticides and pharmaceuticals, and as solvents (ATSDR, 1993; HSDB, 2001). They are components of aviation gasoline, asphalt and naphtha, and automobile exhaust. Technical xylene consists of approximately 44 percent m-xylene (1,3-dimethylbenzene [108-38-3]), 20 percent o-xylene (1,2-dimethylbenzene [95-47-6]), 20 percent p-xylene (1,4-dimethylbenzene [106-42-3]), and 15 percent ethylbenzene. Laboratory analyses of environmental media often report values for total xylenes (1330-20-7), mixed xylenes or m- and p- xylene. The xylene isomers have similar physical property values and are toxicologically similar; therefore, the relevant physical properties for m-xylene, presented below, may be applied to the mixed xylenes, total xylene or any of the three isomers:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	Kd (L/kg)	Da (cm2/s)	Dw (cm2/s)	VP (atm)	S (mg/L)
106.2	3.20[a]	7.34E-3[b]	2.61[b]	7.00E-2[b]	7.8E-6[b]	1.06E-2[c]	1.61E+2[b]

a U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles andApplications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91 /011 B, January. '

b U.S. Environmental Protection Agency (EPA), 1996, Soil Screening Guidance: Users Guide, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355 .4-23, April.

c U.S. Environmental Protection Agency (EPA), 1994, Technical Background Document for Soil Screening Guidance, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355 .4-17, EPA540/R-94/106, PB95-963532, November.

Naturally occurring sources of xylenes are petroleum, forest fires and volatiles from plants (ATSDR, 1993; HSDB, 2001). The production and use of xylenes in petroleum products and as chemical solvents and intermediates may result in their release to the environment through various waste streams. Outgassing from landfills and automobile exhaust are other significant sources. Spills, leaking underground storage tanks, and leaching from landfills may release xylenes to soil and groundwater.

Xylenes will exist solely in the vapor phase in the ambient atmosphere, where they are subject to degradation by reaction with photochemically-produced hydroxyl radicals as the only significant removal process (ATSDR, 1993; HSDB, 2001). The atmospheric lifetime of xylenes is about 1 to 2 days. Products of photooxidation include a wide variety of ring hydroxylation and ring cleavage products.

Volatilization is expected to be the major removal mechanism for xylenes released to surface soil, but, depending on the size and rate of release, the majority of the release may infiltrate to subsurface soil (ATSDR, 1993). Photooxidation may degrade a significant part of the small amount that remains at the surface. Biodegradation is probably the only significant subsurface removal mechanism, but it is expected to be slow. A wide range of experimental K., values have been reported in soil samples with differing pH and organic carbon content (HSDB, 2001),

suggesting a wide range in the extent to which the xylenes adsorb to soil particles. Generally, however, xylene is fairly mobile and may readily leach to groundwater.

Volatilization is probably the most significant removal mechanism for xylenes in surface water (ATSDR, 1993). Biodegradation may occur in surface water, groundwater and landfill leachate, although quite slowly. Oxidative reactions are expected to be insignificant. Xylenes are expected to adsorb somewhat to suspended solids and sediment in water (HSDB, 2001).

Xylenes are not expected to participate significantly in food-chain pathways (ATSDR, 1993; HSDB, 2001); therefore, biotransfer factors are not provided.

Oral LD50 values for xylenes include 3.5 to 8 .6 g/kg in rats and 1 .6 to 5 .6 g/kg in mice (HSDB, 2001), suggesting that the acute toxicity is low, but that mice may be slightly more sensitive than rats to the acute effects of ingested xylenes. Prolonged oral exposure of animals to xylenes is associated with CNS signs and increased mortality without histopathological alterations in the internal organs (EPA, 2001). EPA (2001) presents a verified chronic oral RfD for total xylenes of 2E+0 mg/kg-day based on a NOAEL for hyperactivity and decreased body weight and increased mortality in male rats in chronic gavage studies with mixed xylenes. An uncertainty factor of 100 was used. Confidence in the chronic oral RfD is medium. EPA (1997) presents provisional RfDs for o-xylene and m-xylene of 2E+0 mg/kg-day based on the same study. The CNS is considered the target organ for prolonged oral exposure to the xylenes. The oral RfD of 2E+0 mg/kg-day is applied to total or mixed xylenes, and to each of the xylene isomers.

Occupational exposure to xylenes induces CNS effects and GI disturbances (ACGIH, 1991). Other effects attributed to occupational exposure to xylene (blood dyscrasias, and heart, liver and kidney damage) may arise from concurrent exposure to other chemicals. The data are not sufficient for derivation of an inhalation RfC. The CNS is the principal target organ for inhalation exposure to the xylenes.

Xylene is classified as a cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans) (EPA, 2001). There are no reported human cancer data, and gavage studies in rat and mice of both sexes did not result in significant increases in tumor incidence.

References for Xylenes, Total

American Conference of Governmental Industrial Hygienists (ACGIH), 1991, Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth Edition, Cincinnati, OH, pp. 1732-1740.

Agency for Toxic Substances and Disease Registry, (ATSDR), 1993, Toxicological Profile for Xylenes, Draft for Public Comment, U.S. Department of Health and Human Services, Atlanta, GA.

Hazardous Substance Data Bank (HSDB), 2001, National Library of Medicine, on line.

Jones, TD. and BA Owen, 1989, Health Risksfrom Mixtures of Radionuclides and Chemicals in Drinking Water, Oak Ridge National Laboratory, Oak Ridge, TN, ORNL-6533.

Ohio Environmental Protection Agency (OEPA), 1998, U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 1992, Dermal Exposure Assessment: Principles and Applications, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91 /011 B, January.

U.S. Environmental Protection Agency (EPA), 1997, Health Effects Assessment Summary Tables, FY1997 Update, Office of Solid Waste and Emergency Response, 9200.6-303 (97-1), EPA-540-R-97-036, NTIS No. PB97-921199.

U.S. Environmental Protection Agency (EPA), 2001, Integrated Risk Information System (IRIS), National Center for Environmental Assessment, Cincinnati, OH, on line.

APPENDIX D
ProUCL CALCULATIONS FOR EXPOSURE-POINT CONCENTRATIONS

User Selected Options	General UCL Statistics for Data Sets with Non-Detects
From File	G:\DATAMGMT\Projects\PlumBrook\Stats_2008\HH_Stats_Burn\SO\HH_Burn_SO_ProUCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

DNT24

General Statistics			
Number of Valid Data	7	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	2
		Percent Non-Detects	28.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	993	Minimum Detected	6.901
Maximum Detected	18750	Maximum Detected	9.839
Mean of Detected	7001	Mean of Detected	8.284
SD of Detected	7611	SD of Detected	1.242
Minimum Non-Detect	5000	Minimum Non-Detect	8.517
Maximum Non-Detect	50000	Maximum Non-Detect	10.82
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.842	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	8929	Mean	8.481
SD	9574	SD	1.259
95% DL/2 (t) UCL	15960	95% H-Stat (DL/2) UCL	680289
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	8.151
		SD in Log Scale	1.054
		Mean in Original Scale	5743
		SD in Original Scale	6590
		95% Percentile Bootstrap UCL	9909
		95% BCA Bootstrap UCL	10611

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.538	Data appear Normal at 5% Significance Level	
Theta Star	13018		
nu star	5.378		
A-D Test Statistic	0.333	Nonparametric Statistics	
5% A-D Critical Value	0.691	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.691	Mean	6148
5% K-S Critical Value	0.364	SD	6510
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	2977
		95% KM (t) UCL	11933
Assuming Gamma Distribution		95% KM (z) UCL	11045
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	11908
Minimum	993	95% KM (bootstrap t) UCL	33876
Maximum	18750	95% KM (BCA) UCL	11939
Mean	6715	95% KM (Percentile Bootstrap) UCL	11764
Median	4046	95% KM (Chebyshev) UCL	19125
SD	6335	97.5% KM (Chebyshev) UCL	24740
k star	0.848	99% KM (Chebyshev) UCL	35770
Theta star	7923		
Nu star	11.87	Potential UCLs to Use	
AppChi2	5.138	95% KM (t) UCL	11933
95% Gamma Approximate UCL	15505	95% KM (Percentile Bootstrap) UCL	11764
95% Adjusted Gamma UCL	20501		
Note: DL/2 is not a recommended method.			

DNT26

General Statistics			
Number of Valid Data	7	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	5
		Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	352	Minimum Detected	5.864
Maximum Detected	977	Maximum Detected	6.884
Mean of Detected	664.5	Mean of Detected	6.374
SD of Detected	441.9	SD of Detected	0.722
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	50000	Maximum Non-Detect	10.82
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	1	Shapiro Wilk Test Statistic	1
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7243	Mean	7.322
SD	10156	SD	2.268
95% DL/2 (t) UCL	14703	95% H-Stat (DL/2) UCL	183400000
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	

MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.359	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	508.3
5% K-S Critical Value	N/A	SD	270.6
Data not Gamma Distributed at 5% Significance Level		SE of Mean	191.4
		95% KM (t) UCL	880.1
Assuming Gamma Distribution		95% KM (z) UCL	823
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1004
Minimum	N/A	95% KM (bootstrap t) UCL	1.8E+308
Maximum	N/A	95% KM (BCA) UCL	977
Mean	N/A	95% KM (Percentile Bootstrap) UCL	977
Median	N/A	95% KM (Chebyshev) UCL	1342
SD	N/A	97.5% KM (Chebyshev) UCL	1703
k star	N/A	99% KM (Chebyshev) UCL	2412
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	880.1
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	977
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			

TNT

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	4750	Minimum of Log Data	8.466
Maximum	3120000	Maximum of Log Data	14.95
Mean	603477	Mean of log Data	11.28
Median	60300	SD of log Data	2.378
SD	1156489		
Coefficient of Variation	1.916		
Skewness	2.272		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.614	Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1452864	95% H-UCL	2.988E+09
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2462960
95% Adjusted-CLT UCL	1723484	97.5% Chebyshev (MVUE) UCL	3286430
95% Modified-t UCL	1515415	99% Chebyshev (MVUE) UCL	4903976

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.286	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2112613		
nu star	3.999		
Approximate Chi Square Value (.05)	0.721	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	1322462
Adjusted Chi Square Value	0.399	95% Jackknife UCL	1452864
		95% Standard Bootstrap UCL	1259441
Anderson-Darling Test Statistic	0.568	95% Bootstrap-t UCL	22928890
Anderson-Darling 5% Critical Value	0.779	95% Hall's Bootstrap UCL	14068239
Kolmogorov-Smirnov Test Statistic	0.331	95% Percentile Bootstrap UCL	1364227
Kolmogorov-Smirnov 5% Critical Value	0.334	95% BCA Bootstrap UCL	1608756
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2508803
		97.5% Chebyshev(Mean, Sd) UCL	3333239
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4952684
95% Approximate Gamma UCL	3345614		
95% Adjusted Gamma UCL	6047846		
Potential UCL to Use		Use 95% Adjusted Gamma UCL	6047846
Recommended UCL exceeds the maximum observation			

AL

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	6780	Minimum of Log Data	8.822
Maximum	9750	Maximum of Log Data	9.185
Mean	8783	Mean of log Data	9.075
Median	8940	SD of log Data	0.118
SD	952.3		
Coefficient of Variation	0.108		
Skewness	-1.872		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk Test Statistic	0.767
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9482	95% H-UCL	9637
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10497
95% Adjusted-CLT UCL	9103	97.5% Chebyshev (MVUE) UCL	11238
95% Modified-t UCL	9440	99% Chebyshev (MVUE) UCL	12692

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	50.77	Data appear Normal at 5% Significance Level	
Theta Star	173		
nu star	710.7		
Approximate Chi Square Value (.05)	649.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	9375
Adjusted Chi Square Value	632.1	95% Jackknife UCL	9482
		95% Standard Bootstrap UCL	9322
Anderson-Darling Test Statistic	0.78	95% Bootstrap-t UCL	9260
Anderson-Darling 5% Critical Value	0.708	95% Hall's Bootstrap UCL	9190
Kolmogorov-Smirnov Test Statistic	0.301	95% Percentile Bootstrap UCL	9257
Kolmogorov-Smirnov 5% Critical Value	0.311	95% BCA Bootstrap UCL	9201
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10352
		97.5% Chebyshev(Mean, Sd) UCL	11031
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12364
95% Approximate Gamma UCL	9605		
95% Adjusted Gamma UCL	9875		
Potential UCL to Use		Use 95% Student's-t UCL	9482

AS

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	4.91	Minimum of Log Data	1.591
Maximum	9.1	Maximum of Log Data	2.208
Mean	6.477	Mean of log Data	1.841
Median	5.88	SD of log Data	0.247
SD	1.677		
Coefficient of Variation	0.259		
Skewness	0.861		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.86	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.709	95% H-UCL	8.015
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.104
95% Adjusted-CLT UCL	7.74	97.5% Chebyshev (MVUE) UCL	10.24
95% Modified-t UCL	7.743	99% Chebyshev (MVUE) UCL	12.48
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	10.79	**Data appear Normal at 5% Significance Level**	
Theta Star	0.6		
nu star	151.1		
Approximate Chi Square Value (.05)	123.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	7.52
Adjusted Chi Square Value	116.2	95% Jackknife UCL	7.709
		95% Standard Bootstrap UCL	7.435
Anderson-Darling Test Statistic	0.468	95% Bootstrap-t UCL	9.154
Anderson-Darling 5% Critical Value	0.707	95% Hall's Bootstrap UCL	8.776
Kolmogorov-Smirnov Test Statistic	0.205	95% Percentile Bootstrap UCL	7.443
Kolmogorov-Smirnov 5% Critical Value	0.312	95% BCA Bootstrap UCL	7.619
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.241
		97.5% Chebyshev(Mean, Sd) UCL	10.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12.79
95% Approximate Gamma UCL	7.913		
95% Adjusted Gamma UCL	8.423		
Potential UCL to Use		Use 95% Student's-t UCL	7.709

BA

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	73.4	Minimum of Log Data	4.296
Maximum	314	Maximum of Log Data	5.749
Mean	173.6	Mean of log Data	5.024
Median	156	SD of log Data	0.564
SD	94.68		
Coefficient of Variation	0.545		
Skewness	0.677		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.878	Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	243.1	95% H-UCL	323.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	336.2
95% Adjusted-CLT UCL	242.2	97.5% Chebyshev (MVUE) UCL	406.5
95% Modified-t UCL	244.7	99% Chebyshev (MVUE) UCL	544.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.345	**Data appear Normal at 5% Significance Level**	
Theta Star	74.01		
nu star	32.83		
Approximate Chi Square Value (.05)	20.73	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	232.4
Adjusted Chi Square Value	17.89	95% Jackknife UCL	243.1
		95% Standard Bootstrap UCL	227.5
Anderson-Darling Test Statistic	0.359	95% Bootstrap-t UCL	298.1
Anderson-Darling 5% Critical Value	0.71	95% Hall's Bootstrap UCL	456.1
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL	232.3
Kolmogorov-Smirnov 5% Critical Value	0.313	95% BCA Bootstrap UCL	237.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	329.6
		97.5% Chebyshev(Mean, Sd) UCL	397.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	529.7
95% Approximate Gamma UCL	274.9		
95% Adjusted Gamma UCL	318.6		
Potential UCL to Use		Use 95% Student's-t UCL	243.1

CU

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	23.1	Minimum of Log Data	3.14
Maximum	99	Maximum of Log Data	4.595
Mean	58.7	Mean of log Data	3.952
Median	49.4	SD of log Data	0.546
SD	29.65		
Coefficient of Variation	0.505		
Skewness	0.39		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	80.47	95% H-UCL	106.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	112.4
95% Adjusted-CLT UCL	78.9	97.5% Chebyshev (MVUE) UCL	135.6
95% Modified-t UCL	80.75	99% Chebyshev (MVUE) UCL	181

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.555	Data appear Normal at 5% Significance Level	
Theta Star	22.97		
nu star	35.77		
Approximate Chi Square Value (.05)	23.09	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	77.13
Adjusted Chi Square Value	20.07	95% Jackknife UCL	80.47
		95% Standard Bootstrap UCL	75.44
Anderson-Darling Test Statistic	0.265	95% Bootstrap-t UCL	88.35
Anderson-Darling 5% Critical Value	0.71	95% Hall's Bootstrap UCL	84.34
Kolmogorov-Smirnov Test Statistic	0.178	95% Percentile Bootstrap UCL	75.46
Kolmogorov-Smirnov 5% Critical Value	0.313	95% BCA Bootstrap UCL	78.46
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	107.5
		97.5% Chebyshev(Mean, Sd) UCL	128.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	170.2
95% Approximate Gamma UCL	90.96		
95% Adjusted Gamma UCL	104.6		
Potential UCL to Use		Use 95% Student's-t UCL	80.47

FE

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	15000	Minimum of Log Data	9.616
Maximum	23170	Maximum of Log Data	10.05
Mean	17761	Mean of log Data	9.774
Median	16940	SD of log Data	0.154
SD	2883		
Coefficient of Variation	0.162		
Skewness	1.2		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.891	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	19879	95% H-UCL	20081
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	22267
95% Adjusted-CLT UCL	20082	97.5% Chebyshev (MVUE) UCL	24220
95% Modified-t UCL	19961	99% Chebyshev (MVUE) UCL	28055

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	27.31	Data appear Normal at 5% Significance Level	
Theta Star	650.3		
nu star	382.4		
Approximate Chi Square Value (.05)	338.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	19554
Adjusted Chi Square Value	325.4	95% Jackknife UCL	19879
		95% Standard Bootstrap UCL	19471
Anderson-Darling Test Statistic	0.346	95% Bootstrap-t UCL	21072
Anderson-Darling 5% Critical Value	0.708	95% Hall's Bootstrap UCL	21746
Kolmogorov-Smirnov Test Statistic	0.197	95% Percentile Bootstrap UCL	19540
Kolmogorov-Smirnov 5% Critical Value	0.311	95% BCA Bootstrap UCL	19906
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	22511
		97.5% Chebyshev(Mean, Sd) UCL	24566
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28603
95% Approximate Gamma UCL	20090		
95% Adjusted Gamma UCL	20872		
Potential UCL to Use		Use 95% Student's-t UCL	19879

MN

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	182.5	Minimum of Log Data	5.207
Maximum	319	Maximum of Log Data	5.765
Mean	265.9	Mean of log Data	5.568
Median	277	SD of log Data	0.193
SD	46.81		
Coefficient of Variation	0.176		
Skewness	-1.057		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.901	Shapiro Wilk Test Statistic	0.864
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	300.3	95% H-UCL	312
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	350.9
95% Adjusted-CLT UCL	287.5	97.5% Chebyshev (MVUE) UCL	387.6
95% Modified-t UCL	299.1	99% Chebyshev (MVUE) UCL	459.6

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	19.24	Data appear Normal at 5% Significance Level	
Theta Star	13.82		
nu star	269.3		
Approximate Chi Square Value (.05)	232.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	295
Adjusted Chi Square Value	221.9	95% Jackknife UCL	300.3
		95% Standard Bootstrap UCL	292.6
Anderson-Darling Test Statistic	0.516	95% Bootstrap-t UCL	292.4
Anderson-Darling 5% Critical Value	0.707	95% Hall's Bootstrap UCL	288.2
Kolmogorov-Smirnov Test Statistic	0.306	95% Percentile Bootstrap UCL	290.7
Kolmogorov-Smirnov 5% Critical Value	0.311	95% BCA Bootstrap UCL	286.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	343
		97.5% Chebyshev(Mean, Sd) UCL	376.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	442
95% Approximate Gamma UCL	308.3		
95% Adjusted Gamma UCL	322.8		
Potential UCL to Use		Use 95% Student's-t UCL	300.3

PB

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	155	Minimum of Log Data	5.043
Maximum	777.5	Maximum of Log Data	6.656
Mean	485.9	Mean of log Data	6.019
Median	585	SD of log Data	0.682
SD	254.5		
Coefficient of Variation	0.524		
Skewness	-0.403		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.891	Shapiro Wilk Test Statistic	0.824
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	672.8	95% H-UCL	1150
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1064
95% Adjusted-CLT UCL	628.5	97.5% Chebyshev (MVUE) UCL	1308
95% Modified-t UCL	670.4	99% Chebyshev (MVUE) UCL	1788

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.894	Data appear Normal at 5% Significance Level	
Theta Star	256.5		
nu star	26.52		
Approximate Chi Square Value (.05)	15.78	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	644.1
Adjusted Chi Square Value	13.34	95% Jackknife UCL	672.8
		95% Standard Bootstrap UCL	634.2
Anderson-Darling Test Statistic	0.565	95% Bootstrap-t UCL	655.9
Anderson-Darling 5% Critical Value	0.712	95% Hall's Bootstrap UCL	603.8
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL	627.9
Kolmogorov-Smirnov 5% Critical Value	0.314	95% BCA Bootstrap UCL	607.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	905.1
		97.5% Chebyshev(Mean, Sd) UCL	1087
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1443
95% Approximate Gamma UCL	816.6		
95% Adjusted Gamma UCL	965.7		
Potential UCL to Use		Use 95% Student's-t UCL	672.8

TL

General Statistics			
Number of Valid Data	7	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	3
		Percent Non-Detects	42.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.3	Minimum Detected	0.262
Maximum Detected	1.95	Maximum Detected	0.668
Mean of Detected	1.643	Mean of Detected	0.484
SD of Detected	0.29	SD of Detected	0.181
Minimum Non-Detect	1.19	Minimum Non-Detect	0.174
Maximum Non-Detect	1.26	Maximum Non-Detect	0.231
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.86%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.962
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.202	Mean	0.0682
SD	0.586	SD	0.535
95% DL/2 (t) UCL	1.633	95% H-Stat (DL/2) UCL	1.425
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.348	Mean in Log Scale	0.26
SD	0.419	SD in Log Scale	0.308
95% MLE (t) UCL	1.656	Mean in Original Scale	1.35
95% MLE (Tiku) UCL	1.703	SD in Original Scale	0.418
		95% Percentile Bootstrap UCL	1.603
		95% BCA Bootstrap UCL	1.59

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	10.58	Data appear Normal at 5% Significance Level	
Theta Star	0.155		
nu star	84.67		
A-D Test Statistic	0.253	Nonparametric Statistics	
5% A-D Critical Value	0.656	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.656	Mean	1.496
5% K-S Critical Value	0.394	SD	0.254
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.111
		95% KM (t) UCL	1.711
Assuming Gamma Distribution		95% KM (z) UCL	1.678
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.714
Minimum	1.3	95% KM (bootstrap t) UCL	1.632
Maximum	1.95	95% KM (BCA) UCL	1.864
Mean	1.599	95% KM (Percentile Bootstrap) UCL	1.843
Median	1.54	95% KM (Chebyshev) UCL	1.98
SD	0.212	97.5% KM (Chebyshev) UCL	2.189
k star	38.85	99% KM (Chebyshev) UCL	2.6
Theta star	0.0411		
Nu star	543.9	Potential UCLs to Use	
AppChi2	490.8	95% KM (t) UCL	1.711
95% Gamma Approximate UCL	1.771	95% KM (Percentile Bootstrap) UCL	1.843
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

V

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	18.4	Minimum of Log Data	2.912
Maximum	25.9	Maximum of Log Data	3.254
Mean	23.01	Mean of log Data	3.129
Median	23.8	SD of log Data	0.128
SD	2.808		
Coefficient of Variation	0.122		
Skewness	-0.851		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk Test Statistic	0.872
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	25.07	95% H-UCL	25.45
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	27.86
95% Adjusted-CLT UCL	24.39	97.5% Chebyshev (MVUE) UCL	29.96
95% Modified-t UCL	25.01	99% Chebyshev (MVUE) UCL	34.09

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	42.23	Data appear Normal at 5% Significance Level	
Theta Star	0.545		
nu star	591.3		
Approximate Chi Square Value (.05)	535.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	24.75
Adjusted Chi Square Value	519.8	95% Jackknife UCL	25.07
		95% Standard Bootstrap UCL	24.64
Anderson-Darling Test Statistic	0.49	95% Bootstrap-t UCL	24.6
Anderson-Darling 5% Critical Value	0.708	95% Hall's Bootstrap UCL	24.3
Kolmogorov-Smirnov Test Statistic	0.273	95% Percentile Bootstrap UCL	24.55
Kolmogorov-Smirnov 5% Critical Value	0.311	95% BCA Bootstrap UCL	24.45
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	27.63
		97.5% Chebyshev(Mean, Sd) UCL	29.64
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	33.57
95% Approximate Gamma UCL	25.39		
95% Adjusted Gamma UCL	26.17		
Potential UCL to Use		Use 95% Student's-t UCL	25.07

BZAP

General Statistics

Number of Valid Data	7	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	4
		Percent Non-Detects	57.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	61.3	Minimum Detected	4.116
Maximum Detected	108	Maximum Detected	4.682
Mean of Detected	77.33	Mean of Detected	4.312
SD of Detected	26.57	SD of Detected	0.321
Minimum Non-Detect	78.3	Minimum Non-Detect	4.361
Maximum Non-Detect	420	Maximum Non-Detect	6.04

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.772	Shapiro Wilk Test Statistic	0.78
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	126.6	Mean	4.653
SD	76.19	SD	0.692
95% DL/2 (t) UCL	182.6	95% H-Stat (DL/2) UCL	301.1
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	4.267
		SD in Log Scale	0.193
		Mean in Original Scale	72.61
		SD in Original Scale	16.16
		95% Percentile Bootstrap UCL	83.74
		95% BCA Bootstrap UCL	86.75
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.576	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	73.5
5% K-S Critical Value	N/A	SD	19.93
Data not Gamma Distributed at 5% Significance Level		SE of Mean	12.21
		95% KM (t) UCL	97.22
Assuming Gamma Distribution		95% KM (z) UCL	93.58
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	97.42
Minimum	N/A	95% KM (bootstrap t) UCL	486.8
Maximum	N/A	95% KM (BCA) UCL	108
Mean	N/A	95% KM (Percentile Bootstrap) UCL	108
Median	N/A	95% KM (Chebyshev) UCL	126.7
SD	N/A	97.5% KM (Chebyshev) UCL	149.7
k star	N/A	99% KM (Chebyshev) UCL	194.9
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	97.22
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL	108
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			

NAPH

General Statistics			
Number of Valid Data	7	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	3
		Percent Non-Detects	42.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	835	Minimum Detected	6.727
Maximum Detected	9930	Maximum Detected	9.203
Mean of Detected	4044	Mean of Detected	7.925
SD of Detected	4043	SD of Detected	1.024
Minimum Non-Detect	400	Minimum Non-Detect	5.991
Maximum Non-Detect	420	Maximum Non-Detect	6.04

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.86%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.84
5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level	
Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	2399
SD	3519
95% DL/2 (t) UCL	4983
Maximum Likelihood Estimate(MLE) Method	
Mean	900.4
SD	4863
95% MLE (t) UCL	4472
95% MLE (Tiku) UCL	5010

Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.991
5% Shapiro Wilk Critical Value	0.748
Data appear Lognormal at 5% Significance Level	
Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean	6.81
SD	1.568
95% H-Stat (DL/2) UCL	5224
Log ROS Method	
Mean in Log Scale	6.631
SD in Log Scale	1.769
Mean in Original Scale	2369
SD in Original Scale	3541
95% Percentile Bootstrap UCL	4728
95% BCA Bootstrap UCL	5362

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.532
Theta Star	7602
nu star	4.256
A-D Test Statistic	0.267
5% A-D Critical Value	0.663
K-S Test Statistic	0.663
5% K-S Critical Value	0.4
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	835
Maximum	9930
Mean	3203
Median	2082
SD	3045
k star	1.246
Theta star	2571
Nu star	17.44
AppChi2	8.989
95% Gamma Approximate UCL	6215
95% Adjusted Gamma UCL	N/A

Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	2669
SD	3087
SE of Mean	1347
95% KM (t) UCL	5286
95% KM (z) UCL	4884
95% KM (jackknife) UCL	5023
95% KM (bootstrap t) UCL	8218
95% KM (BCA) UCL	6227
95% KM (Percentile Bootstrap) UCL	5411
95% KM (Chebyshev) UCL	8540
97.5% KM (Chebyshev) UCL	11081
99% KM (Chebyshev) UCL	16072
Potential UCLs to Use	
95% KM (t) UCL	5286
95% KM (Percentile Bootstrap) UCL	5411

Note: DL/2 is not a recommended method.

PCB1260

General Statistics

Number of Valid Data	7	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	1
		Percent Non-Detects	14.29%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1950	Minimum Detected	7.576
Maximum Detected	11600	Maximum Detected	9.359
Mean of Detected	6788	Mean of Detected	8.661
SD of Detected	3611	SD of Detected	0.68
Minimum Non-Detect	1260	Minimum Non-Detect	7.139
Maximum Non-Detect	1260	Maximum Non-Detect	7.139

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Test Statistic	0.899
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5909	Mean	8.344
SD	4035	SD	1.042
95% DL/2 (t) UCL	8872	95% H-Stat (DL/2) UCL	14365
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	5699	Mean in Log Scale	8.427
SD	4109	SD in Log Scale	0.876
95% MLE (t) UCL	8717	Mean in Original Scale	5979
95% MLE (Tiku) UCL	8773	SD in Original Scale	3930
		95% Percentile Bootstrap UCL	8169
		95% BCA Bootstrap UCL	8352

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.729	Data appear Normal at 5% Significance Level	
Theta Star	3925		
nu star	20.75		
A-D Test Statistic	0.347	Nonparametric Statistics	
5% A-D Critical Value	0.701	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.701	Mean	6097
5% K-S Critical Value	0.334	SD	3490
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1445
		95% KM (t) UCL	8905
Assuming Gamma Distribution		95% KM (z) UCL	8474
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8873
Minimum	1179	95% KM (bootstrap t) UCL	8919
Maximum	11600	95% KM (BCA) UCL	8854
Mean	5987	95% KM (Percentile Bootstrap) UCL	8669
Median	6800	95% KM (Chebyshev) UCL	12395
SD	3919	97.5% KM (Chebyshev) UCL	15121
k star	1.265	99% KM (Chebyshev) UCL	20474
Theta star	4732		
Nu star	17.71	Potential UCLs to Use	
AppChi2	9.184	95% KM (t) UCL	8905
95% Gamma Approximate UCL	11547	95% KM (Percentile Bootstrap) UCL	8669
95% Adjusted Gamma UCL	14320		
Note: DL/2 is not a recommended method.			

General UCL Statistics for Data Sets with Non-Detects	
User Selected Options	
From File	G:\DATAMGMT\Projects\PlumBrook\Stats_2008\HH_Stats_NoBurn\SO\HH_NoBurn_SO_ProUCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

DNT24

General Statistics

Number of Valid Data	42	Number of Detected Data	23
Number of Distinct Detected Data	22	Number of Non-Detect Data	19
		Percent Non-Detects	45.24%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	240	Minimum Detected	5.481
Maximum Detected	200000	Maximum Detected	12.21
Mean of Detected	12527	Mean of Detected	7.405
SD of Detected	41830	SD of Detected	1.641
Minimum Non-Detect	110	Minimum Non-Detect	4.7
Maximum Non-Detect	250	Maximum Non-Detect	5.521

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	20
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	22
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	47.62%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.318	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.914	5% Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6892	Mean	5.967
SD	31277	SD	2.01
95% DL/2 (t) UCL	15014	95% H-Stat (DL/2) UCL	5608
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	5.515
		SD in Log Scale	2.52
		Mean in Original Scale	6877
		SD in Original Scale	31280
		95% Percentile Bootstrap UCL	16295
		95% BCA Bootstrap UCL	21685

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.319	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	39250		
nu star	14.68		
A-D Test Statistic	3.457	**Nonparametric Statistics**	
5% A-D Critical Value	0.841	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.841	Mean	6968
5% K-S Critical Value	0.196	SD	30886
Data not Gamma Distributed at 5% Significance Level		SE of Mean	4873
		95% KM (t) UCL	15169
Assuming Gamma Distribution		95% KM (z) UCL	14984
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	15065
Minimum	1E-09	95% KM (bootstrap t) UCL	147026
Maximum	200000	95% KM (BCA) UCL	16023
Mean	8984	95% KM (Percentile Bootstrap) UCL	16541
Median	865.9	95% KM (Chebyshev) UCL	28209
SD	31291	97.5% KM (Chebyshev) UCL	37399
k star	0.097	99% KM (Chebyshev) UCL	55453
Theta star	92573		
Nu star	8.152	**Potential UCLs to Use**	
AppChi2	2.823	97.5% KM (Chebyshev) UCL	37399
95% Gamma Approximate UCL	25940		
95% Adjusted Gamma UCL	26999		

Note: DL/2 is not a recommended method.

DNT26

General Statistics

Number of Valid Data	42	Number of Detected Data	14
Number of Distinct Detected Data	12	Number of Non-Detect Data	28
		Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	152	Minimum Detected	5.024
Maximum Detected	78000	Maximum Detected	11.26
Mean of Detected	6796	Mean of Detected	6.741
SD of Detected	20650	SD of Detected	1.675
Minimum Non-Detect	110	Minimum Non-Detect	4.7
Maximum Non-Detect	12000	Maximum Non-Detect	9.393

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	41
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	97.62%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.36	Shapiro Wilk Test Statistic	0.81
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2458	Mean	5.191
SD	12069	SD	1.635
95% DL/2 (t) UCL	5592	95% H-Stat (DL/2) UCL	1155
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.536
		SD in Log Scale	2.772
		Mean in Original Scale	2276
		SD in Original Scale	12069
		95% Percentile Bootstrap UCL	5922
		95% BCA Bootstrap UCL	8394

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.304	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	22345		
nu star	8.516		
A-D Test Statistic	2.449	**Nonparametric Statistics**	
5% A-D Critical Value	0.827	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.827	Mean	2376
5% K-S Critical Value	0.247	SD	11909
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1907
		95% KM (t) UCL	5586
Assuming Gamma Distribution		95% KM (z) UCL	5514
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5484
Minimum	152	95% KM (bootstrap t) UCL	90425
Maximum	78000	95% KM (BCA) UCL	6061
Mean	6876	95% KM (Percentile Bootstrap) UCL	6121
Median	6666	95% KM (Chebyshev) UCL	10690
SD	11631	97.5% KM (Chebyshev) UCL	14287
k star	0.803	99% KM (Chebyshev) UCL	21354
Theta star	8564		
Nu star	67.44	**Potential UCLs to Use**	
AppChi2	49.54	95% KM (Chebyshev) UCL	10690
95% Gamma Approximate UCL	9360		
95% Adjusted Gamma UCL	9464		

Note: DL/2 is not a recommended method.

NBZME2

General Statistics

Number of Valid Data	42	Number of Detected Data	6
Number of Distinct Detected Data	5	Number of Non-Detect Data	36
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	110	Minimum Detected	4.7
Maximum Detected	2000	Maximum Detected	7.601
Mean of Detected	475.8	Mean of Detected	5.454
SD of Detected	753	SD of Detected	1.141
Minimum Non-Detect	87	Minimum Non-Detect	4.466
Maximum Non-Detect	12000	Maximum Non-Detect	9.393

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	42
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.582	Shapiro Wilk Test Statistic	0.729
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	324.5	Mean	4.481
SD	1015	SD	1.126
95% DL/2 (t) UCL	588.1	95% H-Stat (DL/2) UCL	253.7
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.107
		SD in Log Scale	1.901
		Mean in Original Scale	76.4
		SD in Original Scale	310.7
		95% Percentile Bootstrap UCL	167.6
		95% BCA Bootstrap UCL	226.4
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.526	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	904		
nu star	6.317		
A-D Test Statistic	1.048	**Nonparametric Statistics**	
5% A-D Critical Value	0.719	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.719	Mean	165.3
5% K-S Critical Value	0.343	SD	296.5
Data not Gamma Distributed at 5% Significance Level		SE of Mean	51.38
		95% KM (t) UCL	251.8
Assuming Gamma Distribution		95% KM (z) UCL	249.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	238.7
Minimum	110	95% KM (bootstrap t) UCL	3219
Maximum	2000	95% KM (BCA) UCL	365
Mean	464.6	95% KM (Percentile Bootstrap) UCL	263.5
Median	459.6	95% KM (Chebyshev) UCL	389.3
SD	265.4	97.5% KM (Chebyshev) UCL	486.2
k star	4.601	99% KM (Chebyshev) UCL	676.5
Theta star	101		
Nu star	386.5	**Potential UCLs to Use**	
AppChi2	341.9	95% KM (BCA) UCL	365
95% Gamma Approximate UCL	525.2		
95% Adjusted Gamma UCL	527.5		

Note: DL/2 is not a recommended method.

TNT

General Statistics

Number of Valid Data	42	Number of Detected Data	31
Number of Distinct Detected Data	29	Number of Non-Detect Data	11
		Percent Non-Detects	26.19%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	140	Minimum Detected	4.942
Maximum Detected	2270000	Maximum Detected	14.64
Mean of Detected	88666	Mean of Detected	8.09
SD of Detected	406953	SD of Detected	2.219
Minimum Non-Detect	87	Minimum Non-Detect	4.466
Maximum Non-Detect	250	Maximum Non-Detect	5.521

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	28
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	33.33%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.229	Shapiro Wilk Test Statistic	0.941
5% Shapiro Wilk Critical Value	0.929	5% Shapiro Wilk Critical Value	0.929
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	65461	Mean	7.047
SD	350333	SD	2.604
95% DL/2 (t) UCL	156433	95% H-Stat (DL/2) UCL	126747
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	6.778
		SD in Log Scale	2.952
		Mean in Original Scale	65451
		SD in Original Scale	350335
		95% Percentile Bootstrap UCL	169861
		95% BCA Bootstrap UCL	237117

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.22	**Data appear Lognormal at 5% Significance Level**	
Theta Star	403299		
nu star	13.63		
A-D Test Statistic	4.294	**Nonparametric Statistics**	
5% A-D Critical Value	0.889	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.889	Mean	65481
5% K-S Critical Value	0.174	SD	346134
Data not Gamma Distributed at 5% Significance Level		SE of Mean	54292
		95% KM (t) UCL	156848
Assuming Gamma Distribution		95% KM (z) UCL	154784
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	156447
Minimum	1E-09	95% KM (bootstrap t) UCL	2221922
Maximum	2270000	95% KM (BCA) UCL	173453
Mean	65444	95% KM (Percentile Bootstrap) UCL	171320
Median	1050	95% KM (Chebyshev) UCL	302136
SD	350337	97.5% KM (Chebyshev) UCL	404537
k star	0.0894	99% KM (Chebyshev) UCL	605684
Theta star	731933		
Nu star	7.511	**Potential UCLs to Use**	
AppChi2	2.455	99% KM (Chebyshev) UCL	605684
95% Gamma Approximate UCL	200213		
95% Adjusted Gamma UCL	208874		

Note: DL/2 is not a recommended method.

AL

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	29

Raw Statistics		**Log-transformed Statistics**	
Minimum	8840	Minimum of Log Data	9.087
Maximum	14900	Maximum of Log Data	9.609
Mean	10749	Mean of log Data	9.275
Median	10550	SD of log Data	0.119
SD	1341		
Coefficient of Variation	0.125		
Skewness	1.198		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11151	95% H-UCL	11147
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11732
95% Adjusted-CLT UCL	11192	97.5% Chebyshev (MVUE) UCL	12159
95% Modified-t UCL	11159	99% Chebyshev (MVUE) UCL	12997

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	64.51	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	166.6		
nu star	4129		
Approximate Chi Square Value (.05)	3980	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	11139
Adjusted Chi Square Value	3973	95% Jackknife UCL	11151
		95% Standard Bootstrap UCL	11131
Anderson-Darling Test Statistic	0.555	95% Bootstrap-t UCL	11206
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	11237
Kolmogorov-Smirnov Test Statistic	0.129	95% Percentile Bootstrap UCL	11151
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	11166
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	11782
		97.5% Chebyshev(Mean, Sd) UCL	12229
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13108
95% Approximate Gamma UCL	11149		
95% Adjusted Gamma UCL	11171		
Potential UCL to Use		Use 95% Approximate Gamma UCL	11149

AS

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	29

Raw Statistics		**Log-transformed Statistics**	
Minimum	5.13	Minimum of Log Data	1.635
Maximum	11.12	Maximum of Log Data	2.409
Mean	7.445	Mean of log Data	1.994
Median	7.47	SD of log Data	0.17
SD	1.279		
Coefficient of Variation	0.172		
Skewness	0.559		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk Test Statistic	0.981
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.829	95% H-UCL	7.852
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.426
95% Adjusted-CLT UCL	7.841	97.5% Chebyshev (MVUE) UCL	8.851
95% Modified-t UCL	7.833	99% Chebyshev (MVUE) UCL	9.685

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	32.43	**Data appear Normal at 5% Significance Level**	
Theta Star	0.23		
nu star	2075		
Approximate Chi Square Value (.05)	1971	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	7.817
Adjusted Chi Square Value	1965	95% Jackknife UCL	7.829
		95% Standard Bootstrap UCL	7.812
Anderson-Darling Test Statistic	0.291	95% Bootstrap-t UCL	7.847
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	7.891
Kolmogorov-Smirnov Test Statistic	0.0822	95% Percentile Bootstrap UCL	7.815
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	7.83
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.431
		97.5% Chebyshev(Mean, Sd) UCL	8.858
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.695
95% Approximate Gamma UCL	7.842		
95% Adjusted Gamma UCL	7.863		
Potential UCL to Use		Use 95% Student's-t UCL	7.829

BA

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	31

Raw Statistics		**Log-transformed Statistics**	
Minimum	47.1	Minimum of Log Data	3.852
Maximum	212	Maximum of Log Data	5.357
Mean	104.2	Mean of log Data	4.582
Median	92.65	SD of log Data	0.357
SD	40.4		
Coefficient of Variation	0.388		
Skewness	1.192		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.886	Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	116.3	95% H-UCL	117.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	133.2
95% Adjusted-CLT UCL	117.6	97.5% Chebyshev (MVUE) UCL	145.9
95% Modified-t UCL	116.6	99% Chebyshev (MVUE) UCL	170.7

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.185	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	14.5		
nu star	459.8		
Approximate Chi Square Value (.05)	411.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	116
Adjusted Chi Square Value	408.7	95% Jackknife UCL	116.3
		95% Standard Bootstrap UCL	115.4
Anderson-Darling Test Statistic	0.673	95% Bootstrap-t UCL	118
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	118.5
Kolmogorov-Smirnov Test Statistic	0.144	95% Percentile Bootstrap UCL	116.8
Kolmogorov-Smirnov 5% Critical Value	0.156	95% BCA Bootstrap UCL	116.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	135.3
		97.5% Chebyshev(Mean, Sd) UCL	148.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	175.3
95% Approximate Gamma UCL	116.6		
95% Adjusted Gamma UCL	117.3		
Potential UCL to Use		Use 95% Approximate Gamma UCL	116.6

CD

General Statistics

Number of Valid Data	32	Number of Detected Data	28
Number of Distinct Detected Data	26	Number of Non-Detect Data	4
		Percent Non-Detects	12.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0771	Minimum Detected	-2.563
Maximum Detected	0.78	Maximum Detected	-0.248
Mean of Detected	0.448	Mean of Detected	-0.936
SD of Detected	0.203	SD of Detected	0.573
Minimum Non-Detect	0.26	Minimum Non-Detect	-1.347
Maximum Non-Detect	0.65	Maximum Non-Detect	-0.431

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	27
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	84.38%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Test Statistic	0.907
5% Shapiro Wilk Critical Value	0.924	5% Shapiro Wilk Critical Value	0.924
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.425	Mean	-0.99
SD	0.2	SD	0.572
95% DL/2 (t) UCL	0.486	95% H-Stat (DL/2) UCL	0.626
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.522	Mean in Log Scale	-0.975
SD	0.127	SD in Log Scale	0.552
95% MLE (t) UCL	0.56	Mean in Original Scale	0.428
95% MLE (Tiku) UCL	0.634	SD in Original Scale	0.197
		95% Percentile Bootstrap UCL	0.485
		95% BCA Bootstrap UCL	0.479

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.551	**Data appear Normal at 5% Significance Level**	
Theta Star	0.126		
nu star	198.9		
A-D Test Statistic	0.602	**Nonparametric Statistics**	
5% A-D Critical Value	0.75	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.75	Mean	0.432
5% K-S Critical Value	0.166	SD	0.2
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0373
		95% KM (t) UCL	0.495
Assuming Gamma Distribution		95% KM (z) UCL	0.493
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.495
Minimum	0.0771	95% KM (bootstrap t) UCL	0.494
Maximum	0.78	95% KM (BCA) UCL	0.489
Mean	0.441	95% KM (Percentile Bootstrap) UCL	0.493
Median	0.455	95% KM (Chebyshev) UCL	0.594
SD	0.194	97.5% KM (Chebyshev) UCL	0.665
k star	3.86	99% KM (Chebyshev) UCL	0.803
Theta star	0.114		
Nu star	247.1	**Potential UCLs to Use**	
AppChi2	211.7	95% KM (t) UCL	0.495
95% Gamma Approximate UCL	0.515	95% KM (Percentile Bootstrap) UCL	0.493
95% Adjusted Gamma UCL	0.519		

Note: DL/2 is not a recommended method.

CO

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	29

Raw Statistics		Log-transformed Statistics	
Minimum	4.02	Minimum of Log Data	1.391
Maximum	16.4	Maximum of Log Data	2.797
Mean	6.95	Mean of log Data	1.894
Median	6.5	SD of log Data	0.286
SD	2.421		
Coefficient of Variation	0.348		
Skewness	2.368		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.777	Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	7.675	95% H-UCL	7.59
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.465
95% Adjusted-CLT UCL	7.845	97.5% Chebyshev (MVUE) UCL	9.135
95% Modified-t UCL	7.705	99% Chebyshev (MVUE) UCL	10.45

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	10.36	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.671		
nu star	663		
Approximate Chi Square Value (.05)	604.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	7.653
Adjusted Chi Square Value	601.2	95% Jackknife UCL	7.675
		95% Standard Bootstrap UCL	7.65
Anderson-Darling Test Statistic	1.162	95% Bootstrap-t UCL	8.01
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	9.146
Kolmogorov-Smirnov Test Statistic	0.187	95% Percentile Bootstrap UCL	7.682
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	7.972
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.815
		97.5% Chebyshev(Mean, Sd) UCL	9.622
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	11.21
95% Approximate Gamma UCL	7.625		
95% Adjusted Gamma UCL	7.663		

Potential UCL to Use			
		Use 95% Student's-t UCL	7.675
		or 95% Modified-t UCL	7.705

CU

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	31

Raw Statistics		Log-transformed Statistics	
Minimum	13	Minimum of Log Data	2.565
Maximum	534	Maximum of Log Data	6.28
Mean	55.87	Mean of log Data	3.547
Median	25.35	SD of log Data	0.814
SD	93.49		
Coefficient of Variation	1.673		
Skewness	4.623		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.435	Shapiro Wilk Test Statistic	0.862
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	83.89	95% H-UCL	66.77
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	80.85
95% Adjusted-CLT UCL	97.49	97.5% Chebyshev (MVUE) UCL	95.2
95% Modified-t UCL	86.14	99% Chebyshev (MVUE) UCL	123.4

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.098	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	50.9		
nu star	70.26		
Approximate Chi Square Value (.05)	51.96	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	83.05
Adjusted Chi Square Value	51.12	95% Jackknife UCL	83.89
		95% Standard Bootstrap UCL	82.58
Anderson-Darling Test Statistic	2.817	95% Bootstrap-t UCL	135
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	177.8
Kolmogorov-Smirnov Test Statistic	0.246	95% Percentile Bootstrap UCL	87.28
Kolmogorov-Smirnov 5% Critical Value	0.159	95% BCA Bootstrap UCL	100.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	127.9
		97.5% Chebyshev(Mean, Sd) UCL	159.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	220.3
95% Approximate Gamma UCL	75.54		
95% Adjusted Gamma UCL	76.79		

Potential UCL to Use			
		Use 95% Chebyshev (Mean, Sd) UCL	127.9

FE

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	28

Raw Statistics		Log-transformed Statistics	
Minimum	11550	Minimum of Log Data	9.354
Maximum	29960	Maximum of Log Data	10.31
Mean	18522	Mean of log Data	9.804
Median	17735	SD of log Data	0.214
SD	4115		
Coefficient of Variation	0.222		
Skewness	1.009		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	19755	95% H-UCL	19814
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	21592
95% Adjusted-CLT UCL	19857	97.5% Chebyshev (MVUE) UCL	22924
95% Modified-t UCL	19777	99% Chebyshev (MVUE) UCL	25540

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	20.3	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	912.5		
nu star	1299		
Approximate Chi Square Value (.05)	1216	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	19719
Adjusted Chi Square Value	1212	95% Jackknife UCL	19755
		95% Standard Bootstrap UCL	19697
Anderson-Darling Test Statistic	0.621	95% Bootstrap-t UCL	19975
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	20055
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	19707
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	19768
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	21693
		97.5% Chebyshev(Mean, Sd) UCL	23065
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	25760
95% Approximate Gamma UCL	19781		
95% Adjusted Gamma UCL	19851		

Potential UCL to Use			
		Use 95% Approximate Gamma UCL	19781

MN

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	27

Raw Statistics		**Log-transformed Statistics**	
Minimum	147	Minimum of Log Data	4.99
Maximum	600	Maximum of Log Data	6.397
Mean	281.7	Mean of log Data	5.6
Median	249	SD of log Data	0.282
SD	89.38		
Coefficient of Variation	0.317		
Skewness	1.784		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.854	Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	308.5	95% H-UCL	307.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	342.9
95% Adjusted-CLT UCL	313	97.5% Chebyshev (MVUE) UCL	369.7
95% Modified-t UCL	309.3	99% Chebyshev (MVUE) UCL	422.3

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	11.24	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	25.06		
nu star	719.5		
Approximate Chi Square Value (.05)	658.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	307.7
Adjusted Chi Square Value	655.1	95% Jackknife UCL	308.5
		95% Standard Bootstrap UCL	306.5
Anderson-Darling Test Statistic	0.775	95% Bootstrap-t UCL	317.1
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	322.5
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL	306.3
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	315.3
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	350.6
		97.5% Chebyshev(Mean, Sd) UCL	380.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	438.9
95% Approximate Gamma UCL	307.9		
95% Adjusted Gamma UCL	309.4		
Potential UCL to Use		Use 95% Approximate Gamma UCL	307.9

NI

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	26

Raw Statistics		Log-transformed Statistics	
Minimum	11.6	Minimum of Log Data	2.451
Maximum	35.7	Maximum of Log Data	3.575
Mean	20.74	Mean of log Data	3
Median	19.65	SD of log Data	0.256
SD	5.452		
Coefficient of Variation	0.263		
Skewness	0.851		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Test Statistic	0.978
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	22.37	95% H-UCL	22.51
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24.87
95% Adjusted-CLT UCL	22.48	97.5% Chebyshev (MVUE) UCL	26.67
95% Modified-t UCL	22.4	99% Chebyshev (MVUE) UCL	30.19

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	14.32	Data appear Normal at 5% Significance Level	
Theta Star	1.448		
nu star	916.6		
Approximate Chi Square Value (.05)	847.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0416	95% CLT UCL	22.32
Adjusted Chi Square Value	843.8	95% Jackknife UCL	22.37
		95% Standard Bootstrap UCL	22.27
Anderson-Darling Test Statistic	0.377	95% Bootstrap-t UCL	22.63
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	22.62
Kolmogorov-Smirnov Test Statistic	0.125	95% Percentile Bootstrap UCL	22.27
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	22.51
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	24.94
		97.5% Chebyshev(Mean, Sd) UCL	26.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	30.33
95% Approximate Gamma UCL	22.43		
95% Adjusted Gamma UCL	22.53		

Potential UCL to Use			
		Use 95% Student's-t UCL	22.37

PB

General Statistics

Number of Valid Observations	42	Number of Distinct Observations	41

Raw Statistics		Log-transformed Statistics	
Minimum	21.1	Minimum of Log Data	3.049
Maximum	603	Maximum of Log Data	6.402
Mean	184.4	Mean of log Data	4.755
Median	135.5	SD of log Data	1.029
SD	169		
Coefficient of Variation	0.917		
Skewness	1.158		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.798	Shapiro Wilk Test Statistic	0.88
Shapiro Wilk Critical Value	0.942	Shapiro Wilk Critical Value	0.942
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	228.3	95% H-UCL	289.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	351.4
95% Adjusted-CLT UCL	232.3	97.5% Chebyshev (MVUE) UCL	419.6
95% Modified-t UCL	229.1	99% Chebyshev (MVUE) UCL	553.7

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.151	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	160.2		
nu star	96.68		
Approximate Chi Square Value (.05)	75	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0443	95% CLT UCL	227.3
Adjusted Chi Square Value	74.32	95% Jackknife UCL	228.3
		95% Standard Bootstrap UCL	227.1
Anderson-Darling Test Statistic	0.688	95% Bootstrap-t UCL	233.6
Anderson-Darling 5% Critical Value	0.773	95% Hall's Bootstrap UCL	232.5
Kolmogorov-Smirnov Test Statistic	0.121	95% Percentile Bootstrap UCL	228.7
Kolmogorov-Smirnov 5% Critical Value	0.14	95% BCA Bootstrap UCL	233.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	298.1
		97.5% Chebyshev(Mean, Sd) UCL	347.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	443.9
95% Approximate Gamma UCL	237.7		
95% Adjusted Gamma UCL	239.9		

Potential UCL to Use		Use 95% Approximate Gamma UCL	237.7

SE

General Statistics

Number of Valid Data	32	Number of Detected Data	13
Number of Distinct Detected Data	13	Number of Non-Detect Data	19
		Percent Non-Detects	59.38%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.546	Minimum Detected	-0.605
Maximum Detected	2.06	Maximum Detected	0.723
Mean of Detected	1.066	Mean of Detected	-0.0221
SD of Detected	0.479	SD of Detected	0.423
Minimum Non-Detect	0.202	Minimum Non-Detect	-1.599
Maximum Non-Detect	0.83	Maximum Non-Detect	-0.186

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	24
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	75.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk Test Statistic	0.952
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.641	Mean	-0.667
SD	0.47	SD	0.684
95% DL/2 (t) UCL	0.782	95% H-Stat (DL/2) UCL	0.683
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.27	Mean in Log Scale	-0.503
SD	0.828	SD in Log Scale	0.524
95% MLE (t) UCL	0.518	Mean in Original Scale	0.7
95% MLE (Tiku) UCL	0.768	SD in Original Scale	0.438
		95% Percentile Bootstrap UCL	0.826
		95% BCA Bootstrap UCL	0.846

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	4.668	**Data appear Normal at 5% Significance Level**	
Theta Star	0.228		
nu star	121.4		
A-D Test Statistic	0.363	**Nonparametric Statistics**	
5% A-D Critical Value	0.735	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.735	Mean	0.778
5% K-S Critical Value	0.237	SD	0.381
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0711
		95% KM (t) UCL	0.899
Assuming Gamma Distribution		95% KM (z) UCL	0.895
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.889
Minimum	0.546	95% KM (bootstrap t) UCL	0.931
Maximum	2.06	95% KM (BCA) UCL	0.951
Mean	1.06	95% KM (Percentile Bootstrap) UCL	0.916
Median	1.017	95% KM (Chebyshev) UCL	1.088
SD	0.321	97.5% KM (Chebyshev) UCL	1.222
k star	11.09	99% KM (Chebyshev) UCL	1.486
Theta star	0.0956		
Nu star	709.7	**Potential UCLs to Use**	
AppChi2	648.9	95% KM (t) UCL	0.899
95% Gamma Approximate UCL	1.159	95% KM (Percentile Bootstrap) UCL	0.916
95% Adjusted Gamma UCL	1.165		

Note: DL/2 is not a recommended method.

TL

General Statistics

Number of Valid Data	32	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	28
		Percent Non-Detects	87.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.2	Minimum Detected	0.182
Maximum Detected	1.44	Maximum Detected	0.365
Mean of Detected	1.333	Mean of Detected	0.285
SD of Detected	0.106	SD of Detected	0.0803
Minimum Non-Detect	0.31	Minimum Non-Detect	-1.171
Maximum Non-Detect	1.42	Maximum Non-Detect	0.351

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	31
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	96.88%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.503	Mean	-0.996
SD	0.393	SD	0.815
95% DL/2 (t) UCL	0.621	95% H-Stat (DL/2) UCL	0.574
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.0109
		SD in Log Scale	0.13
		Mean in Original Scale	1.02
		SD in Original Scale	0.143
		95% Percentile Bootstrap UCL	1.06
		95% BCA Bootstrap UCL	1.067

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	52.32	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0255		
nu star	418.6		
A-D Test Statistic	0.25	**Nonparametric Statistics**	
5% A-D Critical Value	0.657	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.657	Mean	1.217
5% K-S Critical Value	0.394	SD	0.055
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0114
		95% KM (t) UCL	1.236
Assuming Gamma Distribution		95% KM (z) UCL	1.236
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.28
Minimum	1.2	95% KM (bootstrap t) UCL	1.229
Maximum	1.44	95% KM (BCA) UCL	1.44
Mean	1.318	95% KM (Percentile Bootstrap) UCL	1.393
Median	1.314	95% KM (Chebyshev) UCL	1.267
SD	0.0356	97.5% KM (Chebyshev) UCL	1.288
k star	1286	99% KM (Chebyshev) UCL	1.33
Theta star	0.00102		
Nu star	82325	**Potential UCLs to Use**	
AppChi2	81658	95% KM (t) UCL	1.236
95% Gamma Approximate UCL	1.329	95% KM (Percentile Bootstrap) UCL	1.393
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

V

General Statistics

Number of Valid Observations	32	Number of Distinct Observations	28

Raw Statistics		Log-transformed Statistics	
Minimum	20.3	Minimum of Log Data	3.011
Maximum	31.3	Maximum of Log Data	3.444
Mean	25.06	Mean of log Data	3.214
Median	24.88	SD of log Data	0.12
SD	3.018		
Coefficient of Variation	0.12		
Skewness	0.321		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	25.97	95% H-UCL	26
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	27.38
95% Adjusted-CLT UCL	25.97	97.5% Chebyshev (MVUE) UCL	28.38
95% Modified-t UCL	25.97	99% Chebyshev (MVUE) UCL	30.35

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	65.33	**Data appear Normal at 5% Significance Level**	
Theta Star	0.384		
nu star	4181		
Approximate Chi Square Value (.05)	4032	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0416	95% CLT UCL	25.94
Adjusted Chi Square Value	4024	95% Jackknife UCL	25.97
		95% Standard Bootstrap UCL	25.91
Anderson-Darling Test Statistic	0.262	95% Bootstrap-t UCL	26.02
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	25.94
Kolmogorov-Smirnov Test Statistic	0.0837	95% Percentile Bootstrap UCL	25.9
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	25.94
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	27.39
		97.5% Chebyshev(Mean, Sd) UCL	28.39
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	30.37
95% Approximate Gamma UCL	25.99		
95% Adjusted Gamma UCL	26.04		

Potential UCL to Use			
		Use 95% Student's-t UCL	25.97

BZAP

General Statistics

Number of Valid Data	42	Number of Detected Data	21
Number of Distinct Detected Data	20	Number of Non-Detect Data	21
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.5	Minimum Detected	2.526
Maximum Detected	360	Maximum Detected	5.886
Mean of Detected	113.5	Mean of Detected	4.324
SD of Detected	97.04	SD of Detected	1.004
Minimum Non-Detect	24	Minimum Non-Detect	3.178
Maximum Non-Detect	430	Maximum Non-Detect	6.064

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	42
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.881	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	77.71	Mean	3.669
SD	90.97	SD	1.188
95% DL/2 (t) UCL	101.3	95% H-Stat (DL/2) UCL	95.28
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.681
		SD in Log Scale	1.026
		Mean in Original Scale	68.48
		SD in Original Scale	82
		95% Percentile Bootstrap UCL	90.24
		95% BCA Bootstrap UCL	93.29

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.205	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	94.15		
nu star	50.62		
A-D Test Statistic	0.195	**Nonparametric Statistics**	
5% A-D Critical Value	0.761	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.761	Mean	69.7
5% K-S Critical Value	0.193	SD	84.13
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	13.85
		95% KM (t) UCL	93.02
Assuming Gamma Distribution		95% KM (z) UCL	92.49
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	92.82
Minimum	12.5	95% KM (bootstrap t) UCL	100.4
Maximum	360	95% KM (BCA) UCL	95.09
Mean	115.8	95% KM (Percentile Bootstrap) UCL	92.38
Median	114.3	95% KM (Chebyshev) UCL	130.1
SD	69.46	97.5% KM (Chebyshev) UCL	156.2
k star	2.343	99% KM (Chebyshev) UCL	207.6
Theta star	49.42		
Nu star	196.8	**Potential UCLs to Use**	
AppChi2	165.4	95% KM (t) UCL	93.02
95% Gamma Approximate UCL	137.8		
95% Adjusted Gamma UCL	138.7		

Note: DL/2 is not a recommended method.

BZBF

General Statistics

Number of Valid Data	42	Number of Detected Data	21
Number of Distinct Detected Data	21	Number of Non-Detect Data	21
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.1	Minimum Detected	2.493
Maximum Detected	820	Maximum Detected	6.709
Mean of Detected	172.8	Mean of Detected	4.513
SD of Detected	204.1	SD of Detected	1.216
Minimum Non-Detect	24	Minimum Non-Detect	3.178
Maximum Non-Detect	430	Maximum Non-Detect	6.064

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	40
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	95.24%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.76	Shapiro Wilk Test Statistic	0.972
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	107.3	Mean	3.762
SD	164.6	SD	1.335
95% DL/2 (t) UCL	150.1	95% H-Stat (DL/2) UCL	131.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.667
		SD in Log Scale	1.282
		Mean in Original Scale	96.23
		SD in Original Scale	162.4
		95% Percentile Bootstrap UCL	142.5
		95% BCA Bootstrap UCL	147.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.815	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	212		
nu star	34.22		
A-D Test Statistic	0.345	**Nonparametric Statistics**	
5% A-D Critical Value	0.774	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.774	Mean	98.53
5% K-S Critical Value	0.196	SD	161.2
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	25.77
		95% KM (t) UCL	141.9
Assuming Gamma Distribution		95% KM (z) UCL	140.9
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	141.4
Minimum	12.1	95% KM (bootstrap t) UCL	167.9
Maximum	820	95% KM (BCA) UCL	146.3
Mean	177.4	95% KM (Percentile Bootstrap) UCL	143.8
Median	156.5	95% KM (Chebyshev) UCL	210.8
SD	154.8	97.5% KM (Chebyshev) UCL	259.4
k star	1.328	99% KM (Chebyshev) UCL	354.9
Theta star	133.6		
Nu star	111.5	**Potential UCLs to Use**	
AppChi2	88.15	95% KM (t) UCL	141.9
95% Gamma Approximate UCL	224.5		
95% Adjusted Gamma UCL	226.3		

Note: DL/2 is not a recommended method.

DBAHA

General Statistics

Number of Valid Data	42	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	37
		Percent Non-Detects	88.10%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	10.4	Minimum Detected	2.342
Maximum Detected	124	Maximum Detected	4.82
Mean of Detected	41.06	Mean of Detected	3.228
SD of Detected	48.35	SD of Detected	1.053
Minimum Non-Detect	3.33	Minimum Non-Detect	1.203
Maximum Non-Detect	430	Maximum Non-Detect	6.064

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	42
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.739	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	38.94	Mean	2.797
SD	64.9	SD	1.225
95% DL/2 (t) UCL	55.79	95% H-Stat (DL/2) UCL	56.48
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.509
		SD in Log Scale	1.012
		Mean in Original Scale	9.077
		SD in Original Scale	19.61
		95% Percentile Bootstrap UCL	14.75
		95% BCA Bootstrap UCL	18.13

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.6	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	68.48		
nu star	5.996		
A-D Test Statistic	0.539	Nonparametric Statistics	
5% A-D Critical Value	0.69	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.69	Mean	15.22
5% K-S Critical Value	0.364	SD	19.03
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	3.55
		95% KM (t) UCL	21.19
Assuming Gamma Distribution		95% KM (z) UCL	21.06
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	19.94
Minimum	1E-09	95% KM (bootstrap t) UCL	35.69
Maximum	124	95% KM (BCA) UCL	48.48
Mean	4.888	95% KM (Percentile Bootstrap) UCL	25.41
Median	1E-09	95% KM (Chebyshev) UCL	30.69
SD	20.23	97.5% KM (Chebyshev) UCL	37.39
k star	0.058	99% KM (Chebyshev) UCL	50.54
Theta star	84.29		
Nu star	4.871	Potential UCLs to Use	
AppChi2	1.093	95% KM (t) UCL	21.19
95% Gamma Approximate UCL	21.78		
95% Adjusted Gamma UCL	23.07		

Note: DL/2 is not a recommended method.

PCB1260

General Statistics

Number of Valid Data	42	Number of Detected Data	33
Number of Distinct Detected Data	29	Number of Non-Detect Data	9
		Percent Non-Detects	21.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	13	Minimum Detected	2.565
Maximum Detected	44400	Maximum Detected	10.7
Mean of Detected	2376	Mean of Detected	6.192
SD of Detected	7641	SD of Detected	1.85
Minimum Non-Detect	40	Minimum Non-Detect	3.689
Maximum Non-Detect	13300	Maximum Non-Detect	9.496
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	41
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	97.62%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.292	Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.931	5% Shapiro Wilk Critical Value	0.931
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2066	Mean	6.024
SD	6843	SD	1.807
95% DL/2 (t) UCL	3843	95% H-Stat (DL/2) UCL	7289
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	5.831
		SD in Log Scale	1.803
		Mean in Original Scale	1891
		SD in Original Scale	6816
		95% Percentile Bootstrap UCL	3907
		95% BCA Bootstrap UCL	5017

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.397	**Data appear Lognormal at 5% Significance Level**	
Theta Star	5991		
nu star	26.17		
A-D Test Statistic	1.452	**Nonparametric Statistics**	
5% A-D Critical Value	0.83	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.83	Mean	1912
5% K-S Critical Value	0.164	SD	6732
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1055
		95% KM (t) UCL	3687
Assuming Gamma Distribution		95% KM (z) UCL	3647
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3682
Minimum	1E-09	95% KM (bootstrap t) UCL	11258
Maximum	44400	95% KM (BCA) UCL	4103
Mean	1936	95% KM (Percentile Bootstrap) UCL	3919
Median	415	95% KM (Chebyshev) UCL	6512
SD	6813	97.5% KM (Chebyshev) UCL	8502
k star	0.14	99% KM (Chebyshev) UCL	12412
Theta star	13794		
Nu star	11.79	**Potential UCLs to Use**	
AppChi2	5.09	97.5% KM (Chebyshev) UCL	8502
95% Gamma Approximate UCL	4486		
95% Adjusted Gamma UCL	4628		

Note: DL/2 is not a recommended method.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	G:\DATAMGMT\Projects\PlumBrook\Stats_2008\HH_Stats_Burn\SX\HH_Burn_SX_ProUCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

DNT24

General Statistics

Number of Valid Data	19	Number of Detected Data	11
Number of Distinct Detected Data	11	Number of Non-Detect Data	8
		Percent Non-Detects	42.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	370	Minimum Detected	5.914
Maximum Detected	9700000	Maximum Detected	16.09
Mean of Detected	1584202	Mean of Detected	11.01
SD of Detected	3357853	SD of Detected	3.116
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	250	Maximum Non-Detect	5.521

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	11
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.11%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.546	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	917202	Mean	8.19
SD	2628629	SD	4.123
95% DL/2 (t) UCL	1962927	95% H-Stat (DL/2) UCL	1.128E+10
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	7.491
		SD in Log Scale	5.03
		Mean in Original Scale	917193
		SD in Original Scale	2628633
		95% Percentile Bootstrap UCL	1945221
		95% BCA Bootstrap UCL	2442187

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.222	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	7137455		
nu star	4.883		
A-D Test Statistic	0.869	**Nonparametric Statistics**	
5% A-D Critical Value	0.851	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.851	Mean	917325
5% K-S Critical Value	0.281	SD	2558476
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	615603
		95% KM (t) UCL	1984820
Assuming Gamma Distribution		95% KM (z) UCL	1929902
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1961552
Minimum	1E-09	95% KM (bootstrap t) UCL	16538085
Maximum	9700000	95% KM (BCA) UCL	1974356
Mean	965719	95% KM (Percentile Bootstrap) UCL	1948803
Median	11000	95% KM (Chebyshev) UCL	3600677
SD	2617294	97.5% KM (Chebyshev) UCL	4761766
k star	0.0918	99% KM (Chebyshev) UCL	7042500
Theta star	10518792		
Nu star	3.489	**Potential UCLs to Use**	
AppChi2	0.531	95% KM (BCA) UCL	1974356
95% Gamma Approximate UCL	6346921		
95% Adjusted Gamma UCL	7574561		

Note: DL/2 is not a recommended method.

DNT26

General Statistics

Number of Valid Data	19	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	14
		Percent Non-Detects	73.68%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	10800	Minimum Detected	9.287
Maximum Detected	1400000	Maximum Detected	14.15
Mean of Detected	386940	Mean of Detected	11.51
SD of Detected	588364	SD of Detected	2.083
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	12500	Maximum Non-Detect	9.433

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	78.95%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.746	Shapiro Wilk Test Statistic	0.931
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	102611	Mean	6.945
SD	327730	SD	3.308
95% DL/2 (t) UCL	232989	95% H-Stat (DL/2) UCL	25972205
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	5.575
		SD in Log Scale	4.267
		Mean in Original Scale	101960
		SD in Original Scale	327938
		95% Percentile Bootstrap UCL	243098
		95% BCA Bootstrap UCL	344690

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.323	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1199313		
nu star	3.226		
A-D Test Statistic	0.304	Nonparametric Statistics	
5% A-D Critical Value	0.715	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.715	Mean	109784
5% K-S Critical Value	0.373	SD	316721
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	81237
		95% KM (t) UCL	250655
Assuming Gamma Distribution		95% KM (z) UCL	243408
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	236411
Minimum	1E-09	95% KM (bootstrap t) UCL	1037678
Maximum	3872073	95% KM (BCA) UCL	454526
Mean	839356	95% KM (Percentile Bootstrap) UCL	324579
Median	592552	95% KM (Chebyshev) UCL	463889
SD	1033656	97.5% KM (Chebyshev) UCL	617111
k star	0.146	99% KM (Chebyshev) UCL	918085
Theta star	5742916		
Nu star	5.554	Potential UCLs to Use	
AppChi2	1.416	95% KM (t) UCL	250655
95% Gamma Approximate UCL	3291459		
95% Adjusted Gamma UCL	3749057		

Note: DL/2 is not a recommended method.

NBZME2

General Statistics

Number of Valid Data	19	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	16
		Percent Non-Detects	84.21%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	782	Minimum Detected	6.662
Maximum Detected	7040	Maximum Detected	8.859
Mean of Detected	4071	Mean of Detected	7.969
SD of Detected	3141	SD of Detected	1.157
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	12500	Maximum Non-Detect	9.433

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.992	Shapiro Wilk Test Statistic	0.902
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1760	Mean	5.852
SD	2653	SD	1.966
95% DL/2 (t) UCL	2815	95% H-Stat (DL/2) UCL	20502
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.966
		SD in Log Scale	2.312
		Mean in Original Scale	692.1
		SD in Original Scale	1833
		95% Percentile Bootstrap UCL	1424
		95% BCA Bootstrap UCL	1759

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.337	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1399
5% K-S Critical Value	N/A	SD	1697
Data not Gamma Distributed at 5% Significance Level		SE of Mean	519.7
		95% KM (t) UCL	2300
Assuming Gamma Distribution		95% KM (z) UCL	2253
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3700
Minimum	N/A	95% KM (bootstrap t) UCL	1762
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	3664
SD	N/A	97.5% KM (Chebyshev) UCL	4644
k star	N/A	99% KM (Chebyshev) UCL	6570
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	2300
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL	N/A
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

TNT

General Statistics

Number of Valid Data	19	Number of Detected Data	13
Number of Distinct Detected Data	13	Number of Non-Detect Data	6
		Percent Non-Detects	31.58%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	394	Minimum Detected	5.976
Maximum Detected	35400000	Maximum Detected	17.38
Mean of Detected	5761086	Mean of Detected	10.94
SD of Detected	12035278	SD of Detected	4.052
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	250	Maximum Non-Detect	5.521
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	31.58%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.553	Shapiro Wilk Test Statistic	0.911
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3941819	Mean	8.826
SD	10204644	SD	4.601
95% DL/2 (t) UCL	8001445	95% H-Stat (DL/2) UCL	1.577E+12
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	826589	Mean in Log Scale	7.752
SD	12733130	SD in Log Scale	5.966
95% MLE (t) UCL	5892101	Mean in Original Scale	3941799
95% MLE (Tiku) UCL	6152966	SD in Original Scale	10204652
		95% Percentile Bootstrap UCL	8015814
		95% BCA Bootstrap UCL	9082128

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.177	**Data appear Lognormal at 5% Significance Level**	
Theta Star	32483538		
nu star	4.611		
A-D Test Statistic	1.035	**Nonparametric Statistics**	
5% A-D Critical Value	0.881	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.881	Mean	3941920
5% K-S Critical Value	0.263	SD	9932431
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2371700
		95% KM (t) UCL	8054599
Assuming Gamma Distribution		95% KM (z) UCL	7843020
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8001522
Minimum	1E-09	95% KM (bootstrap t) UCL	19669385
Maximum	35400000	95% KM (BCA) UCL	7568262
Mean	3941796	95% KM (Percentile Bootstrap) UCL	7968146
Median	3600	95% KM (Chebyshev) UCL	14279922
SD	10204653	97.5% KM (Chebyshev) UCL	18753183
k star	0.0859	99% KM (Chebyshev) UCL	27540040
Theta star	45888746		
Nu star	3.264	**Potential UCLs to Use**	
AppChi2	0.455	99% KM (Chebyshev) UCL	27540040
95% Gamma Approximate UCL	28291102		
95% Adjusted Gamma UCL	33962811		

Note: DL/2 is not a recommended method.

AL

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		Log-transformed Statistics	
Minimum	4640	Minimum of Log Data	8.442
Maximum	17390	Maximum of Log Data	9.764
Mean	11959	Mean of log Data	9.343
Median	11800	SD of log Data	0.331
SD	3414		
Coefficient of Variation	0.285		
Skewness	-0.296		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.973	Shapiro Wilk Test Statistic	0.91
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	13317	95% H-UCL	13956
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16076
95% Adjusted-CLT UCL	13190	97.5% Chebyshev (MVUE) UCL	17829
95% Modified-t UCL	13308	99% Chebyshev (MVUE) UCL	21273

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.251	**Data appear Normal at 5% Significance Level**	
Theta Star	1293		
nu star	351.5		
Approximate Chi Square Value (.05)	309.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	13247
Adjusted Chi Square Value	305.6	95% Jackknife UCL	13317
		95% Standard Bootstrap UCL	13245
Anderson-Darling Test Statistic	0.372	95% Bootstrap-t UCL	13325
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	13152
Kolmogorov-Smirnov Test Statistic	0.139	95% Percentile Bootstrap UCL	13142
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	13146
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15372
		97.5% Chebyshev(Mean, Sd) UCL	16850
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	19751
95% Approximate Gamma UCL	13601		
95% Adjusted Gamma UCL	13756		

Potential UCL to Use			
		Use 95% Student's-t UCL	13317

AS

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		Log-transformed Statistics	
Minimum	4.7	Minimum of Log Data	1.548
Maximum	27.8	Maximum of Log Data	3.325
Mean	11.77	Mean of log Data	2.387
Median	10.2	SD of log Data	0.399
SD	5.242		
Coefficient of Variation	0.445		
Skewness	1.728		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.854	Shapiro Wilk Test Statistic	0.973
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	13.86	95% H-UCL	14.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16.51
95% Adjusted-CLT UCL	14.26	97.5% Chebyshev (MVUE) UCL	18.58
95% Modified-t UCL	13.94	99% Chebyshev (MVUE) UCL	22.64

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.507	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	2.138		
nu star	209.3		
Approximate Chi Square Value (.05)	176.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	13.75
Adjusted Chi Square Value	174.2	95% Jackknife UCL	13.86
		95% Standard Bootstrap UCL	13.71
Anderson-Darling Test Statistic	0.431	95% Bootstrap-t UCL	14.68
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	15.46
Kolmogorov-Smirnov Test Statistic	0.138	95% Percentile Bootstrap UCL	13.81
Kolmogorov-Smirnov 5% Critical Value	0.199	95% BCA Bootstrap UCL	14.36
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	17.01
		97.5% Chebyshev(Mean, Sd) UCL	19.28
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	23.74
95% Approximate Gamma UCL	13.93		
95% Adjusted Gamma UCL	14.14		
Potential UCL to Use		Use 95% Approximate Gamma UCL	13.93

BA

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		Log-transformed Statistics	
Minimum	55.1	Minimum of Log Data	4.009
Maximum	3965	Maximum of Log Data	8.285
Mean	437.6	Mean of log Data	4.967
Median	103	SD of log Data	1.163
SD	1015		
Coefficient of Variation	2.319		
Skewness	3.085		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.413	Shapiro Wilk Test Statistic	0.693
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	841.2	95% H-UCL	616.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	621.9
95% Adjusted-CLT UCL	996.5	97.5% Chebyshev (MVUE) UCL	775.3
95% Modified-t UCL	868.7	99% Chebyshev (MVUE) UCL	1077

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.507	Data do not follow a Discernable Distribution (0.05)	
Theta Star	863.6		
nu star	19.26		
Approximate Chi Square Value (.05)	10.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	820.5
Adjusted Chi Square Value	9.734	95% Jackknife UCL	841.2
		95% Standard Bootstrap UCL	809.5
Anderson-Darling Test Statistic	3.816	95% Bootstrap-t UCL	7397
Anderson-Darling 5% Critical Value	0.797	95% Hall's Bootstrap UCL	3829
Kolmogorov-Smirnov Test Statistic	0.391	95% Percentile Bootstrap UCL	845
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL	1007
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1452
		97.5% Chebyshev(Mean, Sd) UCL	1891
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2754
95% Approximate Gamma UCL	817.7		
95% Adjusted Gamma UCL	865.6		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	2754

CU

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		Log-transformed Statistics	
Minimum	9.815	Minimum of Log Data	2.284
Maximum	1580	Maximum of Log Data	7.365
Mean	146	Mean of log Data	3.847
Median	29	SD of log Data	1.295
SD	356.1		
Coefficient of Variation	2.439		
Skewness	4.026		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.398	Shapiro Wilk Test Statistic	0.865
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	287.7	95% H-UCL	275.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	252.1
95% Adjusted-CLT UCL	361	97.5% Chebyshev (MVUE) UCL	317.6
95% Modified-t UCL	300.3	99% Chebyshev (MVUE) UCL	446.2

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.499	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	292.8		
nu star	18.95		
Approximate Chi Square Value (.05)	10.08	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	280.4
Adjusted Chi Square Value	9.517	95% Jackknife UCL	287.7
		95% Standard Bootstrap UCL	277.2
Anderson-Darling Test Statistic	2.157	95% Bootstrap-t UCL	752.3
Anderson-Darling 5% Critical Value	0.798	95% Hall's Bootstrap UCL	739.2
Kolmogorov-Smirnov Test Statistic	0.318	95% Percentile Bootstrap UCL	303.7
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL	390.3
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	502.1
		97.5% Chebyshev(Mean, Sd) UCL	656.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	958.9
95% Approximate Gamma UCL	274.5		
95% Adjusted Gamma UCL	290.7		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	958.9

FE

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		Log-transformed Statistics	
Minimum	13130	Minimum of Log Data	9.483
Maximum	37300	Maximum of Log Data	10.53
Mean	26693	Mean of log Data	10.16
Median	25710	SD of log Data	0.267
SD	6639		
Coefficient of Variation	0.249		
Skewness	-0.0146		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	29334	95% H-UCL	30044
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	33948
95% Adjusted-CLT UCL	29193	97.5% Chebyshev (MVUE) UCL	37067
95% Modified-t UCL	29333	99% Chebyshev (MVUE) UCL	43193

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	13.39	Data appear Normal at 5% Significance Level	
Theta Star	1994		
nu star	508.8		
Approximate Chi Square Value (.05)	457.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	29198
Adjusted Chi Square Value	453.2	95% Jackknife UCL	29334
		95% Standard Bootstrap UCL	29191
Anderson-Darling Test Statistic	0.263	95% Bootstrap-t UCL	29241
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	29253
Kolmogorov-Smirnov Test Statistic	0.127	95% Percentile Bootstrap UCL	29094
Kolmogorov-Smirnov 5% Critical Value	0.198	95% BCA Bootstrap UCL	29182
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	33332
		97.5% Chebyshev(Mean, Sd) UCL	36204
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	41847
95% Approximate Gamma UCL	29687		
95% Adjusted Gamma UCL	29965		
Potential UCL to Use		Use 95% Student's-t UCL	29334

MN

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		**Log-transformed Statistics**	
Minimum	152	Minimum of Log Data	5.024
Maximum	1360	Maximum of Log Data	7.215
Mean	467.3	Mean of log Data	5.955
Median	382	SD of log Data	0.627
SD	319.9		
Coefficient of Variation	0.685		
Skewness	1.523		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.847	Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	594.5	95% H-UCL	643.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	769.6
95% Adjusted-CLT UCL	615.4	97.5% Chebyshev (MVUE) UCL	902
95% Modified-t UCL	598.8	99% Chebyshev (MVUE) UCL	1162

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.356	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	198.3		
nu star	89.52		
Approximate Chi Square Value (.05)	68.71	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	588
Adjusted Chi Square Value	67.11	95% Jackknife UCL	594.5
		95% Standard Bootstrap UCL	582.4
Anderson-Darling Test Statistic	0.355	95% Bootstrap-t UCL	635.3
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	659.2
Kolmogorov-Smirnov Test Statistic	0.124	95% Percentile Bootstrap UCL	587.3
Kolmogorov-Smirnov 5% Critical Value	0.2	95% BCA Bootstrap UCL	616.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	787.2
		97.5% Chebyshev(Mean, Sd) UCL	925.6

Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1197
95% Approximate Gamma UCL	608.8		
95% Adjusted Gamma UCL	623.3		
Potential UCL to Use		Use 95% Approximate Gamma UCL	608.8

PB

General Statistics			
Number of Valid Observations	19	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	8.94	Minimum of Log Data	2.191
Maximum	8220	Maximum of Log Data	9.014
Mean	756.8	Mean of log Data	4.134
Median	18.1	SD of log Data	2.196
SD	1992		
Coefficient of Variation	2.632		
Skewness	3.413		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.437	Shapiro Wilk Test Statistic	0.809
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1549	95% H-UCL	7519
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1831
95% Adjusted-CLT UCL	1891	97.5% Chebyshev (MVUE) UCL	2408
95% Modified-t UCL	1609	99% Chebyshev (MVUE) UCL	3541

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.27	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2798		
nu star	10.28		
Approximate Chi Square Value (.05)	4.116	Nonparametric Statistics	
Adjusted Level of Significance	0.0369	95% CLT UCL	1508
Adjusted Chi Square Value	3.781	95% Jackknife UCL	1549
		95% Standard Bootstrap UCL	1510
Anderson-Darling Test Statistic	2.346	95% Bootstrap-t UCL	6276
Anderson-Darling 5% Critical Value	0.852	95% Hall's Bootstrap UCL	4767
Kolmogorov-Smirnov Test Statistic	0.313	95% Percentile Bootstrap UCL	1586
Kolmogorov-Smirnov 5% Critical Value	0.216	95% BCA Bootstrap UCL	2046
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2749
		97.5% Chebyshev(Mean, Sd) UCL	3611
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5304
95% Approximate Gamma UCL	1890		
95% Adjusted Gamma UCL	2057		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	5304

SB

General Statistics

Number of Valid Data	19	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	13
		Percent Non-Detects	68.42%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.724	Minimum Detected	-0.323
Maximum Detected	5.55	Maximum Detected	1.714
Mean of Detected	2.314	Mean of Detected	0.643
SD of Detected	1.694	SD of Detected	0.678
Minimum Non-Detect	0.404	Minimum Non-Detect	-0.906
Maximum Non-Detect	7.6	Maximum Non-Detect	2.028
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.965	Mean	0.0318
SD	1.734	SD	1.34
95% DL/2 (t) UCL	2.655	95% H-Stat (DL/2) UCL	10.47
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.474
		SD in Log Scale	0.979
		Mean in Original Scale	1.028
		SD in Original Scale	1.285
		95% Percentile Bootstrap UCL	1.553
		95% BCA Bootstrap UCL	1.736

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.466	**Data appear Normal at 5% Significance Level**	
Theta Star	1.578		
nu star	17.59		
A-D Test Statistic	0.297	**Nonparametric Statistics**	
5% A-D Critical Value	0.702	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.702	Mean	1.458
5% K-S Critical Value	0.335	SD	1.316
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.4
		95% KM (t) UCL	2.151
Assuming Gamma Distribution		95% KM (z) UCL	2.116
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.07
Minimum	0.724	95% KM (bootstrap t) UCL	2.588
Maximum	5.796	95% KM (BCA) UCL	2.754
Mean	2.981	95% KM (Percentile Bootstrap) UCL	2.449
Median	2.343	95% KM (Chebyshev) UCL	3.201
SD	1.487	97.5% KM (Chebyshev) UCL	3.955
k star	3.326	99% KM (Chebyshev) UCL	5.437
Theta star	0.896		
Nu star	126.4	**Potential UCLs to Use**	
AppChi2	101.4	95% KM (t) UCL	2.151
95% Gamma Approximate UCL	3.715	95% KM (Percentile Bootstrap) UCL	2.449
95% Adjusted Gamma UCL	3.788		

Note: DL/2 is not a recommended method.

TL

General Statistics

Number of Valid Data	19	Number of Detected Data	13
Number of Distinct Detected Data	13	Number of Non-Detect Data	6
		Percent Non-Detects	31.58%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.63	Minimum Detected	0.489
Maximum Detected	3.32	Maximum Detected	1.2
Mean of Detected	2.331	Mean of Detected	0.822
SD of Detected	0.551	SD of Detected	0.227
Minimum Non-Detect	1.18	Minimum Non-Detect	0.166
Maximum Non-Detect	1.21	Maximum Non-Detect	0.191

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	31.58%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.907	Shapiro Wilk Test Statistic	0.942
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.785	Mean	0.402
SD	0.94	SD	0.662
95% DL/2 (t) UCL	2.159	95% H-Stat (DL/2) UCL	2.059
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.797	Mean in Log Scale	0.644
SD	0.937	SD in Log Scale	0.331
95% MLE (t) UCL	2.17	Mean in Original Scale	2.006
95% MLE (Tiku) UCL	2.203	SD in Original Scale	0.67
		95% Percentile Bootstrap UCL	2.254
		95% BCA Bootstrap UCL	2.276

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	15.96	**Data appear Normal at 5% Significance Level**	
Theta Star	0.146		
nu star	415		
A-D Test Statistic	0.389	**Nonparametric Statistics**	
5% A-D Critical Value	0.733	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.733	Mean	2.109
5% K-S Critical Value	0.236	SD	0.546
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.13
		95% KM (t) UCL	2.335
Assuming Gamma Distribution		95% KM (z) UCL	2.324
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.315
Minimum	1.426	95% KM (bootstrap t) UCL	2.38
Maximum	3.32	95% KM (BCA) UCL	2.398
Mean	2.191	95% KM (Percentile Bootstrap) UCL	2.355
Median	2.036	95% KM (Chebyshev) UCL	2.677
SD	0.516	97.5% KM (Chebyshev) UCL	2.923
k star	17.58	99% KM (Chebyshev) UCL	3.406
Theta star	0.125		
Nu star	668	**Potential UCLs to Use**	
AppChi2	609.1	95% KM (t) UCL	2.335
95% Gamma Approximate UCL	2.403	95% KM (Percentile Bootstrap) UCL	2.355
95% Adjusted Gamma UCL	2.423		

Note: DL/2 is not a recommended method.

V

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics		**Log-transformed Statistics**	
Minimum	10.5	Minimum of Log Data	2.351
Maximum	40.8	Maximum of Log Data	3.709
Mean	27.91	Mean of log Data	3.287
Median	29.1	SD of log Data	0.316
SD	7.47		
Coefficient of Variation	0.268		
Skewness	-0.392		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Test Statistic	0.888
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	30.88	95% H-UCL	32.31
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37.06
95% Adjusted-CLT UCL	30.56	97.5% Chebyshev (MVUE) UCL	40.96
95% Modified-t UCL	30.85	99% Chebyshev (MVUE) UCL	48.61

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	10.3	**Data appear Normal at 5% Significance Level**	
Theta Star	2.708		
nu star	391.6		
Approximate Chi Square Value (.05)	346.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0369	95% CLT UCL	30.73
Adjusted Chi Square Value	343	95% Jackknife UCL	30.88
		95% Standard Bootstrap UCL	30.62
Anderson-Darling Test Statistic	0.481	95% Bootstrap-t UCL	30.58
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	30.77
Kolmogorov-Smirnov Test Statistic	0.179	95% Percentile Bootstrap UCL	30.59
Kolmogorov-Smirnov 5% Critical Value	0.198	95% BCA Bootstrap UCL	30.45
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	35.38
		97.5% Chebyshev(Mean, Sd) UCL	38.61
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	44.96
95% Approximate Gamma UCL	31.52		
95% Adjusted Gamma UCL	31.86		
Potential UCL to Use		Use 95% Student's-t UCL	30.88

BZAP

General Statistics

Number of Valid Data	19	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	14
		Percent Non-Detects	73.68%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	12.4	Minimum Detected	2.518
Maximum Detected	108	Maximum Detected	4.682
Mean of Detected	38.12	Mean of Detected	3.324
SD of Detected	39.48	SD of Detected	0.817
Minimum Non-Detect	9.65	Minimum Non-Detect	2.267
Maximum Non-Detect	420	Maximum Non-Detect	6.04

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.692	Shapiro Wilk Test Statistic	0.879
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	98.8	Mean	3.795
SD	92.52	SD	1.522
95% DL/2 (t) UCL	135.6	95% H-Stat (DL/2) UCL	890.3
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.389
		SD in Log Scale	0.835
		Mean in Original Scale	16.64
		SD in Original Scale	23.19
		95% Percentile Bootstrap UCL	26.58
		95% BCA Bootstrap UCL	31.81

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.824	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	46.26		
nu star	8.241		
A-D Test Statistic	0.599	**Nonparametric Statistics**	
5% A-D Critical Value	0.686	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.686	Mean	24.84
5% K-S Critical Value	0.361	SD	26.87
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	9.105
		95% KM (t) UCL	40.63
Assuming Gamma Distribution		95% KM (z) UCL	39.82
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	38.57
Minimum	12.4	95% KM (bootstrap t) UCL	75.03
Maximum	145	95% KM (BCA) UCL	52.78
Mean	63.17	95% KM (Percentile Bootstrap) UCL	42.46
Median	47.86	95% KM (Chebyshev) UCL	64.53
SD	44.15	97.5% KM (Chebyshev) UCL	81.7
k star	1.657	99% KM (Chebyshev) UCL	115.4
Theta star	38.13		
Nu star	62.95	**Potential UCLs to Use**	
AppChi2	45.7	95% KM (t) UCL	40.63
95% Gamma Approximate UCL	87.01		
95% Adjusted Gamma UCL	89.53		

Note: DL/2 is not a recommended method.

DBAHA

General Statistics

Number of Valid Data	19	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	16
		Percent Non-Detects	84.21%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	16.1	Minimum Detected	2.779
Maximum Detected	302	Maximum Detected	5.71
Mean of Detected	119.2	Mean of Detected	4.056
SD of Detected	158.7	SD of Detected	1.502
Minimum Non-Detect	8.09	Minimum Non-Detect	2.091
Maximum Non-Detect	420	Maximum Non-Detect	6.04

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.811	Shapiro Wilk Test Statistic	0.953
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	104.7	Mean	3.652
SD	103	SD	1.755
95% DL/2 (t) UCL	145.7	95% H-Stat (DL/2) UCL	1122
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.813
		SD in Log Scale	1.715
		Mean in Original Scale	20.39
		SD in Original Scale	68.82
		95% Percentile Bootstrap UCL	50.2
		95% BCA Bootstrap UCL	70.2

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	**Data appear Normal at 5% Significance Level**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.374	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	44.46
5% K-S Critical Value	N/A	SD	81.74
Data not Gamma Distributed at 5% Significance Level		SE of Mean	30.2
		95% KM (t) UCL	96.83
Assuming Gamma Distribution		95% KM (z) UCL	94.14
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	84.58
Minimum	N/A	95% KM (bootstrap t) UCL	319.7
Maximum	N/A	95% KM (BCA) UCL	302
Mean	N/A	95% KM (Percentile Bootstrap) UCL	302
Median	N/A	95% KM (Chebyshev) UCL	176.1
SD	N/A	97.5% KM (Chebyshev) UCL	233.1
k star	N/A	99% KM (Chebyshev) UCL	344.9
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	96.83
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL	302
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

NAPH

General Statistics

Number of Valid Data	19	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	9
		Percent Non-Detects	47.37%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	37.9	Minimum Detected	3.635
Maximum Detected	51300	Maximum Detected	10.85
Mean of Detected	9508	Mean of Detected	6.819
SD of Detected	16443	SD of Detected	2.802
Minimum Non-Detect	26	Minimum Non-Detect	3.258
Maximum Non-Detect	420	Maximum Non-Detect	6.04

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	73.68%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.664	Shapiro Wilk Test Statistic	0.875
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5070	Mean	5.678
SD	12581	SD	2.503
95% DL/2 (t) UCL	10075	95% H-Stat (DL/2) UCL	251477
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	4.573
		SD in Log Scale	3.345
		Mean in Original Scale	5015
		SD in Original Scale	12604
		95% Percentile Bootstrap UCL	10255
		95% BCA Bootstrap UCL	12688

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.273	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	34775		
nu star	5.468		
A-D Test Statistic	0.582	**Nonparametric Statistics**	
5% A-D Critical Value	0.816	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.816	Mean	5033
5% K-S Critical Value	0.288	SD	12261
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	2965
		95% KM (t) UCL	10174
Assuming Gamma Distribution		95% KM (z) UCL	9910
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	10041
Minimum	37.9	95% KM (bootstrap t) UCL	18521
Maximum	51300	95% KM (BCA) UCL	10482
Mean	9517	95% KM (Percentile Bootstrap) UCL	10311
Median	9526	95% KM (Chebyshev) UCL	17957
SD	11627	97.5% KM (Chebyshev) UCL	23549
k star	0.467	99% KM (Chebyshev) UCL	34534
Theta star	20359		
Nu star	17.76	**Potential UCLs to Use**	
AppChi2	9.22	95% KM (BCA) UCL	10482
95% Gamma Approximate UCL	18336		
95% Adjusted Gamma UCL	19466		

Note: DL/2 is not a recommended method.

PCB1254

General Statistics

Number of Valid Data	19	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	17
		Percent Non-Detects	89.47%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1660	Minimum Detected	7.415
Maximum Detected	3670	Maximum Detected	8.208
Mean of Detected	2665	Mean of Detected	7.811
SD of Detected	1421	SD of Detected	0.561
Minimum Non-Detect	40	Minimum Non-Detect	3.689
Maximum Non-Detect	14200	Maximum Non-Detect	9.561

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	1	Shapiro Wilk Test Statistic	1
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	845.2	Mean	5.386
SD	1743	SD	1.682
95% DL/2 (t) UCL	1539	95% H-Stat (DL/2) UCL	3874
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.359	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1772
5% K-S Critical Value	N/A	SD	460.4
Data not Gamma Distributed at 5% Significance Level		SE of Mean	153.5
		95% KM (t) UCL	2038
Assuming Gamma Distribution		95% KM (z) UCL	2024
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3105
Minimum	N/A	95% KM (bootstrap t) UCL	1780
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	2441
SD	N/A	97.5% KM (Chebyshev) UCL	2730
k star	N/A	99% KM (Chebyshev) UCL	3299
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	2038
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			

PCB1260

General Statistics

Number of Valid Data	19	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	12
		Percent Non-Detects	63.16%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	53	Minimum Detected	3.97
Maximum Detected	4010	Maximum Detected	8.297
Mean of Detected	1378	Mean of Detected	6.421
SD of Detected	1380	SD of Detected	1.722
Minimum Non-Detect	39	Minimum Non-Detect	3.664
Maximum Non-Detect	8620	Maximum Non-Detect	9.062

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.848
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	788.8	Mean	5.3
SD	1325	SD	1.731
95% DL/2 (t) UCL	1316	95% H-Stat (DL/2) UCL	4498
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	3.981
		SD in Log Scale	2.246
		Mean in Original Scale	518.5
		SD in Original Scale	1044
		95% Percentile Bootstrap UCL	941.2
		95% BCA Bootstrap UCL	1055

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.519	**Data appear Normal at 5% Significance Level**	
Theta Star	2652		
nu star	7.273		
A-D Test Statistic	0.384	**Nonparametric Statistics**	
5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.737	Mean	568.8
5% K-S Critical Value	0.323	SD	1025
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	261
		95% KM (t) UCL	1021
Assuming Gamma Distribution		95% KM (z) UCL	998.2
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	998
Minimum	53	95% KM (bootstrap t) UCL	1237
Maximum	4010	95% KM (BCA) UCL	1480
Mean	1358	95% KM (Percentile Bootstrap) UCL	1256
Median	1361	95% KM (Chebyshev) UCL	1707
SD	801.1	97.5% KM (Chebyshev) UCL	2199
k star	1.567	99% KM (Chebyshev) UCL	3166
Theta star	866.5		
Nu star	59.56	**Potential UCLs to Use**	
AppChi2	42.81	95% KM (t) UCL	1021
95% Gamma Approximate UCL	1889	95% KM (Percentile Bootstrap) UCL	1256
95% Adjusted Gamma UCL	1946		

Note: DL/2 is not a recommended method.

User Selected Options	General UCL Statistics for Data Sets with Non-Detects
From File	G:\DATAMGMT\Projects\PlumBrook\Stats_2008\HH_Stats_NoBurn\SX\HH_NoBurn_SX_ProUCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

DNT24

General Statistics			
Number of Valid Data	26	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	22
		Percent Non-Detects	84.62%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	417	Minimum Detected	6.033
Maximum Detected	754.5	Maximum Detected	6.626
Mean of Detected	579.1	Mean of Detected	6.336
SD of Detected	148.3	SD of Detected	0.26
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	250	Maximum Non-Detect	5.521
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	84.62%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.98	Shapiro Wilk Test Statistic	0.982
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	166	Mean	4.74
SD	189.1	SD	0.771
95% DL/2 (t) UCL	229.4	95% H-Stat (DL/2) UCL	205.2
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	5.124
		SD in Log Scale	0.744
		Mean in Original Scale	220.5
		SD in Original Scale	180.2
		95% Percentile Bootstrap UCL	276.6
		95% BCA Bootstrap UCL	294.5

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	5.184	Data appear Normal at 5% Significance Level	
Theta Star	111.7		
nu star	41.47		
A-D Test Statistic	0.223	Nonparametric Statistics	
5% A-D Critical Value	0.657	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.657	Mean	441.9
5% K-S Critical Value	0.394	SD	77.2
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	17.48
		95% KM (t) UCL	471.8
Assuming Gamma Distribution		95% KM (z) UCL	470.7
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	499.6
Minimum	393.3	95% KM (bootstrap t) UCL	464.8
Maximum	1120	95% KM (BCA) UCL	N/A
Mean	801.8	95% KM (Percentile Bootstrap) UCL	652.3
Median	825.4	95% KM (Chebyshev) UCL	518.1
SD	228.7	97.5% KM (Chebyshev) UCL	551.1
k star	9.933	99% KM (Chebyshev) UCL	615.9
Theta star	80.72		
Nu star	516.5	Potential UCLs to Use	
AppChi2	464.8	95% KM (t) UCL	471.8
95% Gamma Approximate UCL	891	95% KM (Percentile Bootstrap) UCL	652.3
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			

TNT

General Statistics			
Number of Valid Data	26	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	21
		Percent Non-Detects	80.77%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	229	Minimum Detected	5.434
Maximum Detected	816.5	Maximum Detected	6.705
Mean of Detected	491.9	Mean of Detected	6.069
SD of Detected	275.6	SD of Detected	0.569
Minimum Non-Detect	125	Minimum Non-Detect	4.828
Maximum Non-Detect	250	Maximum Non-Detect	5.521
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	84.62%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk Test Statistic	0.869
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	166.7	Mean	4.747
SD	197.8	SD	0.764
95% DL/2 (t) UCL	233	95% H-Stat (DL/2) UCL	197.6
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	619.3	Mean in Log Scale	4.136
SD	233.1	SD in Log Scale	1.298
95% MLE (t) UCL	697.4	Mean in Original Scale	140.6
95% MLE (Tiku) UCL	813.5	SD in Original Scale	210.8
		95% Percentile Bootstrap UCL	214.6
		95% BCA Bootstrap UCL	233.5

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.743	Data appear Normal at 5% Significance Level	
Theta Star	282.1		
nu star	17.43		
A-D Test Statistic	0.511	Nonparametric Statistics	
5% A-D Critical Value	0.681	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.681	Mean	279.6
5% K-S Critical Value	0.358	SD	149.7
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	32.83
		95% KM (t) UCL	335.6
Assuming Gamma Distribution		95% KM (z) UCL	333.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	340.6
Minimum	148.5	95% KM (bootstrap t) UCL	431.1
Maximum	1576	95% KM (BCA) UCL	763
Mean	857.2	95% KM (Percentile Bootstrap) UCL	413.3
Median	840.6	95% KM (Chebyshev) UCL	422.7
SD	440.9	97.5% KM (Chebyshev) UCL	484.6
k star	2.691	99% KM (Chebyshev) UCL	606.2
Theta star	318.6		
Nu star	139.9	Potential UCLs to Use	
AppChi2	113.6	95% KM (t) UCL	335.6
95% Gamma Approximate UCL	1056	95% KM (Percentile Bootstrap) UCL	413.3
95% Adjusted Gamma UCL	1071		
Note: DL/2 is not a recommended method.			

AL

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	25

Raw Statistics		Log-transformed Statistics	
Minimum	6225	Minimum of Log Data	8.736
Maximum	233600	Maximum of Log Data	12.36
Mean	20972	Mean of log Data	9.524
Median	12395	SD of log Data	0.616
SD	43431		
Coefficient of Variation	2.071		
Skewness	5.075		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.246	Shapiro Wilk Test Statistic	0.512
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	35521	95% H-UCL	21314
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	25573
95% Adjusted-CLT UCL	44040	97.5% Chebyshev (MVUE) UCL	29542
95% Modified-t UCL	36934	99% Chebyshev (MVUE) UCL	37336
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.187	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	17674		
nu star	61.7		
Approximate Chi Square Value (.05)	44.64	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	34982
Adjusted Chi Square Value	43.68	95% Jackknife UCL	35521
		95% Standard Bootstrap UCL	34208
Anderson-Darling Test Statistic	6.446	95% Bootstrap-t UCL	211318
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	139978
Kolmogorov-Smirnov Test Statistic	0.449	95% Percentile Bootstrap UCL	38063
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	46778
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	58099
		97.5% Chebyshev(Mean, Sd) UCL	74164
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	105720
95% Approximate Gamma UCL	28991		
95% Adjusted Gamma UCL	29627		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	58099

AS

General Statistics

Number of Valid Observations	26	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	4.1	Minimum of Log Data	1.411
Maximum	131	Maximum of Log Data	4.875
Mean	14.48	Mean of log Data	2.327
Median	9.72	SD of log Data	0.624
SD	24.02		
Coefficient of Variation	1.659		
Skewness	4.929		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.318	Shapiro Wilk Test Statistic	0.737
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	22.53	95% H-UCL	16.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	19.35
95% Adjusted-CLT UCL	27.1	97.5% Chebyshev (MVUE) UCL	22.37
95% Modified-t UCL	23.29	99% Chebyshev (MVUE) UCL	28.33

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.434	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	10.1		
nu star	74.58		
Approximate Chi Square Value (.05)	55.69	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	22.23
Adjusted Chi Square Value	54.62	95% Jackknife UCL	22.53
		95% Standard Bootstrap UCL	22.02
Anderson-Darling Test Statistic	3.824	95% Bootstrap-t UCL	63.8
Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	60.31
Kolmogorov-Smirnov Test Statistic	0.348	95% Percentile Bootstrap UCL	23.67
Kolmogorov-Smirnov 5% Critical Value	0.174	95% BCA Bootstrap UCL	29.19
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	35.02
		97.5% Chebyshev(Mean, Sd) UCL	43.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	61.36
95% Approximate Gamma UCL	19.39		
95% Adjusted Gamma UCL	19.78		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	35.02

BA

General Statistics

Number of Valid Observations	26	Number of Distinct Observations	26

Raw Statistics		Log-transformed Statistics	
Minimum	40.65	Minimum of Log Data	3.705
Maximum	798	Maximum of Log Data	6.682
Mean	110	Mean of log Data	4.431
Median	71	SD of log Data	0.57
SD	146.1		
Coefficient of Variation	1.328		
Skewness	4.555		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.367	Shapiro Wilk Test Statistic	0.687
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	158.9	95% H-UCL	124.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	148.5
95% Adjusted-CLT UCL	184.4	97.5% Chebyshev (MVUE) UCL	170.3
95% Modified-t UCL	163.2	99% Chebyshev (MVUE) UCL	213.1

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.805	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	60.9		
nu star	93.88		
Approximate Chi Square Value (.05)	72.54	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	157.1
Adjusted Chi Square Value	71.3	95% Jackknife UCL	158.9
		95% Standard Bootstrap UCL	156.5
Anderson-Darling Test Statistic	4.153	95% Bootstrap-t UCL	415.9
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	378.1
Kolmogorov-Smirnov Test Statistic	0.332	95% Percentile Bootstrap UCL	161.1
Kolmogorov-Smirnov 5% Critical Value	0.173	95% BCA Bootstrap UCL	198.7
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	234.8
		97.5% Chebyshev(Mean, Sd) UCL	288.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	395
95% Approximate Gamma UCL	142.3		
95% Adjusted Gamma UCL	144.8		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	234.8

CD

General Statistics

Number of Valid Data	26	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	11
		Percent Non-Detects	42.31%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0779	Minimum Detected	-2.552
Maximum Detected	8.64	Maximum Detected	2.156
Mean of Detected	0.923	Mean of Detected	-1.072
SD of Detected	2.171	SD of Detected	1.15
Minimum Non-Detect	0.0572	Minimum Non-Detect	-2.861
Maximum Non-Detect	0.64	Maximum Non-Detect	-0.446
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	24
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.31%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.397	Shapiro Wilk Test Statistic	0.838
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.65	Mean	-1.215
SD	1.658	SD	0.986
95% DL/2 (t) UCL	1.206	95% H-Stat (DL/2) UCL	1.12
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.315
		SD in Log Scale	1.012
		Mean in Original Scale	0.628
		SD in Original Scale	1.664
		95% Percentile Bootstrap UCL	1.249
		95% BCA Bootstrap UCL	1.728

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.54	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.709		
nu star	16.2		
A-D Test Statistic	2.171	Nonparametric Statistics	
5% A-D Critical Value	0.784	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.784	Mean	0.633
5% K-S Critical Value	0.232	SD	1.631
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.332
		95% KM (t) UCL	1.2
Assuming Gamma Distribution		95% KM (z) UCL	1.179
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.189
Minimum	0.0779	95% KM (bootstrap t) UCL	4.521
Maximum	8.64	95% KM (BCA) UCL	1.26
Mean	0.904	95% KM (Percentile Bootstrap) UCL	1.253
Median	0.593	95% KM (Chebyshev) UCL	2.079
SD	1.626	97.5% KM (Chebyshev) UCL	2.705
k star	0.914	99% KM (Chebyshev) UCL	3.934
Theta star	0.989		
Nu star	47.51	Potential UCLs to Use	
AppChi2	32.69	97.5% KM (Chebyshev) UCL	2.705
95% Gamma Approximate UCL	1.313		
95% Adjusted Gamma UCL	1.347		
Note: DL/2 is not a recommended method.			

CO

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	26

Raw Statistics		Log-transformed Statistics	
Minimum	6.3	Minimum of Log Data	1.841
Maximum	166	Maximum of Log Data	5.112
Mean	16.76	Mean of log Data	2.417
Median	9.74	SD of log Data	0.648
SD	30.83		
Coefficient of Variation	1.84		
Skewness	4.903		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.307	Shapiro Wilk Test Statistic	0.654
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	27.09	95% H-UCL	18.12
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	21.79
95% Adjusted-CLT UCL	32.92	97.5% Chebyshev (MVUE) UCL	25.29
95% Modified-t UCL	28.06	99% Chebyshev (MVUE) UCL	32.17
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.253	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	13.38		
nu star	65.14		
Approximate Chi Square Value (.05)	47.57	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	26.7
Adjusted Chi Square Value	46.58	95% Jackknife UCL	27.09
		95% Standard Bootstrap UCL	26.43
Anderson-Darling Test Statistic	4.653	95% Bootstrap-t UCL	94.61
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	63.34
Kolmogorov-Smirnov Test Statistic	0.368	95% Percentile Bootstrap UCL	28.43
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	34.91
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	43.11
		97.5% Chebyshev(Mean, Sd) UCL	54.52
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	76.92
95% Approximate Gamma UCL	22.95		
95% Adjusted Gamma UCL	23.44		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	43.11

CU

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	17.6	Minimum of Log Data	2.868
Maximum	504	Maximum of Log Data	6.223
Mean	45.99	Mean of log Data	3.384
Median	24.65	SD of log Data	0.646
SD	94.06		
Coefficient of Variation	2.045		
Skewness	4.992		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.272	Shapiro Wilk Test Statistic	0.542
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	77.5	95% H-UCL	47.54
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	57.17
95% Adjusted-CLT UCL	95.63	97.5% Chebyshev (MVUE) UCL	66.34
95% Modified-t UCL	80.51	99% Chebyshev (MVUE) UCL	84.35
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.145	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	40.18		
nu star	59.52		
Approximate Chi Square Value (.05)	42.78	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	76.33
Adjusted Chi Square Value	41.84	95% Jackknife UCL	77.5
		95% Standard Bootstrap UCL	75.61
Anderson-Darling Test Statistic	5.957	95% Bootstrap-t UCL	376
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL	219.3
Kolmogorov-Smirnov Test Statistic	0.382	95% Percentile Bootstrap UCL	82.04
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	101.2
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	126.4
		97.5% Chebyshev(Mean, Sd) UCL	161.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	229.5
95% Approximate Gamma UCL	63.99		
95% Adjusted Gamma UCL	65.42		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	126.4

FE

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	25

Raw Statistics		Log-transformed Statistics	
Minimum	17650	Minimum of Log Data	9.778
Maximum	412600	Maximum of Log Data	12.93
Mean	38804	Mean of log Data	10.18
Median	22848	SD of log Data	0.58
SD	76327		
Coefficient of Variation	1.967		
Skewness	5.08		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.238	Shapiro Wilk Test Statistic	0.416
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	64374	95% H-UCL	39390
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	47093
95% Adjusted-CLT UCL	79362	97.5% Chebyshev (MVUE) UCL	54087
95% Modified-t UCL	66859	99% Chebyshev (MVUE) UCL	67827
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.294	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	29979		
nu star	67.31		
Approximate Chi Square Value (.05)	49.43	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	63426
Adjusted Chi Square Value	48.41	95% Jackknife UCL	64374
		95% Standard Bootstrap UCL	63903
Anderson-Darling Test Statistic	7.156	95% Bootstrap-t UCL	458448
Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL	196146
Kolmogorov-Smirnov Test Statistic	0.419	95% Percentile Bootstrap UCL	68717
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	97149
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	104053
		97.5% Chebyshev(Mean, Sd) UCL	132286
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	187744
95% Approximate Gamma UCL	52843		
95% Adjusted Gamma UCL	53948		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	104053

MN

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	205	Minimum of Log Data	5.323
Maximum	8230	Maximum of Log Data	9.016
Mean	904.9	Mean of log Data	6.287
Median	489	SD of log Data	0.793
SD	1647		
Coefficient of Variation	1.82		
Skewness	4.041		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.392	Shapiro Wilk Test Statistic	0.757
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1457	95% H-UCL	1050
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1264
95% Adjusted-CLT UCL	1710	97.5% Chebyshev (MVUE) UCL	1497
95% Modified-t UCL	1499	99% Chebyshev (MVUE) UCL	1955
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.996	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	908.2		
nu star	51.81		
Approximate Chi Square Value (.05)	36.28	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	1436
Adjusted Chi Square Value	35.42	95% Jackknife UCL	1457
		95% Standard Bootstrap UCL	1420
Anderson-Darling Test Statistic	3.987	95% Bootstrap-t UCL	4780
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	3845
Kolmogorov-Smirnov Test Statistic	0.333	95% Percentile Bootstrap UCL	1486
Kolmogorov-Smirnov 5% Critical Value	0.176	95% BCA Bootstrap UCL	1871
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2313
		97.5% Chebyshev(Mean, Sd) UCL	2922
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4118
95% Approximate Gamma UCL	1292		
95% Adjusted Gamma UCL	1324		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	2313

NI

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	25

Raw Statistics		Log-transformed Statistics	
Minimum	17.6	Minimum of Log Data	2.868
Maximum	475	Maximum of Log Data	6.163
Mean	46.78	Mean of log Data	3.434
Median	26.85	SD of log Data	0.638
SD	88.54		
Coefficient of Variation	1.893		
Skewness	4.896		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.29	Shapiro Wilk Test Statistic	0.569
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	76.44	95% H-UCL	49.56
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	59.56
95% Adjusted-CLT UCL	93.15	97.5% Chebyshev (MVUE) UCL	69.04
95% Modified-t UCL	79.22	99% Chebyshev (MVUE) UCL	87.64
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.228	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	38.09		
nu star	63.86		
Approximate Chi Square Value (.05)	46.48	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	75.34
Adjusted Chi Square Value	45.5	95% Jackknife UCL	76.44
		95% Standard Bootstrap UCL	74.45
Anderson-Darling Test Statistic	5.682	95% Bootstrap-t UCL	414
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	213.7
Kolmogorov-Smirnov Test Statistic	0.402	95% Percentile Bootstrap UCL	80.02
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	104.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	122.5
		97.5% Chebyshev(Mean, Sd) UCL	155.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	219.5
95% Approximate Gamma UCL	64.27		
95% Adjusted Gamma UCL	65.66		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	122.5

PB

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	7.88	Minimum of Log Data	2.064
Maximum	227	Maximum of Log Data	5.425
Mean	21.18	Mean of log Data	2.639
Median	11.86	SD of log Data	0.621
SD	42.13		
Coefficient of Variation	1.989		
Skewness	5.041		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.266	Shapiro Wilk Test Statistic	0.569
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	35.29	95% H-UCL	21.94
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	26.33
95% Adjusted-CLT UCL	43.5	97.5% Chebyshev (MVUE) UCL	30.44
95% Modified-t UCL	36.65	99% Chebyshev (MVUE) UCL	38.51
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.22	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	17.37		
nu star	63.42		
Approximate Chi Square Value (.05)	46.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0398	95% CLT UCL	34.77
Adjusted Chi Square Value	45.12	95% Jackknife UCL	35.29
		95% Standard Bootstrap UCL	34.42
Anderson-Darling Test Statistic	5.534	95% Bootstrap-t UCL	151.9
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	88.85
Kolmogorov-Smirnov Test Statistic	0.351	95% Percentile Bootstrap UCL	37.37
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	46.3
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	57.2
		97.5% Chebyshev(Mean, Sd) UCL	72.78
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	103.4
95% Approximate Gamma UCL	29.14		
95% Adjusted Gamma UCL	29.77		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	57.2

SE

General Statistics			
Number of Valid Data	26	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	10
		Percent Non-Detects	38.46%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.527	Minimum Detected	-0.641
Maximum Detected	51.8	Maximum Detected	3.947
Mean of Detected	5.32	Mean of Detected	0.841
SD of Detected	12.44	SD of Detected	1.035
Minimum Non-Detect	0.57	Minimum Non-Detect	-0.562
Maximum Non-Detect	0.64	Maximum Non-Detect	-0.446
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.31%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.353	Shapiro Wilk Test Statistic	0.838
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.391	Mean	0.0584
SD	9.955	SD	1.29
95% DL/2 (t) UCL	6.726	95% H-Stat (DL/2) UCL	4.173
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.0929
		SD in Log Scale	1.265
		Mean in Original Scale	3.405
		SD in Original Scale	9.951
		95% Percentile Bootstrap UCL	7.221
		95% BCA Bootstrap UCL	9.296

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.63	Data do not follow a Discernable Distribution (0.05)	
Theta Star	8.439		
nu star	20.17		
A-D Test Statistic	2.24	Nonparametric Statistics	
5% A-D Critical Value	0.777	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.777	Mean	3.477
5% K-S Critical Value	0.224	SD	9.735
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.972
		95% KM (t) UCL	6.845
Assuming Gamma Distribution		95% KM (z) UCL	6.72
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6.747
Minimum	1E-09	95% KM (bootstrap t) UCL	24.36
Maximum	51.8	95% KM (BCA) UCL	7.657
Mean	3.679	95% KM (Percentile Bootstrap) UCL	7.375
Median	1.465	95% KM (Chebyshev) UCL	12.07
SD	9.899	97.5% KM (Chebyshev) UCL	15.79
k star	0.385	99% KM (Chebyshev) UCL	23.1
Theta star	9.564		
Nu star	20	Potential UCLs to Use	
AppChi2	10.85	97.5% KM (Chebyshev) UCL	15.79
95% Gamma Approximate UCL	6.781		
95% Adjusted Gamma UCL	7.071		
Note: DL/2 is not a recommended method.			

TL

General Statistics

Number of Valid Data	26	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	20
		Percent Non-Detects	76.92%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.3	Minimum Detected	0.262
Maximum Detected	2.1	Maximum Detected	0.742
Mean of Detected	1.607	Mean of Detected	0.461
SD of Detected	0.298	SD of Detected	0.179
Minimum Non-Detect	1.15	Minimum Non-Detect	0.14
Maximum Non-Detect	24.3	Maximum Non-Detect	3.19
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	26
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.922	Shapiro Wilk Test Statistic	0.946
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.713	Mean	-0.0475
SD	3.054	SD	0.853
95% DL/2 (t) UCL	2.736	95% H-Stat (DL/2) UCL	2.227
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.0983
		SD in Log Scale	0.359
		Mean in Original Scale	0.969
		SD in Original Scale	0.398
		95% Percentile Bootstrap UCL	1.104
		95% BCA Bootstrap UCL	1.13

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	18.54	Data appear Normal at 5% Significance Level	
Theta Star	0.0867		
nu star	222.5		
A-D Test Statistic	0.285	Nonparametric Statistics	
5% A-D Critical Value	0.697	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.697	Mean	1.377
5% K-S Critical Value	0.332	SD	0.19
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0425
		95% KM (t) UCL	1.449
Assuming Gamma Distribution		95% KM (z) UCL	1.447
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.452
Minimum	1.3	95% KM (bootstrap t) UCL	1.472
Maximum	2.1	95% KM (BCA) UCL	1.64
Mean	1.576	95% KM (Percentile Bootstrap) UCL	1.529
Median	1.562	95% KM (Chebyshev) UCL	1.562
SD	0.155	97.5% KM (Chebyshev) UCL	1.642
k star	102	99% KM (Chebyshev) UCL	1.8
Theta star	0.0154		
Nu star	5304	Potential UCLs to Use	
AppChi2	5136	95% KM (t) UCL	1.449
95% Gamma Approximate UCL	1.627	95% KM (Percentile Bootstrap) UCL	1.529
95% Adjusted Gamma UCL	1.631		

Note: DL/2 is not a recommended method.

V

General Statistics

Number of Valid Observations	26	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	20.15	Minimum of Log Data	3.003
Maximum	536	Maximum of Log Data	6.284
Mean	49.43	Mean of log Data	3.497
Median	30.8	SD of log Data	0.594
SD	99.36		
Coefficient of Variation	2.01		
Skewness	5.078		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.243	Shapiro Wilk Test Statistic	0.468
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	82.72	95% H-UCL	50.16
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	60.06
95% Adjusted-CLT UCL	102.2	97.5% Chebyshev (MVUE) UCL	69.13
95% Modified-t UCL	85.95	99% Chebyshev (MVUE) UCL	86.95
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.249	Data do not follow a Discernable Distribution (0.05)	
Theta Star	39.57		
nu star	64.95		
Approximate Chi Square Value (.05)	47.41	Nonparametric Statistics	
Adjusted Level of Significance	0.0398	95% CLT UCL	81.49
Adjusted Chi Square Value	46.42	95% Jackknife UCL	82.72
		95% Standard Bootstrap UCL	79.83
Anderson-Darling Test Statistic	6.675	95% Bootstrap-t UCL	515.8
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	312.4
Kolmogorov-Smirnov Test Statistic	0.437	95% Percentile Bootstrap UCL	88.26
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	109.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	134.4
		97.5% Chebyshev(Mean, Sd) UCL	171.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	243.3
95% Approximate Gamma UCL	67.72		
95% Adjusted Gamma UCL	69.17		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	134.4

BZAP

General Statistics			
Number of Valid Data	25	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	15
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	10.6	Minimum Detected	2.361
Maximum Detected	28.6	Maximum Detected	3.353
Mean of Detected	16.38	Mean of Detected	2.747
SD of Detected	5.92	SD of Detected	0.315
Minimum Non-Detect	3.65	Minimum Non-Detect	1.295
Maximum Non-Detect	420	Maximum Non-Detect	6.04
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	25
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.777	Shapiro Wilk Test Statistic	0.854
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	87.3	Mean	3.513
SD	93.75	SD	1.584
95% DL/2 (t) UCL	119.4	95% H-Stat (DL/2) UCL	955.9
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.507
		SD in Log Scale	0.363
		Mean in Original Scale	13.11
		SD in Original Scale	5.237
		95% Percentile Bootstrap UCL	14.98
		95% BCA Bootstrap UCL	15.21

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	7.327	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	2.236		
nu star	146.5		
A-D Test Statistic	0.882	Nonparametric Statistics	
5% A-D Critical Value	0.725	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.725	Mean	14.45
5% K-S Critical Value	0.267	SD	5.334
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	1.452
		95% KM (t) UCL	16.94
Assuming Gamma Distribution		95% KM (z) UCL	16.84
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	16.7
Minimum	10.6	95% KM (bootstrap t) UCL	20
Maximum	28.6	95% KM (BCA) UCL	17.9
Mean	17.04	95% KM (Percentile Bootstrap) UCL	17.44
Median	15.48	95% KM (Chebyshev) UCL	20.78
SD	5.191	97.5% KM (Chebyshev) UCL	23.52
k star	10.43	99% KM (Chebyshev) UCL	28.9
Theta star	1.633		
Nu star	521.7	Potential UCLs to Use	
AppChi2	469.7	95% KM (t) UCL	16.94
95% Gamma Approximate UCL	18.93		
95% Adjusted Gamma UCL	19.06		

Note: DL/2 is not a recommended method.

BZBF

General Statistics

Number of Valid Data	25	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	16
		Percent Non-Detects	64.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.125	Minimum Detected	1.634
Maximum Detected	27.3	Maximum Detected	3.307
Mean of Detected	16.01	Mean of Detected	2.67
SD of Detected	6.787	SD of Detected	0.522
Minimum Non-Detect	1.44	Minimum Non-Detect	0.365
Maximum Non-Detect	420	Maximum Non-Detect	6.04
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	25
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 9 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	86	Mean	3.209
SD	94.89	SD	1.957
95% DL/2 (t) UCL	118.5	95% H-Stat (DL/2) UCL	3058
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	2.168
		SD in Log Scale	0.625
		Mean in Original Scale	10.52
		SD in Original Scale	6.55
		95% Percentile Bootstrap UCL	12.67
		95% BCA Bootstrap UCL	12.88

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.397	Data appear Normal at 5% Significance Level	
Theta Star	4.713		
nu star	61.15		
A-D Test Statistic	0.377	Nonparametric Statistics	
5% A-D Critical Value	0.723	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.723	Mean	11.66
5% K-S Critical Value	0.28	SD	7.281
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.994
		95% KM (t) UCL	15.07
Assuming Gamma Distribution		95% KM (z) UCL	14.94
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	14.8
Minimum	5.125	95% KM (bootstrap t) UCL	15.02
Maximum	27.3	95% KM (BCA) UCL	17.92
Mean	17.44	95% KM (Percentile Bootstrap) UCL	16.69
Median	17.56	95% KM (Chebyshev) UCL	20.35
SD	6.069	97.5% KM (Chebyshev) UCL	24.11
k star	6.534	99% KM (Chebyshev) UCL	31.5
Theta star	2.669		
Nu star	326.7	Potential UCLs to Use	
AppChi2	285.8	95% KM (t) UCL	15.07
95% Gamma Approximate UCL	19.94	95% KM (Percentile Bootstrap) UCL	16.69
95% Adjusted Gamma UCL	20.12		

Note: DL/2 is not a recommended method.

APPENDIX E

RESPONSES TO COMMENTS ON THE FINAL BASELINE HUMAN HEALTH RISK ASSESSMENT

OhioEPA

Inter-Office Communication

To:	Paul Jayko, **NWDO-DERR**	Date: 29 May 2009
From:	Janusz Z. Byczkowski, DERR, CO	
Subject:	**Draft Baseline Human Health Risk Assessment, and Draft Screening Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works Sandusky, Ohio,** March 2009. Site: US NASA PLUM BROOK, TAYLOR & COLUMBUS Rds., SANDUSKY, OH 44870; ERIE Cnt.; OHID# 322-0552.	

The following memo is regarding the ***"Draft Baseline Human Health Risk Assessment" and "Draft Screening Ecological Risk Assessment", Reservoir No. 2 Burning Ground", Former Plum Brook Ordnance Works Sandusky, Ohio,*** dated March, 2009.

If you have any questions or need further technical support, please call me at: 614-644-3070 or e-mail at jbyczkowski@epa.state.oh.us.

DOCUMENT TITLE: ***Draft Baseline Human Health Risk Assessment, and Draft Screening Ecological Risk Assessment, Res. No. 2 Burning Ground***

SITE: US NASA PLUM BROOK, TAYLOR & COLUMBUS Rds., SANDUSKY, OH 44870; ERIE Cnt.; OHID# 322-0552.

DOCUMENT/DATE: Draft /March 2009

Ohio EPA – Division of Emergency and Remedial Response COMMENTS

REVIEWER: Dr. Janusz Z. Byczkowski, DERR, CO; Tel: 614-644-3070; e-mail: jbyczkowski@epa.state.oh.us.

Review/DATE: 05/29/2009

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
1.	P. 2-8 P. 2-9 Table 2-1 and SERA Table 2-2		**General Remark:** This Document contains some errors and misrepresentations, and thus, it should be revised. If you have any questions or need further technical support, please give me a call at: 614-644-3070 or e-mail at jbyczkowski@epa.state.oh.us. For example, this Document states: On pages 2-8 and 2-9: "…[…] *Table 2-1 provides the following information for each detected chemical for each medium at 2BG: […] • Range of detected concentrations • Range of detection limits • Arithmetic mean of site concentrations • 95 percent UCL on arithmetic mean…"* but then, in the heading of Table 2-1: "…| *Range of detection limits*	*Minimum Detected Concentration*	*Maximum Detected Concentration*	*Average* | Comment: Description in the text apparently misrepresents the data listed in the tables.	I suggest a **revision** of both Documents, followed by the quality reading. Also, the specific issues listed below should be addressed. Please **reconcile text with tables** throughout the Document.	Consistency between text and tables in the documents will be reviewed.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			Specifically, "*Average*" does not mean the same as an "*arithmetic mean*". If it indeed was an arithmetic mean, all values in the "*Average*" column, listed as greater than the corresponding "*Maximum Detected Concentrations*" would be implausible and thus, in error. Also, "*95 percent UCL on arithmetic mean*" is not the same as "*Average*". The data and other variables in tables should be defined precisely and labeled exactly what they are, e.g., "The *95% UCL on arithmetic mean*" (instead of "Average"), all units for numerical data should be listed (best in the heading or a footnote) and all the tables should be followed by an adequate description in the text.		
2.	HHRA Table 4-1		**Specific Issues:** In Table 4-1, both "*Reference Doses*" and "*Cancer Slope Factors*" are listed without units. Comment: It looks unprofessional and may be confusing for the reader when numerical values are listed without their units. Especially for the inhalation pathway, it is unclear whether the "Reference Doses" expressed concentrations (e.g., mg/m^3), or converted equivalent external dose rates (e.g., mg/kg per day). Similarly, it is unclear whether "Cancer Slope Factors" for inhalation indeed listed slope factors (SF), or may be, the inhalation unit risks (IUR).	Please revise this table and check all others, providing respective **units for all numerical values** listed.	Tables will be revised to include units for all numerical values.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
3.	HHRA S. 2.1.3 P. 2-3, L.# 40 and S. 5.1 P. 5-2 L.# 22 also S. 5.3 P. 5-5 Eq. 5.7		This Document states on P. 2-3: "…*Acceptable exposure levels are generally concentration levels that represent an increased upper bound lifetime risk cancer risk to an individual of 1E-6 to 1E-4 (EPA, 1990), referred to as "risk management range…*" and on page 5-2: "…*ILCR estimates above 1E-4 are considered to be unacceptable. The OEPA (2004b) policy is consistent with the EPA (1990) policy of risk management…*" then, on page 6-1: "…*risk exceeds generally acceptable limits (cancer risk greater than 1E-4…*" <u>Comment</u>: Baseline risk assessment should objectively evaluate risk, without deciding what level is or is not "*acceptable*". Even at this early stage of risk assessment (which is not yet an FS or risk management step), whenever the NCP "range" of risk has been invoked, there should be also a reference to the current OEPA - DERR (2004) risk goal guidance. For consistency, also the target risk level (TR) used in RBRL calculations, e.g., in equation 5.7 (and elsewhere), should be presented as a point value = 1E-5. Listing a couple of values can be misleading, giving an impression that for some chemicals of concern, the target levels may be an order of magnitude higher than for the others. The OEPA guidance is very clear about cancer risk goal for any potential carcinogen (it's 1E-5): "…*The DERR Remedial Response program has*	i) Please delete any reference to "*acceptable risk*" from baseline human health risk assessment, and ii) when referring to 40 CFR Part 300 "risk management range", please refer also to OEPA-DERR (2004); also iii) use **point risk goal of 1E-5**, particularly, in Conclusions and Summaries (e.g. S. 7.3 on pages 7-4 and 7-5).	The text will be revised accordingly per the comment.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			adopted a human health cumulative excess lifetime carcinogenic risk goal of 1E-5 and a cumulative non-cancer hazard goal equal to a hazard index (HI) of 1, for all receptors and land uses. These goals are to be used as both the level of acceptable excess cancer risk or non-cancer hazard and for the development of remediation goals for a site…" **Reference:** **OEPA – DERR (2004)** Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response and Office of Federal Facility Oversight. Technical Decision Compendium, 28 April 2004. Available on-line: http://www.epa.state.oh.us/derr/rules/riskgoal.pdf		
4.	HHRA S. 2.1.5, L.# 18		This Document states in Section 2.1.5: *"…Each groundwater BSC is either the MDC or the calculated 95 percent upper tolerance limit of the background groundwater data set.* […] *BSCs for soil were reported as the 95 percent upper tolerance limit for lognormal data sets or the 95th percentile for datasets with nonparametric distribution…"* and then: *"…Background screening was not used to eliminate COPCs…"* Comment: The described methodology does not follow the screening process recommended either by U.S. EPA (1989), or OEPA-DERR (2004). OEPA – DERR does not recommend the usage of the Upper Tolerance Limit (*UTL*) as the background screening criterion. Instead, the upper cutoff value should be used to estimate the background	Please follow methodology described by U.S. EPA (1989) in RAGS part A. For each chemical that may be screened out based on background, please calculate the background level equal to the **upper cutoff value**, according to OEPA – DERR (2004a). In the BHHRA document, please list a single, unadjusted, representative background level for each chemical, in each medium, within the same geological formation as the on-site area of concern.	It is true, there is no recent background data taken specifically for 2BG. However, there is a metals background data set from 2001, from background locations as agreed upon by the PBOW Team, including USACE and OEPA, that would suffice as the background data set for all PBOW FUDS AOCs to be investigated, including Acid Area 1. During the development of the appropriate background statistic to compare to for PBOW FUDS AOCs, the PBOW Team reviewed many statistics, including arithmetic mean, median, UCLs and UTLs. The OEPA risk assessors Bonnie Buthker, Laurie Moore with the rest of the PBOW team deemed the 95% UTL or the maximum detected background metal

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			concentration level and to compare it to the samples, taken from the area of concern within the same geological formation, on a point by point basis. For guidance on acceptable background calculation methodology, please see the OEPA – DERR (2004 and 2004a). **References:** **U.S. EPA (1989)** Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989; page 5-21. On-line: http://www.epa.gov/oswer/riskassessment/ragsa/index.htm **OEPA - DERR (2004)**: TECHNICAL DECISION COMPENDIUM Remedial Response Program: Methodology for Evaluating Site-specific Background Concentrations of Chemicals. On-line: http://www.epa.state.oh.us/derr/rules/Methodology.pdf **OEPA - DERR (2004a)**: Background Calculation Methodology. DERR-00-RR-039P, 30 June 2004, Final. On-line: http://www.epa.state.oh.us/derr/rules/RR-039_public.pdf		concentration, which ever is less, as the appropriate statistic to use during background screening of AOCs' metals, and as documented in the May 2000 PBOW Team Meeting Minutes as consensus for using this method.
5.	HHRA S. 2.3 P. 2-9 and P.2-10 L.# 13 L.# 25 L.# 35 and		In several paragraphs, this Document states: "...*Specific compounds exceeding the USEPA Region 9 Residential PRGs (EPA, 2004a) are identified in Table 2-1*..." Comment: Actually, in the table 2-1 the values listed (RBCs) are equal to 1/10 of PRGs for non-carcinogens	Please explain in the text derivation of the RBCs used, and please **provide in Table 2-1 the missing information** according to U.S. EPA (2001) RAGS part D.	During the 26 June 2008 PBOW Team Meeting, USACE presented to the team the discussion of and recommendation to use the Regional Screening Levels (RSLs) adopted all three EPA regions which had screening levels previously, and being EPA Region 3, Region 6 and Region 9. The PBOW Team decision was to

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
	L# 6 L.# 11 L.# 14 Table 2-1		(including lead) and 100% PRGs for potential carcinogens. Please note that in the Table 2-1, some reporting limits (or range of detection limits) are missing. Also, the rational for COPC selection or rejection has not been included. This information could be displayed in the appropriately indexed "*Standard Table*" for occurrence, distribution and selection of chemicals of potential concern (see: Table 2.1) according to U.S. EPA (2001) RAGS part D. **Reference:** **U.S. EPA (2001)** Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments), Final, December 2001. On-line: http://www.epa.gov/oswer/riskassessment/ragsd/index.htm		discuss RSLs with Bonnie Buthker, DOD Program Manager at OEPA and use RSLs for any new starts after being given the "go ahead" by Bonnie Buthker. On 18 March 2009, Bonnie Buthker stated that Brian Tucker of OEPA has directed her to direct USACE FUDs risk assessors to use the RSLs, and no longer the obsolete Region 9 PRGs. According to the 26 June 2008 PBOW Team agreement, when Bonnie Buthker gave the "go ahead" to use RSLs, any new starts there after should use the RSLs. The Acid Area 1 Risk Assessment Work Plans are dated April 2009 which is after 18 March 2009, and will incorporate the RSLs, not the obsolete EPA Region 9 PRGs from 2004. The rationale and process for selection or rejection of a COPC is specifically addressed in the Work Plan for 2BG.
6.	S. 3.2.2 P. 3-13 L.# 25 and S. 8.0 P. 8-2 to 8-5		This Document states: "*...Evaluation Manual (HHEM) (EPA, 1991b) was used in the BHHRA. This model was selected based on correspondence between OEPA (2004c) and the USACE...*" Comment: The *OEPA (2004c)* is not listed in the References section 8.0. The references are not well organized alphabetically.	Please **revise and organize References, section 8.0** and perform quality reading to reconcile text with the section 8.0.	The text and references will be revisited for completeness per the comment.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			While the U.S. Army Core of Engineers is referred to in this Document as the "USACE", the U.S. Environmental Protection Agency is only referred to as "EPA" and in the text it may be confused with the Ohio EPA.		
7.	S. 5.4 P. 5-7 L.# 1		This Document states: "*…COCs are defined as the chemicals that contribute significantly to an ILCR exceeding 1E-4…*" but then, e.g., on page 5-8: "*…COCs* […as] *exceeding the PRGs…*" Comment: This definition of COC is contradicting some other statements in this Document and is in disagreement with the OEPA (2004) [see above, comment # 3].	Please use **1E-5** in defining both human health cumulative excess lifetime carcinogenic risk goal and a level of concern from aggregate exposures.	See response to comment no. 3
Draft Screening Level Ecological Risk Assessment					
8.	SLERA S.7 P. 7-4		This Document states: "*U.S. Environmental Protection Agency (EPA)…*" and then: "*EPA…*" Comment: See above, comment # 6.	Please **revise and organize References, section 7.0** and perform quality reading to reconcile text with the section 7.0.	See response to comment no. 6
9.	SLERA Figure 2-2		This document states: "*…Injestion…*" Comment: It should be "Ingestion".	Please correct **typos** (and perform quality reading).	Change will be made as noted.
10.	SLERA S. 2.1.1 P. 2-3 L# 7		This document states: "*…Jacobs personnel completed a checklist similar to EPA's checklist for ecologicalaAssessment/ sampling (EPA, 1997)…*"	Please complete a checklist recommended by **OEPA-DERR (2008)**.	The text will be removed indicating the completion of the ecological checklist. The checklists were reviewed prior to completion of the ecological site surveys to ensure the

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			Comment: The ecological risk assessment guidance by OEPA-DERR, updated in 2008, provides the recommended generic ecological scoping checklist list in the Appendix B. **Reference:** **OEPA-DERR (2008)** Ecological Risk Assessment Guidance Document. Available on-line at: http://www.epa.state.oh.us/derr/rules/RR-031.pdf		surveys were adequate. The results of the ecological surveys are presented in the Appendices.
11	SERA S. 2.2.5 P. 2-12 L# 13		This document states: "*...BSCs for soil were reported as 95 percent upper tolerance limit (UTL) for lognormal data sets or the 95th percentile for datasets with nonparametric distribution...*" Comment: According to OEPA – DERR (2004), background concentration levels are to be calculated as the upper cutoff value of the data set defined as the upper quartile + 1.5 X (interquartile range). **Reference:** **OEPA - DERR (2004):** TECHNICAL DECISION COMPENDIUM Remedial Response Program: Background Calculation. On-line: http://www.epa.state.oh.us/derr/rules/RR-039_public.pdf	Please use **background definition** as described in OEPA – DERR (2004).	See response to comment no. 4
12	SERA S. 2.2.6 P. 2-12 L# 31 and P. 2-13		This document states: "*The following RBSEVs or RBSEV hierarchy, as noted, were used for the ecological evaluation...*" Comment: The hierarchy listed does not follow the OEPA-DERR recommendations.	Please use **screening hierarchy** for soil and sediment in accordance with OEPA (2008).	The hierarchy used is consistent with the approach specified in the Work Plan. The Ohio EPA sediment values were reviewed and used as part of this process.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			For soil, please add at the top of the list "U.S. EPA ECO-SSLs". For sediment risk-based screening, please use the following hierarchy, after comparing to OEPA Ohio-specific SRVs (Attachment H, p. 3-28. On-line: http://www.epa.state.oh.us/derr/rules/RR-031.pdf): 1) Consensus-based TEC values; The TEC values are located in: Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems, D.D. MacDonald, C.G. Ingersoll, and T.A. Berger, Arch. Environ. Contam. Toxicol. 39, 20-31 (2000). 2) Ecological Screening Levels, U.S. EPA, Region 5, 2003. http://www.epa.gov/reg5rcra/ca/edql.htm . **References:** **U.S. EPA ECO-SSLs**) U.S. EPA Ecological Screening Levels (Eco-SSL). On-line: http://www.epa.gov/ecotox/ecossl/ **OEPA-DERR (2008)** ECOLOGICAL RISK ASSESSMENT Guidance Document. On-line: http://www.epa.state.oh.us/derr/rules/RR-031.pdf		
13	SERA S. 3.1 P. 3-4 L# 38		This document states: "...*the drainage ditches associated with 2BG are ephemeral and were dry at the time of sampling...*" Comment: In the case of ephemeral runoff/surface water, the sampling should be performed during the wet season.	Please do additional **sampling,** or at least perform a predictive **modeling** of surface water.	The drainage ditches were dry at the time of sampling and sediment samples do not indicate the presence of contaminants at levels of concern.

APPENDIX C

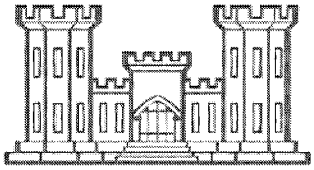
RESERVOIR NO. 2 BURNING GROUND SLERA
(ELECTRONIC DELIVERABLE ONLY)

Revised Final Screening Level Ecological Risk Assessment

Reservoir No. 2 Burning Ground

Former Plum Brook Ordnance Works
Sandusky, Ohio

Prepared for:



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
NASHVILLE, TENNESSEE
CONTRACT DACW62-03-D-0004-0004

Prepared by:

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February 2010

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List of Acronyms and Abbreviations

%	percent
2BG	Reservoir No. 2 Burning Ground
amsl	above mean sea level
ARP	assessment receptor profile
BAF	bioaccumulation factor
BCF	bioconcentration factor
bgs	below ground surface
BSC	background screening concentration
BTAG	Biotechnical Assistance Group
CERLN	U.S. Army Corps of Engineers, Nashville District
COC	contaminant of concern
COPEC	chemicals of potential ecological concern
DNAP	(Ohio) Division of Natural Areas and Preserves
DERP	Defense Environmental Restoration Program
DNT	dinitrotoluene
EC_{20}	effective concentration for 20 percent
ECSM	ecological conceptual site model
EDQL	ecological data quality level
EPA	U.S. Environmental Protection Agency
EPC	exposure-point concentration
ERBSL	ecological risk-based screening levels
FCM	food chain multiplier
ft	foot or feet
ft^2	square feet
FUDS	Formerly Used Defense Site
H_o	null hypotheses
HQ	hazard quotient
IT	IT Corporation
Jacobs	Jacobs Engineering Group
kg	kilogram
KM	Kaplan-Meier
K_{oc}	soil adsorption coefficient
K_{ow}	octanol/water partition coefficient
LC_{50}	lethal concentration to 50 percent

LD_{50}	lethal dose to 50 percent
LOAEL	lowest observed adverse effect level
MDC	maximum detected concentration
mg/kg	milligrams per kilogram
mg/kg-day	milligram per kilogram per day
NASA	National Aeronautics and Space Administration
NOAEL	no observed adverse effect level
NWI	National Wetland Inventory
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OME	Ontario Ministry of the Environment and Energy
PAH	polycyclic aromatic hydrocarbon
PBOW	Plum Brook Ordnance Works
PCB	polychlorinated biphenyl
RA	risk assessment
RBSC	risk-based screening criteria
RBSEV	risk-based screening ecotoxicity value
RI	Remedial Investigation
RTE	rare, threatened, or endangered
RTEC	Registry of Toxic Effects Concentrations
SLERA	screening level ecological risk assessment
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TEQ	toxicity equivalent
TRV	toxicity reference value
UCL	upper confidence limit
UCL_{95}	95 percent upper confidence limit
UTL	upper tolerance limit
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

EXECUTIVE SUMMARY

This screening level ecological risk assessment (SLERA) was prepared to evaluate the potential for adverse effects to ecological receptors from exposure to hazardous substance releases at Reservoir No. 2 Burning Ground (2BG), located at the former Plum Brook Ordnance Works (PBOW), Sandusky, Erie County, Ohio. This SLERA was prepared in accordance with the *Baseline Human Health Risk Assessment and Ecological Risk Assessment Work Plans* (Jacobs, 2008), and is consistent with U.S. Environmental Protection Agency (EPA) and Ohio EPA – Division of Emergency and Remedial Response (OEPA, 2003) guidance and with the procedures established in the Baseline Ecological Risk Assessment Work Plan for TNT Areas A & C soil (IT Corporation, 2001). The results of this assessment may be used to determine whether remediation or additional investigation is warranted at the site.

Reservoir No. 2 Burning Ground is located in the northwestern portion of PBOW. The burn area is approximately 125 feet (ft) wide by 175 ft long. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft below ground surface (bgs) and one ft in thickness.

The 2BG site physical features include a former burning ground located in an open field and a drainage ditch at the northern edge of the field. The remains of a baseball field are still evident at the site. A paved service road is adjacent to the east side of the site. The majority of the site is currently an open field; however, the southern portion of the site and areas to the west are now wooded. The only surface water feature within the 2BG site is a drainage ditch that runs east to west and forms the north edge of the site. A less pronounced drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is ephemeral and flows only during the wet season and following precipitation events, remaining essentially dry during the summer months (Jacobs 2006). The drainages were dry during completion of the spring and fall ecological surveys and at the time of environmental sampling during the remedial investigation (RI).

Ecological surveys were performed in the spring and fall of 2008. The predominant community types observed at 2BG were Upland Old Fields, Shrub Thickets, and Successional Woods. Wetlands were not identified at Site 2BG. During the ecological survey, 2BG was examined for vegetative stress, including plants displaying stunted growth, poor foliage growth, tissue discoloration, and a loss of leaf coverage. Vegetative stress attributable to chemicals was not observed. Based on site reconnaissance information, it does not appear that significant ecological threats exist at the site as there is no definitive absence of biota or animal life in areas expected to support these ecological components. No threatened or endangered species were found in 2BG.

The primary objective of this SLERA is to evaluate the potential for adverse effects posed to ecological receptors as a result of possible hazardous substance releases. This objective was met by characterizing the ecological communities in the vicinity of the site, determining the particular hazardous substances released, identifying pathways for receptor exposure, and estimating the magnitude of the potential for adverse effects to identified receptors. This SLERA addresses the potential for adverse effects to the vegetation, wildlife, aquatic life, threatened and endangered species, and wetlands and other sensitive habitats associated with the burn area and areas outside the burn associated with the site. There is no habitat for fish in

the area of concern as the small drainage ditches within and adjacent to the area are intermittent.

The chemicals of potential ecological concern (COPECs), the ecosystems and receptors at risk, the ecotoxicity of the contaminants known or suspected to be present, and observed or anticipated ecological effects were evaluated in two steps: (1) a screening assessment and (2) a predictive assessment. Ecological endpoints addressed in both steps were identified.

Assessment receptor species were selected based on the likelihood of finding the species at 2BG. Historical information, site reconnaissance, and the availability of toxicological data were used to select terrestrial and aquatic receptor species. The assessment receptors were selected for evaluation during the predictive SLERA. Seven representative assessment receptor species that are expected or possible in the vicinity of 2BG were selected as indicator species for the potential effects of COPECs. These indicator species represent two classes of vertebrate wildlife, mammals and birds, and a range of both body size and food habits, including herbivory, omnivory, and carnivory. Only terrestrial receptors were evaluated because aquatic habitat is absent at Site 2BG.

The assessment endpoints for the 2BG are stated as "the protection of long-term survival and reproductive capabilities for terrestrial invertebrates, herbivorous mammals, omnivorous mammals, insectivorous mammals and birds, carnivorous birds, and aquatic benthic invertebrates." The corresponding null hypothesis (H_o) for each of the assessment endpoints is stated as: "the presence of site contaminants within soil, sediment, vegetation, and prey will have no effect on the survival or reproductive capabilities of populations of terrestrial invertebrates, herbivorous mammals, omnivorous mammals, insectivorous mammals and birds, carnivorous birds, benthic invertebrates, and omnivorous aquatic mammals."

For assessments, measurable responses to stressors, collectively termed toxicity reference values (TRVs), were selected as measurement endpoints. The most appropriate measurement endpoints were chosen based on exposure pathways as well as ecotoxicity of the contaminant.

An exposure analysis combining the spatial and temporal distribution of the assessment receptors and the COPECs was performed to evaluate potential exposure. The focus of the analysis was dependent on the assessment receptors evaluated and the assessment and measurement endpoints.

The intake estimates were combined with the COPEC TRVs to derive estimates of potential adverse ecological effects. The uncertainties associated with the estimation of potential adverse ecological effects were identified, with the degree of uncertainty estimated qualitatively (low, medium, or high) or quantitatively, and the impact of the uncertainty estimated qualitatively (overestimate or underestimate, as appropriate).

Risk characterization integrates information on exposure, exposure-effects relationships, and defined or presumed target populations. The result is an estimate of the likelihood, severity, and characteristics of potential adverse effects from environmental stressors present at a site. Qualitative and semiquantitative approaches were taken to estimate the likelihood of adverse effects occurring as a result of potential exposure of the assessment receptors to COPECs. Potential adverse affects to terrestrial plants were qualitatively assessed by comparing plant toxicity benchmarks with COPEC concentrations. Potential adverse impacts to aquatic biota were qualitatively assessed by comparing and sediment quality criteria for the protection of

aquatic life to sediment COPEC concentrations. Surface water data were not used in the assessment because data were not available as the drainage ditches are intermittent and were dry at the time of sampling.

For the semiquantitative predictive assessment, TRVs and estimated exposure rates were used to generate hazard quotients (HQs) by dividing the receptor exposure rate for each contaminant by the TRV. HQs are a means of estimating the potential for adverse effects to organisms at a contaminated site and for assessing the potential for toxicological effects to occur.

For soils, ecological risk was evaluated separately between the burn area and areas outside the burn area. Hence two separate risk characterizations were completed for soils associated with 2BG. Soil data, from the 0 to 5-ft bgs, were used to characterize potential ecological risk in the burn area and outside the burn area. This was completed because the burn area itself is expected to contain greater chemical concentrations than areas outside the burn area, and therefore, greater risk to ecological receptors. The separate risk evaluation of the two areas (the burn area and outside the burn area) was completed to assist in future remedial decision-making for site if warranted. Ecological risk associated with drainage ditch sediments have been assessed across the entire 2 BG site.

Soil COPEC impacts to terrestrial plants are estimated to be generally insignificant as no vegetative stress was observed inside or outside the burn areas associated with 2BG.

Inside the burn area, terrestrial receptors are predicted to incur elevated hazards from exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), explosives, and two polycyclic aromatic hydrocarbons (PAHs) (acenaphthene and naphthalene), based on no observed adverse effect level- (NOAEL-) based HQ approaches (Section 5.3). Several metals had elevated HQs but the metals concentrations are within the range of naturally occurring background. Estimated hazards are above 1,000 for some receptors using the NOAEL-based approach. However, the estimated HQs that are above 1,000 using the NOAEL-based approach are considered unrealistic and toxicologically impossible. The white-tailed deer and red-tailed hawk had no HQ exceedances greater than 10 within 2BG.

Outside the burn area, terrestrial receptors are predicted to incur elevated hazards from exposure to explosives only with 2,4,6-trinitrotoluene being the greatest risk driver. The white tailed deer and red-tailed hawk had no HQ exceedances greater than 10 outside 2BG.

Aquatic benthic organisms are predicted to have potentially elevated hazards from exposure to PAHs in sediments based on the data screening compared to ecological risk-based screening levels (ERBSLs). However, given the limited aquatic habitat at the site, the potential for adverse impacts to aquatic biota is considered negligible.

1.0 INTRODUCTION

This screening level ecological risk assessment (SLERA) was prepared to evaluate the potential for adverse effects to ecological receptors from exposure to hazardous substance releases at Reservoir No. 2 Burning Ground (2BG), located at the former Plum Brook Ordnance Works (PBOW), Sandusky, Erie County, Ohio (Figures 1-1 and 1-2). The results of this assessment may be used to determine whether remediation or additional investigation is warranted at the site.

This SLERA was prepared by Jacobs Engineering Group (Jacobs) under contract DACW62-03-D-0008, Delivery Order #8. This work is being conducted for the U.S. Army Corp of Engineers (USACE) under the Defense Environmental Restoration Program (DERP) – Formerly Used Defense Sites (FUDS). The Army is the executive agent for the FUDS program and the USACE manages and directs the program's administration. Investigations at PBOW under DERP-FUDS are being managed by the USACE Huntington District and technically overseen by the USACE Nashville District (CERLN).

This SLERA was prepared in accordance with the *Baseline Human Health Risk Assessment and* Ecological *Risk Assessment Work Plans* (Jacobs, 2008*), and* is consistent with U.S. Environmental Protection Agency (EPA) and Ohio EPA (OEPA) – Division of Emergency and Remedial Response (OEPA, 2003) guidance and with the procedures established in the Baseline Ecological Risk Assessment Work Plan for TNT Areas A & C soil (IT Corporation [IT], 2001).

The primary objective of this SLERA is to evaluate the potential for adverse effects posed to ecological receptors as a result of possible hazardous substance releases. This objective was met by characterizing the ecological communities in the vicinity of the site, determining the particular hazardous substances released, identifying pathways for receptor exposure, and estimating the magnitude of the potential for adverse effects to identified receptors. This SLERA addresses the potential for adverse effects to the vegetation, wildlife, aquatic life (aquatic sediment-dwelling organisms only), threatened and endangered species, and other sensitive habitats associated with the site. Wetlands were not evaluated as none are present at Site 2BG. There is no habitat for fish in the area of concern as the drainage ditches within and adjacent to the area are intermittent and were dry during the completion of the spring and fall ecological surveys and remedial investigation (RI) sampling events.

Concentrations of chemicals measured in relevant environmental media including soil and sediment were used to develop the SLERA, including problem formulation (Section 2.0); exposure characterization (Section 3.0); ecological effects characterization (Section 4.0); risk characterization (Section 5.0); and summary and conclusions (Section 6.0). These subtasks are described in greater detail in the following sections.

The chemicals of potential ecological concern (COPECs), the ecosystems and receptors at risk, the ecotoxicity of the contaminants known or suspected to be present, and observed or anticipated ecological effects were evaluated. This evaluation was conducted in two steps: (1) a screening assessment and (2) a predictive assessment. Ecological endpoints addressed in both steps have been identified. The results and conclusions of the screening assessment determined whether a predictive assessment was needed. The criteria by which the need for a predictive assessment was measured were formalized as null hypotheses (H_o) to be accepted, in which case a predictive assessment was not needed, or rejected, in which case a predictive assessment was needed.

2.0 PROBLEM FORMULATION

The screening assessment H_o is stated as follows:

- The potential for adverse ecological effects to ecological receptors at the site is minimal or nonexistent due to the lack of viable habitat for potential ecological receptors.
- The potential for adverse ecological effects to ecological receptors at the site is minimal or nonexistent due to the lack of potential ecological receptors.
- The potential for adverse ecological effects to ecological entities at the site is minimal or nonexistent due to the lack of potential exposure pathways.
- The potential for adverse ecological effects to ecological entities at the site is minimal or nonexistent due to the lack of potential chemical stressors.

If one or more of these H_o are accepted, a predictive assessment is not triggered. All four H_o must be rejected for a predictive assessment to be triggered. The first three H_o were tested with the results of the ecological site description (Section 2.1). The fourth H_o was tested with the results of COPEC selection (Sections 2.2 and 2.3).

Where a predictive assessment was triggered, terrestrial and aquatic ecological conceptual site models were developed, as appropriate, and additional problem formulation tasks were performed, as described in Sections 2.4 to 2.6.

2.1 Ecological Site Description

This ecological site description section includes a general discussion of site background, surface water resources, wetlands, vegetative communities, a species inventory, and a discussion of threatened and endangered species.

2.1.1 General Site Background

PBOW is located approximately 4 miles south of Sandusky, Ohio, and 59 miles west of Cleveland (Figure 1-1). Although located primarily in Perkins and Oxford Townships, the eastern edge of the facility extends into Huron and Milan Townships. PBOW is bounded on the north by Bogart Road, on the south by Mason Road, on the west by Patten Tract Road, and on the east by U.S. Highway 250. The area surrounding PBOW is mostly agricultural and residential (IT, 2001). The facility is currently surrounded by a chain-link fence, and the perimeter is regularly patrolled. Access by authorized personnel is limited to established checkpoints. Public access is restricted, except during the annual deer hunting season.

PBOW, approximately 6,453 acres, is located within the Eastern Lake Plains physiographic region of the Eastern Huron/Erie Lake Plain Ecoregion (Lafferty, 1979; Omernik, 1986). This region is generally characterized as containing flat plains as the predominant land surface form and as having a dominant natural vegetation of elm and ash in undisturbed areas. Approximately two-thirds of Erie County was once covered by a glacial lake that produced features such as beach ridges and wave-cut cliffs. Much of the region is poorly drained due to the flat topography and low stream gradients. Many of the wetlands adjacent to Lake Erie in this region have been preserved by various federal, state, and private organizations (Peterjohn and Rice, 1991), thereby providing important wetland habitat for wildlife.

Across PBOW, the land slopes gently to the north-northeast towards Lake Erie. Elevations range from 675 feet (ft) above mean sea level (amsl) at the southwest edge of the site to 625 ft amsl in the northern portion of the property at Bogart Road, resulting in an average slope of approximately 0.3 percent (%). The Lake Plains region is over 69% cropland, 2.7% pasture land, and 10.5% forest (Ohio Department of Natural Resources [ODNR], 1985). However, since the Trojan Powder Company operated the site in the early 1940s and agricultural production on the land ceased, undeveloped portions of the former PBOW have become second generation forest and open fields.

The 2BG site was used as a burning ground for production process wastes. It is not known when the site was first used for burning; however, a 1950 aerial photo clearly shows the site to be in existence and photographs dated as late as 1962 show ongoing operations at the site. Restoration of the site was performed in 1963 when the area was cleared of debris and the ground restored to proper grade. A review of aerial photographs taken in 1950, 1958, and 1968 indicated the presence of a disturbed area with a rectangular berm (1950), a pronounced burn ground (1958), and a large cleared area that shows the land to have been restored (1968). Based on these photos, the size of the burning ground was estimated to be 125 ft wide by 175 ft long (Jacobs 2006).

An RI (Jacobs, 2006) was performed May through July 2004 to define the extent of soil contamination and to evaluate impacts to the groundwater, surface water, and sediment in the vicinity of 2BG. RI sample collection and data evaluation are discussed in detail in the *Final Site Characterization Report Remedial Investigation Part 1, at Reservoir No. 2 Burning Ground* (Jacobs, 2006).

Based on the information obtained from these investigations, the burn layer at 2BG covers an area of approximately 21,000 square feet (ft^2), or approximately half an acre. This area covers much of the southeastern portion of the existing open field and extends approximately 20 to 30 ft into the wooded area south of the clearing. The burn layer is on average one ft below ground surface (bgs) and one ft in thickness.

Soil within the burn layer footprint represents the most contaminated area at the site. The highest concentrations of explosives and lead at the site were found in the burn layer material. The burn layer material sampled from trenches TR08 and TR09 is composed of 3.6% and 4.5% explosives, respectively. Surface soil contamination outside of the burn area is not as pervasive.

Subsurface soil contamination is minimal both inside and outside of the burn layer footprint. Explosives were detected in the subsurface soil beneath the burn layer at six of the seven locations. Based on these data, downward and lateral migration of contaminants is minimal.

Contaminants detected in the sediment include dioxins/furans and polycyclic aromatic hydrocarbons (PAHs). Organic concentrations are significantly higher at the location upstream of the site, adjacent to the service road, suggesting that contaminants are related to a source other than the burning ground. Polychlorinated biphenyls (PCBs) and explosives, which are the primary contaminants associated with the burning ground, were not detected in the sediments.

Ecological surveys were performed by Jacobs ecologists and their subcontractor in the spring and fall of 2008. Prior to arrival at the site, personnel obtained relevant information on the site including topographic, township, county, and other appropriate maps, and determined the

location of potential ecological units such as streams, creeks, ponds, grasslands, forest, and wetlands at or near the site. Additionally, the 1994 biological inventory of PBOW (National Aeronautics and Space Administration [NASA], 1995) that identified the locations of threatened and endangered species at PBOW was reviewed. The location of known or potential contaminant sources affecting the site and the probable gradient of the pathway by which contaminants may be released from the site to the surrounding environment were identified. Jacobs personnel also used the reconnaissance to evaluate the site for more subtle indications of potential effects from contaminant release.

2.1.2 Surface Water

The only surface water feature within the 2BG site is an intermittent drainage ditch that runs east to west and forms the north edge of the site. Wetlands were not observed at the site. The drainage ditch is located 200 to 300 ft north of the former burn area and drains to the west across the site, then northwest to Pipe Creek. This drainage feature is approximately four ft wide and six to seven ft deep. Elevations in the ditch range from 635 ft amsl upstream of the site to 633 ft amsl downstream. A less pronounced intermittent drainage ditch runs south to north along the eastern side of the service road and discharges into the main drainage ditch north of the site. This drainage system is intermittent and flows only during the wet season and following precipitation events, remaining essentially dry during the summer months (Jacobs 2006). The drainage ditch was dry at the time of the spring and fall ecological surveys. The drainage ditch is not considered significant aquatic habitat.

2.1.3 Wetlands

According to the National Wetland Inventory (NWI) Maps for the area (U.S. Fish and Wildlife Service [USFWS], 1977), there are no designated wetlands at the 2BG site. It should be noted that the accuracy of NWI maps are limited, especially in relatively flat landscapes such as PBOW because minor depressions often contain isolated wetlands not easily identified through air photo interpretation, the process used by the USFWS in preparing NWI maps. No wetlands or significant aquatic habitats were observed during conduct of the spring and fall ecological surveys.

2.1.4 Vegetative Communities

The predominant community types observed at 2BG are Upland Old Fields, Shrub Thickets, and Successional Woods.

Figure 2-1 is a general habitat map that presents the type and extent of biological communities within the site. The ecological survey is provided in Appendix A. A general description of each predominant vegetative community type is provided below.

Upland Old Fields. These areas are dominated by grasses and herbs and have been recently disturbed by mowing and/or brush hogging. Scattered shrubs, small trees, and groups of shrubs also occur in these areas.

Shrub Thickets. Dense areas of shrub thickets are present at 2BG. *Cornus racemosa* (gray dogwood) dominates most of these areas. *Eleagnus umbellata* (autumn olive) is also common. Small trees and saplings also are present within the shrub thickets.

Successional Woods. Successional woods are comprised of small and moderate sized trees, primarily *Fraxinus pennsylvanica* (green ash), *Acer negundo* (box elder), and *Populus deltoids* (cottonwood). These areas generally have moderate to dense shrubby understory. The herbaceous layer is dense in most areas. *Carex* spp. (sedges) dominate most of the understory.

2.1.5 Species Inventory

Based on information from ODNR (1995) and information collected during the site reconnaissance in May and October of 2008, species lists were prepared for plants, mammals, birds, reptiles, amphibians, and fish. Of the 365 plant species documented at the 6,453 acre former PBOW by the ODNR, 85 of the common plant species frequently observed at 2BG are listed in Table 2-1. The ecological survey is provided in Appendix A.

Of the 43 species of mammals that may be found in the region based on species range maps, white-tailed deer were observed onsite during the ecological surveys (Table 2-1). Numerous deer tracks were also observed during the site reconnaissance. Other mammals observed included the eastern fox squirrel and raccoon. It is likely that other species are present but were not observed due to the short duration of the field visits.

Of the 129 species of birds that may be found in the region based on species range maps, 105 species (81 percent) have been recorded at the former PBOW by the ODNR during their multiyear studies. Twenty one bird species were documented at 2BG during the ecological surveys performed by Jacobs. Of the species recorded by the ODNR, 49 were neotropical migrants and would not be expected to nest at the former PBOW. ODNR (1995) notes that, of the top 50 bird species recorded at the former PBOW, only 6 were ground nesters and 3 others occasionally nest on the ground, suggesting that ground nesting birds are being stressed at the facility.

The large deer population that feeds on much of the ground cover at the former PBOW limits the cover available for nesting birds and results in increased predation for these species (ODNR, 1995). Current burning practices used by NASA limit ground cover over the eastern portion of PBOW. Burning has not been conducted in the 2BG vicinity for at least 10 years (Long, 2008). Former burning practices are not expected to have an impact on the current presence of species at 2BG, as any ground cover affected by previous burning would have had ample time to recover. The 15 most abundant bird species recorded at the former PBOW by the ODNR included the American robin; red-winged blackbird; European starling; song sparrow; common grackle; field sparrow; American goldfinch; indigo bunting; blue jay; common yellowthroat; brown-headed cowbird; house wren; gray catbird; northern cardinal; and cedar waxwing. All of the bird species were observed during the ecological surveys with the exception of the red-winged blackbird and common yellowthroat (Table 2-1). However, due to the lack of wetland habitat at Site 2BG, observation of red-winged blackbird and common yellowthroat would not be expected.

Of the 14 species of reptile that may be found in the region based on species range maps, 10 species (71%) have been observed at the former PBOW, including turtles and snakes (ODNR, 1995). During the ecological surveys, no reptiles were observed at 2BG.

Of the 10 species of amphibians that may be found in the region based on species range maps, nine species (90%) have been observed at the former PBOW (ODNR, 1995), including

salamanders, toads, and frogs. No amphibians were observed at 2BG during the ecological surveys.

According to ODNR (1995), a combination of electro-shocking and seining was conducted during the field investigation that identified 14 species of fish at PBOW. Species observed included suckers, sunfish, minnows, sticklebacks, and bullheads. However, none are expected to be present at 2BG given the poor quality or lack of surface water habitat.

In addition to the wildlife discussed above, additional species observed during site reconnaissance visits included ants (active ant mounds), yellow jackets, honey bees, cicadae, monarch butterfly, Japanese beetles, and unidentified moth species.

Figures 2-2 and 2-3, respectively, provide simplified terrestrial and aquatic food webs for 2BG as ecological conceptual site models (ECSMs).

2.1.6 Threatened and Endangered Species Information

According to an Ohio Division of Natural Areas and Preserves (DNAP) review of their natural heritage maps and files (Woischke, 1998), there are records of legal status threatened or endangered species within a 2-mile radius of the site. These species include the following:

- Sedge wren (*Cistothorus platensis*) - endangered
- Dwarf bulrush (*Lipocarpha micrantha*) - threatened
- Twisted yellow-eye-grass (*Ayris torta*) - threatened
- Field sedge (*Carex conoidea*) - threatened
- Least St. John's-wort (*Hypericum gymnanthum*) - endangered
- Flat-leaved rush (*Juncus platyphyllus*) - endangered
- Bushy aster (*Aster dumosus*) - threatened

In addition, based on information contained in ODNR (1995), there are several species of threatened or endangered plants, potentially threatened plants, and threatened or endangered birds that have been recorded at PBOW, as follows:

- Grove sandwort (*Arenaria laterijlora*) - threatened
- Thin-leaved sedge (*C. cephaloidea*) - endangered
- Ashy sunflower (*Helianthus mollis*) - threatened
- Prairie false indigo (*Baptisia lactea*) - potentially threatened
- Broad-winged sedge (*C. alata*) - potentially threatened
- Round-fruited hedge-hyssop (*Gratiola virginiana*) - potentially threatened
- Tall St. John's wort (*H. majus*) - potentially threatened
- Virginia meadow beauty (*Rhexia virginica*) - potentially threatened

- Tall nut rush (*Scleria triglomerata*) - potentially threatened
- Lance-leaved violet (*Viola lanceolata*) - potentially threatened
- Winter wren (*Trogoldytes troglodytes*) - endangered
- Cattle egret (*Bublucus ibis*) - endangered
- Black-crowned night heron (*Aycticorax nycticorax*) - threatened
- Trumpeter swan (*Cygnus buccinator*) - endangered
- Upland sandpiper (plover) (*Bartramia longicauda*) - threatened
- Indiana bat (*Myotis sodalis*) - endangered

Also, wild white lettuce, a species considered extinct in Ohio but common in prairie states was recently found on site, although not in the vicinity of 2BG (Peecook, 1998).

Based on the ecological surveys conducted by Jacobs, no threatened or endangered species were found in 2BG.

2.2 Selection of Chemicals of Potential Ecological Concern

COPECs are the chemicals that were identified as site-related and potentially capable of contributing significantly to risk, and were carried forward to quantitative evaluation in the SLERA (Table 2-2). The following subsections describe the process for their identification. Prior to initiation of the SLERA, a list of chemicals present in site samples was compiled. This initial list included all chemicals detected in any site medium. COPECs were selected from this list as described in the following sections.

2.2.1 Data Organization

The data for each chemical were sorted by medium. For ecological impacts, soil from 0 to 5 ft bgs was considered from within the burn area and outside of the burn area. The 0 to 5 ft depth interval was selected for three primary reasons: (1) to maintain consistency with other PBOW ecological risk assessments that used this depth interval; (2) to include potential exposure to the shrew, a representative burrowing insectivorous mammal; and (3) to increase the size of the total soil data base by including samples collected from a depth interval of 4 to 5 ft; although the shrew may not actually burrow to a depth of 5 ft, there may be other burrowing mammals that do burrow this deep. Chemicals that were not detected at least once in a medium were not included in the risk assessment. Available background data were determined for each medium. Sources of background information include data from previous investigations.

Analytical data may have qualifiers from the analytical laboratory quality control or from the data validation process that reflect the level of confidence in the data. Some of the more common qualifiers and their meanings are as follows (EPA, 1989):

U Chemical was analyzed for but not detected; the associated value is the sample quantitation limit.

J Value is estimated, probably below the contract-required quantitation limit.

N The analysis indicates an analyte for which there is presumptive evidence to make a tentative identification.

NJ The analysis indicates a "tentatively identified analyte", and the reported value represents its approximate concentration.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R Quality control indicates that the data are unusable (chemical may or may not be present).

B Inorganic chemicals: the concentration is less than the contract-required detection limit but greater than the instrument detection limit. Organic chemicals: the concentration in the sample is not sufficiently higher than the concentration in the blank, using the five-times, ten-times (5x, 10x) rule, whereby a chemical is considered a nondetect unless its concentration exceeds five or ten times the blank concentration. For common laboratory contaminants (acetone, 2-butanone [methyl ethyl ketone], methylene chloride, toluene, and the phthalate esters), the sample concentration must exceed 10 times the blank concentration to be considered a detection.

"J", "N", and "NJ" qualified data were used in the SLERA; "R" data and "B" qualified data were not used. The handling of "U" qualified data (nondetects) in the SLERA is described in Section 2.2.2. Where confidence was reasonably high that the chemical was present but the actual concentration was somewhat in question, the data generally were used.

Occasionally, chemicals were analyzed under two different analytical programs. For example, the dinitrotoluenes (DNTs) were analyzed by EPA Method 8330 for nitroaromatics as well as EPA Method 8270B for semivolatile organic compounds (SVOCs). EPA Method 8330 provides concentration values for total DNT, but does not provide isomer-specific data. EPA Method 8270B, on the other hand, provides concentrations for 2,4- and 2,6-DNT isomers, but does not provide a value for total DNT. For each medium evaluated it was necessary to choose the results provided by one analytical method rather than both to avoid double-counting and overestimating ecological hazard. The value for the method considered more sensitive to that specific analyte was used in lieu of the value from the less sensitive method when multiple analytical results were available for an analyte from more than one method. In most cases, the method with the lower detection limit and reporting limit was the more sensitive method.

2.2.2 Developing Exposure-Point Concentrations

The exposure-point concentration (EPC) is a conservative estimate of the average concentration of a COPC, statistically calculated from the analytical results of all samples for a particular environmental medium within an exposure unit.

Because of the uncertainty associated with characterizing contamination in environmental media, both the mean and the upper confidence limit (UCL) of the mean are usually estimated

for each COPC in each medium of interest. The UCL of the mean computed at a 95 percent confidence level is generally referred to as the 95 percent UCL of the arithmetic mean (UCL_{95}).

Concentrations of analytes in environmental samples are determined by using established analytical methods and accurately calibrated laboratory instrumentation. These methods and instruments have practical limits in their ability to accurately report very low and very high analyte concentrations. Each laboratory data value is typically reported with two associated limits; a detection limit and a quantitation limit. The detection limit is the minimum concentration of the analyte that can be differentiated from the normal, random noise of an analytical method or instrument. The quantitation limit, sometimes referred to as the reporting limit, is the minimum concentration of the analyte that can be reliably quantified. Laboratories sometimes report numerical values for analyte concentrations that are greater than the detection limit but less than the quantitation limit. These values are often referred to as "trace level concentrations" and are only rough approximations of the true analyte concentration.

Very high analyte concentrations can cause serious damage to some analytical instruments. Samples with known or suspected high analyte concentrations may be diluted before analysis to lower the analyte concentrations to levels that can be safely analyzed. The analyzed concentration values are then adjusted by the dilution factor to properly represent the analyte concentration in the original undiluted sample.

When a sample is diluted, the detection limits and quantitation limits for that sample must be adjusted by the dilution factor. For example, if a sample is diluted by a factor of 10 (the sample volume is increased to 10 times the original sample by dilution with a solvent before analysis), then the corresponding detection limit and quantitation limit must be multiplied by a factor of 10.

The detection limits and quantitation limits used in this project have been adjusted for dilutions and are referred to as sample detection limits and sample quantitation limits to indicate that the limits are specific to each individual sample and analytical method. These sample detection and quantitation limits may have also been adjusted by the laboratory for percent moisture in soil and sediment samples. Samples with higher moisture content will have higher sample detection and quantitation limits when the data are reported on a dry-weight basis.

For some analytical methods, the presence of even just one analyte with a very high concentration in a sample may necessitate the use of a large dilution that will result in elevated sample detection and quantitation limits for all analytes in that sample for that analytical method. This is especially true for organic analyses using gas-chromatography and mass-spectrometer methods such as for dioxins/furans, nitroaromatics, PCBs, PAHs, volatile organic compounds (VOCs), and SVOCs. For these methods a lower dilution for the non-detected analytes cannot be used without possible damage to the analytical instruments. Large dilutions of 1000 or even 5000 times may be required for some samples from heavily contaminated areas. These large dilutions result in two significant complications for statistical computations.

- Some analytes may be present in a sample at significant concentrations, but are reported as non-detects with elevated sample detection limits because of dilutions.

- Elevated sample detection limits, even for true non-detects, can cause a high-bias in computed UCL_{95} estimates. The magnitude of this high-bias can be significant and is unpredictable for most non-parametric UCL methods.

The proper handling of non-detect data points in statistical computations is critical for the generation of realistic UCL_{95} estimates. Analytical laboratory data sets used for UCL_{95} estimates can be classified as full, left-censored, or interval-censored data sets.

- A full data set is one in which every data point has a value that is assumed, for the purposes of statistical computations, to accurately represent the true analyte concentration in each sample. All data values in a full data set are considered to be positive detections because each reported concentration is greater than the associated sample quantitation limit.

- A left-censored data set is one in which some of the data points cannot be reported with an accurately known value. The non-detects in a laboratory data set are known as censored values. Laboratory data non-detects are called left-censored because the data are reported as "less-than" some value, usually the sample detection limit. These "less-than" data are said to be censored at the detection limit. The only information known about the numerical value of a censored data point is that the true concentration is less than the censoring value.

- Interval-censored data sets contain data points that are reported as being between two censoring values. Many laboratories report estimated data as "trace-level values" with concentrations between the sample detection limit and the sample quantitation limit. These trace-level values are intended to represent concentrations that are believed by the laboratory to be positive detections, above the sample detection limit, but have concentrations too small to be accurately quantified. These interval censored data can be evaluated by some statistical methods as being greater than a lower censoring level (the sample detection limit) and less than higher censoring level (the sample quantitation limit).

The interval-censored data values for this project were evaluated as though they were positive detections. Trace-level values reported as greater than the sample detection limit but less than the sample quantitation limit are assumed to be detected, uncensored values. For this project, all data sets were considered to be either full or left-censored.

The EPA statistical software package ProUCL Version 4.0 was used to compute estimated UCL_{95} concentrations for all data sets containing four or more distinct detected values. ProUCL uses numerous parametric and nonparametric statistical methods to compute UCLs. Parametric methods assume that the data set being evaluated fits closely to a known, predictable data distribution. Nonparametric methods do not rely on the data set fitting a specific distribution.

ProUCL computes parametric UCLs using normal, lognormal and gamma distributions. Nonparametric UCLs are computed using a variety of methods including maximum likelihood estimation, central limit theorem, jackknife, bootstrap, Kaplan-Meier (KM), and regression on order statistics. Maximum likelihood estimation and regression on order statistics methods are sometimes referred to as semi-parametric methods. These two methods use techniques to estimate or assume temporary surrogate values for censored data points before computing estimated UCLs.

Detailed descriptions of the statistical methods use in ProUCL are available in the following two documents:

- ProUCL Version 4.0 User Guide (EPA/600/R-07/038, April 2007, www.epa.gov)

- ProUCL Version 4.0 Technical Guide (EPA/600/R-07/041, April 2007, www.epa.gov)

The ProUCL User Guide acknowledges that at one time the EPA recommended using one-half the detection limit as replacement values for non-detects when only a small percentage of the data were non-detects. This has become the traditional approach for many projects and is known as the "DL/2" method. The EPA now advises against using DL/2 for any statistical calculations. Several studies have shown that DL/2 frequently results in unrealistic statistical results. Several nonparametric statistical methods are now recommended for data sets with non-detects (censored data sets). Since many work plans still reference the DL/2 method it has been included in ProUCL Version 4.0 but with the following comment "Note: DL/2 is not a recommended method."

ProUCL computes estimated UCLs using two slightly different approaches depending on whether the data set to be evaluated is a full data set or a censored data set.

Full Data Sets

- Raw statistics are computed (i.e., minimum, maximum, mean, median).

- Data set is tested for normal distribution, lognormal distribution, and gamma distribution.

- Parametric UCLs are computed as appropriate.

- Nonparametric UCLs are computed as appropriate.

- Recommended UCLs are listed based on logic programmed into ProUCL.

Censored Data Sets

- Raw statistics are computed based on the detected data points only.

- Data set is tested for normal, lognormal and gamma distributions using the detected data points only.

Note: For data sets with multiple detection limits for non-detects, all data less than the largest non-detect detection limit are considered non-detects. This includes positive detections with values less than the maximum non-detect detection limit. If non-detects exist for samples with very large dilutions, a large percentage of the detected data may be considered to be non-detect at an elevated detection limit. This approach is known as "censoring at the highest detection limit."

- Parametric UCLs are computed as appropriate, treating all values less than the largest non-detect detection limit as non-detects.

- Nonparametric UCLs are computed as appropriate, treating all values less than the largest non-detect detection limit as non-detects --- except for the KM, regression on order statistics, and DL/2 methods. KM and regression on order statistics are able to

handle multiple detection limits. The DL/2 method simply uses one-half the sample detection limit for each non-detect value.

- Recommended UCLs are listed based on logic programmed into ProUCL.

For data sets with multiple detection limits for non-detects, ProUCL recommends using the KM method UCLs. For this project, essentially all data sets with more than one non-detect have multiple detection limits for the non-detect samples. The KM UCLs are therefore recommended for data sets in this project that have more than one non-detect sample.

Analytical data from field duplicates were joined with parent sample results to yield one result for use in the statistical manipulations as follows:

- Use average of field duplicate and parent sample if both are positive detections.
- Use average of field duplicate and parent sample detection limits if both are non-detects.
- Use detected value if one sample is a positive detection and the other is a non-detect.

The UCL_{95} or maximum detected concentration (MDC), whichever is smaller, was selected as the EPC and is understood to represent a conservative estimate of average for use in the risk assessment (RA) or in various transport models used to estimate exposure.

2.2.3 Frequency of Detection

Chemicals that are detected infrequently may be artifacts in the data that do not reflect site related activity or disposal practices. Such chemicals were not included in the risk evaluation. Generally, chemicals that are detected only at low concentrations in less than 5% of the samples from a given medium are dropped from further consideration unless their presence is expected based on historical information for the site. For the current assessment, nitroaromatics were not eliminated as COPECs because this group of constituents is site related.

2.2.4 Essential Nutrients

Evaluating essential nutrients is a special form of risk-based screening applied to certain ubiquitous elements that are generally considered to be required nutrients. Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPECs because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine, and phosphorus may be eliminated as COPECs, provided that their presence in a particular medium is shown to be unlikely to cause adverse effects to biological health. No members of this latter group were selected as site-related chemicals; therefore, an exposure analysis for essential nutrients was not performed (Appendix C).

2.2.5 Background Screening

For background screening, the MDC was compared to the PBOW chemical-specific background screening concentration (BSC) for soil. BSCs for soil established as part of the acid areas investigation (IT, 1998) were used for this RA. BSCs for soil were reported as the 95 percent

upper tolerance limit (UTL) for lognormal data sets or the 95th percentile for datasets with a nonparametric distribution.

Background screening also applies to certain organic compounds that are part of normal background concentrations. Such chemicals may include VOCs and PAHs, a class of organic compounds that form from natural or anthropogenic combustion of organic matter including fossil fuels and are generally ubiquitous in the environment. Airborne PAHs associated with non-Department of Defense sources may be deposited on soil and leach to groundwater.

Background screening was applied to each inorganic constituent whose MDC exceeded the risk-based screening criteria (RBSC) and that could not be characterized as an infrequently detected analyte. Background screening consisted of comparing the MDC of the site data set to the BSC. Background screening was not used to eliminate COPECs. Comparison of COPEC concentrations to background levels is discussed in Section 5.4.

2.2.6 Comparison to Risk-Based Screening Ecotoxicity Values

A comparison was made between EPCs of chemicals in sampled media and the risk-based screening ecotoxicity value (RBSEV) for ecological endpoints following recommendations received from OEPA and as discussed in EPA Region 5 Biotechnical Assistance Group (BTAG) Bulletin No. 1 (EPA, 1996a). Chemicals that exceeded the RBSEVs, or for which no RBSEV is available, were retained as COPECs. The following RBSEVs or RBSEV hierarchy, as noted, were used for the ecological evaluation:

- **Soil.** Soil (surface and subsurface soil) screening values were selected using the following hierarchy: (1) Preliminary Remediation Goals for Ecological Endpoints (Efroymson et. al.1997a); (2); Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process (Efroymson, Suter, and Will, 1997b); (3) Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants (Efroymson et. al. 1997c); and (4) Ecological Data Quality Levels (EDQLs)(EPA,1999a). It should be noted that effects on heterotrophic processes may not be relevant to ecological receptors of concern at the site.

- **Sediment.** Sediment screening values were selected using the following hierarchy: (1) EDQLs (EPA, 1999a); (2) Preliminary Remediation Goals for Ecological Endpoints (Efroymson et. al.1997a); and (3) Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (Ontario Ministry of the Environment and Energy [OME]; 1993).

The results of the screening and the selected COPECs with RBSEVs for ecological endpoints of concern are presented in Table 2-2. COPECs were selected for further consideration in the SLERA only if the MDC exceeded the available RBSEV. If no RBSEV was available, the constituent was carried forward for consideration in the SLERA unless it was within background or if it was detected in less than 5 percent of the samples for a given medium.

2.3 Results of the Data Evaluation

Previous investigations at 2BG confirmed the presence of soil contamination from former PBOW operations. The sampling locations for these investigations are provided in Figure 2-4. The objective of the soil investigation conducted under the RI (Jacobs, 2006) was to evaluate the

presence of soil contamination at additional former site facilities not previously sampled. Sediment samples were collected from the drainage ditch bounding 2BG; a total of 3 sediment samples were collected. No surface water samples were collected because the drainages were dry at the time sampling.

Table 2-2 provides the following information for each detected chemical for each medium at 2BG:

- Chemical name,
- Frequency of detection,
- Range of detected concentrations,
- Range of detection limits,
- Arithmetic mean (average) of site concentrations,
- 95th percent UCL on the arithmetic mean,
- Appropriate BSC (background),
- Appropriate RBSEV, and
- Selection/exclusion of chemical as a COPEC.

Soil Within Burn Area. A maximum of 29 soils samples were collected from within the burn area at 2BG, which includes six samples collected in October 1996 and 23 samples collected in May 2004. Depths for the samples were from surface to five ft bgs. Contaminants detected include dioxins/furans, nitroaromatics, metals, PAHs, PCBs, and VOCs. None of the 29 samples were tested for all detected compounds. Generally, 14 samples were tested for dioxins/furans, 19 samples were tested for nitroaromatics (except for 2-amino-4,6-dinitrotoluene and 4-nitrotoluene, which was tested for in 13 samples, and nitrobenzene, which was tested for in 25 samples), metals (except for tin, which was analyzed for in only three samples), PCBs, and PAHs. VOCs were tested for in 6 to 19 samples, depending on the analytes. Specific compounds exceeding soil RBSEVs are identified in Table 2-2.

Soil Outside Burn Area. A maximum of 55 soil samples were collected from outside the burn area at 2BG, which includes 10 samples collected in October 1996, 20 samples collected in May 2004, 10 samples collected in April 2005, and 15 samples collected in December 2005. Depths for the samples were from surface to five ft bgs. Contaminants detected include nitroaromatics, cyanide, metals, PCBs, PAHs, SVOCs, and VOCs. Not all compounds were tested for in every sample. Only 45 samples were tested for metals (except for lead which was tested for in all 55 samples and tin was tested for in only 4 samples). Cyanide was tested for in 25 samples. SVOCs were tested for in 10 samples (except for 2-methylnaphthalene which was tested for in 35 samples and four tri/di-chlorobenzene compounds which were tested for in 30 samples). VOCs were tested for in 13 to 30 samples, depending on the analyte. Specific compounds exceeding soil RBSEVs are identified in Table 2-2.

Sediment. Contaminants detected in three sediment samples from May 2004 at 2BG include dioxins/furans, metals, PAHs, and VOCs. Specific compounds exceeding sediment RBSEVs are identified in Table 2-2.

2.4 Selection of Assessment Receptors

Assessment receptors were selected to represent receptor groups (e.g., insectivorous mammals) known or likely to be present at the site. The assessment receptors were selected for evaluation during the predictive SLERA. The selection process focused on species, groups of species, or functional groups, rather than higher organization levels such as communities or ecosystems. This focuses the exposure characterization on species or components that are the most likely to be affected by the toxicological and mobility characteristics of the COPECs and also focuses on those COPECs that are most likely to produce greater effects in the on-site ecosystem. Site biota was organized into two major functional groups: terrestrial and aquatic. For terrestrial communities, the major groups are plants and wildlife, including terrestrial invertebrates, mammals, and birds. For aquatic and/or wetland communities, the major groups are flora and fauna and sediment-dwelling organisms. Species presence at the site was determined by a literature review and the ecology survey (Sections 2.1.5 and 2.1.6) prior to identification of target receptor species.

Primary criteria for selecting appropriate assessment receptors included, but were not limited to, the following:

- The assessment receptor has a relatively high likelihood of contacting chemicals via direct or indirect exposure.
- The assessment receptor exhibits marked sensitivity to the COPECs given their mode of toxicity, propensity to bioaccumulate, etc.
- The assessment receptor is a key component of ecosystem structure or function (e.g., importance in the food web, ecological relevance).

The assessment receptor may be listed as rare, threatened, or endangered (RTE) by a governmental organization or may represent a critical habitat for RTE species. Based on the availability of species-specific data, an RTE surrogate species may have been selected. Additional criteria for selection of assessment receptors were used to identify species that offer the most favorable combination of characteristics for determining the implications of on-site contaminants. These criteria included (1) limited home range; (2) role in local nonhuman food chains; (3) potential high abundance and wide distribution at the site; (4) sufficient toxicological information available in the literature for comparative and interpretive purposes; (5) sensitivity to COPECs; (6) relatively high likelihood of occurrence on site following remediation (if required); (7) suitability for long-term monitoring; (8) importance to the stability of the ecological food chain or biotic community of concern; and (9) relatively high likelihood that they will be present at the site or that habitats present at the site could support the species.

It is important that sufficient toxicological information be available in the literature for the receptor species or that a closely related species be selected. While the ecological communities at the site have species with many desirable characteristics for use as receptor species, not all of these species have been used extensively for toxicological testing.

2.4.1 Terrestrial Receptors

Seven representative assessment receptor species that are expected or possible in the vicinity of 2BG were selected as indicator species for the potential effects of COPECs. These indicator species represent two classes of vertebrate wildlife, mammals and birds, and a range of both

body size and food habits, including herbivory, omnivory, and carnivory. Potential impacts to terrestrial plants are considered in Section 5.1. The seven species selected include the deer mouse (*Peromyscus maniculatus*; small, omnivorous mammal), short-tailed shrew (*Blarina brevicauda*; small, insectivorous mammal), Eastern cottontail rabbit (*Sylvilagus floridanus*; medium-sized herbivorous mammal), marsh wren (*Cistothorus palustris*; small insectivorous bird), white-tailed deer (*Odocoileus virginianus*; large herbivorous mammal), raccoon (*Procyon lotor*; medium-sized omnivorous mammal), and red-tailed hawk (*Buteo jamaicensis*; large, carnivorous bird). The marsh wren was selected as a surrogate for the sedge wren, an Ohio endangered species that has been documented in the general area and a species that may be expected on site given the availability of some preferred nesting habitat.

The deer mouse, shrew, Eastern cottontail, and marsh wren represent the prey base for the larger predators of the area, represented by the red-tailed hawk. A terrestrial food web is presented in Figure 2-2. Many of these species have limited home ranges, particularly the deer mouse, cottontail, shrew, and marsh wren, which make them particularly vulnerable to exposure from site contaminants. All of the selected terrestrial receptor species have a potentially high abundance and wide distribution at the site; also, sufficient toxicological information, with the exception of some bird species, is available in the literature for comparative and interpretive purposes. In addition, all of the selected species are likely to occur after site remediation, if risk management decisions require it. All species are considered important to the stability of the local ecological food chain and biotic community. Finally, all the selected species have readily available exposure data, as summarized in the Wildlife Exposure Factors Handbook (EPA, 1993).

Larger mammal species were generally not selected as sensitive receptors due to their large home ranges; however, the far-ranging red-tailed hawk was retained due to its unique role as a top predator in the food chain and the white-tailed deer was retained due to its high abundance at the site. Smaller birds were generally not included because most are migratory. The potential risk to species with larger home ranges and migratory avian species was bounded by the predicted risks to the selected terrestrial indicator receptors. Area use factors were conservatively set to 100 percent for the mouse, shrew, rabbit, wren, and raccoon, due to their relatively small home ranges. For the deer and hawk, the area use factor was set at 0.02 (2%) and 0.01 (1%), respectively, based on these two species' relatively large home ranges (518 and 842 hectares, or 1,280 and 2,081 acres, respectively), compared with the size of the site (25 acres).

Results of the assessment receptor selection process are presented in detailed biological and ecological descriptions called assessment receptor profiles (ARPs). Additionally, the biologically relevant criteria used to select the 7 terrestrial assessment receptors are discussed and summarized in the ARPs (Appendix B).

2.4.2 Aquatic Receptors

The only aquatic habitat at the site is the intermittent surface water drainage on the northern side and eastern side of the site. The drainages are considered poor aquatic habitat as they are dry most of the year. Exposure of aquatic benthic dwelling organisms within the intermittent drainages was assumed to occur via direct contact with contaminants in sediment. Potential effects to sediment-dwelling organisms were assessed using sediment quality criteria for the protection of aquatic life (Section 5.2).

2.5 Ecological Endpoint (Assessment and Measurement) Identification

The protection of ecological resources such as habitats and species of plants and animals is a principal motivation for conducting the SLERA. Key aspects of ecological protection are presented as policy goals. These are general goals established by legislation or agency policy that are based on societal concern for the protection of certain environmental resources. For example, environmental protection is mandated by a variety of legislation and government agency policies such as the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (United States Code [U.S.C.] Title 42, Section 9601 [42 U.S.C. 9601] et seq.) and the National Environmental Policy Act (42 U.S.C. 4321 et seq.). Other legislation includes the Endangered Species Act 16 U.S.C. 1531-1544 and the Migratory Bird Treaty Act 16 U.S.C. 703-711. To determine whether these protection goals are met at the site, assessment and measurement endpoints were formulated to define the specific ecological values to be protected and to define the degree to which each may be protected.

Unlike the human health risk assessment process, which focuses on individual receptors, the SLERA focuses on populations or groups of interbreeding nonhuman, non-domesticated receptors. In the SLERA process, the risks to individuals are assessed only if they are protected under the Endangered Species Act, are species that are candidates for protection, or are species that are considered rare. The results of this SLERA may be used to determine whether remediation or additional investigation is warranted at the site to protect populations of ecological receptors.

Given the diversity of the biological world and the multiple values placed on it by society, there is no universally applicable list of assessment endpoints. Suggested criteria that may be considered in selecting assessment endpoints suitable for a specific ecological risk assessment are: (1) ecological relevance; (2) susceptibility to the contaminant(s); (3) accessibility to prediction and/or measurement; and (4) definable in clear, operational terms (Suter, 1993). Selected assessment endpoints should reflect environmental values that are protected by law, are critical resources, or have relevance to ecological functions that may be impaired. Both the entity and attribute are identified for each assessment endpoint.

Assessment endpoints are inferred from effects to one or more measurement endpoints. The measurement endpoint is a measurable response to a stressor that is related to the valued attribute of the chosen assessment endpoint. It serves as a surrogate attribute of the ecological entity of interest (or of a closely related ecological entity) that can be used to draw a predictive conclusion about the potential for effects to the assessment endpoint. Information gained during the site reconnaissance was used to assist in the selection of assessment and measurement endpoints. These endpoints, formal expressions of the environmental values to be protected (Suter, 1993), were used to focus the goals of the SLERA (Table 2-3).

Measurement endpoints for this SLERA are based on toxicity values from the available literature and not on statistical or arithmetic summaries of actual field or laboratory observations or measurements. Where possible, receptors and endpoints were concurrently selected by identifying those that are known to be adversely affected by chemicals at the site based on published literature. COPECs for those receptors and endpoints were identified by drawing on the scientific literature to obtain information regarding potential toxic effects of site chemicals to site species. This process ensures that a conservative approach is taken in selecting endpoints and evaluating receptors that are likely to be adversely affected by the potentially most toxic chemicals at the site.

2.5.1 Assessment Endpoints

The assessment endpoints for 2BG are stated as "the protection of long-term survival and reproductive capabilities for terrestrial invertebrates, herbivorous mammals, omnivorous mammals, insectivorous mammals and birds, carnivorous birds, and aquatic benthic invertebrates." The corresponding H_o for each of the assessment endpoints is stated as: "the presence of site contaminants within soil, sediment, vegetation, and prey will have no effect on the survival or reproductive capabilities of populations of terrestrial invertebrates, herbivorous mammals, omnivorous mammals, insectivorous mammals and birds, carnivorous birds, and benthic invertebrates." Aquatic mammals and birds were not evaluated because of the absence of aquatic habitat at Site 2BG.

Assessment receptor species were selected based on the likelihood of finding the species at 2BG. Historical information, site reconnaissance, and the availability of toxicological data were used to select terrestrial and aquatic receptor species. These receptor species are depicted in food web ECSMs in Figures 2-2 and 2-3. Food web models are simplified versions of the possible movement of contaminants through the food chain present or potentially present at the site. Due to lack of data for all possible species, key species have been selected to represent broad classes, or guilds.

The food web conceptual site models were developed to illustrate how the selected terrestrial and aquatic species are ecologically linked within food webs. One species was used to represent each of the major trophic levels and habitats at the site. The decision was made not to complicate the food web models with detailed species selection at the base of the food web (i.e., specific terrestrial/benthic invertebrates or aquatic vertebrates). Thus, generic terrestrial invertebrates, benthic invertebrates, and aquatic sediment-dwelling organisms were used to represent the bottom of the food chain. For terrestrial invertebrates and plants, partitioning coefficients and simple empirical uptake models were employed to estimate COPEC concentrations within tissues (Section 3.1). These tissue concentrations were then used as input values for exposure to higher trophic level receptors through the dietary ingestion route. Brief life-history descriptions for the selected area receptor species are provided in Appendix B.

All trophic levels may be exposed to COPECs, either by direct exposure to contaminated abiotic media or through ingestion of lower trophic level food items. Primary producers (plants) absorb COPECs as well as nutrients from soil and/or water. Through abiotic processes, COPECs can adsorb to the sediment and detritus particles. When these particles settle and become part of the benthic substrate, they may also become a source of COPECs to benthic communities.

In terrestrial species, bioconcentration may occur in plants and invertebrates, and higher food chain receptors may bioaccumulate COPECs through the ingestion of food items.

2.5.2 Measurement Endpoints

Measurement endpoints are numerical expressions of observations (e.g. toxicity test results or community diversity indices) that can be compared statistically to detect adverse responses to a site contaminant. Examples of typical measurement endpoints include mortality, growth or reproduction in toxicity tests; individual abundance; species diversity; and the presence or absence of indicator data in field surveys of existing impacts (EPA, 1997).

For assessments, measurable responses to stressors may include lowest observed adverse effect levels (LOAEL), no observed adverse effect levels (NOAEL), lethal concentration to 50 percent (LC_{50}) of the test population, lethal dose to 50 percent (LD_{50}) of the test population, or effective concentration for 20 percent (EC_{20}) of the test population, collectively termed toxicity reference values (TRVs) (see Section 4.2 for further explanation). In addition, critical effect values for sediment and soil were selected as measurement endpoints (Table 2-3). The most appropriate measurement endpoints were chosen based on exposure pathways as well as ecotoxicity of the contaminant.

2.6 Ecological Conceptual Site Models

Pictorial representations of potential exposure through the food web are presented in Figures 2-2 and 2-3. The ECSMs trace the contaminant pathways through both abiotic components and biotic food web components of the environment. The ECSMs present all potentially complete exposure pathways. The ECSMs were used as a tool for judging the appropriateness and usefulness of the selected measurement endpoints in evaluating the assessment endpoints, and for identifying sources of uncertainty in the exposure characterization.

3.0 EXPOSURE CHARACTERIZATION

Estimates of the nature, extent, and magnitude of potential exposure to COPECs present at 2BG were developed for both current and reasonably plausible future assessment receptors. Exposure characterization is critical in further evaluating the risk from potential exposure to contaminants identified as COPECs. The exposure assessment was conducted by linking the magnitude (concentration) and distribution (locations) of the contaminants detected in environmental media, evaluating pathways by which chemicals may be transported through the environment, and determining the points at which assessment receptors may contact contaminants. The concepts of bioaccumulation, bioconcentration, and biomagnification are used throughout this document. These terms are defined by EPA (1997) as follows:

- **Bioaccumulation.** General term describing a process by which chemicals are taken up by an organism either directly from exposure to a contaminated medium or by consumption of food containing the chemical.

- **Bioconcentration.** A process by which there is a net accumulation of a chemical directly from an exposure medium into an organism.

- **Biomagnification.** Result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain.

3.1 Exposure Analysis

An exposure analysis combining the spatial and temporal distribution of the assessment receptors and the COPECs was performed to evaluate potential exposure. The exposure analysis focused on the amount of the COPECs assumed to be bioavailable and the pathways by which the ecological receptors would be exposed. The focus of the analysis was dependent on the assessment receptors evaluated and the assessment and measurement endpoints.

Contamination of biota could result from exposure to one or more COPECs. Bioavailability is an important contaminant characteristic that influences the degree of chemical-receptor interaction. Bioavailable substances are those that a receptor can extract from the environment. Bioavailability of a chemical is a function of its physical and chemical environmental factors including grain size and organic carbon content and its tendency to partition between one environmental medium and another (e.g., soil to water) or to the receptor.

Exposure pathways for biota may be direct (bioconcentration) or through the food web via the consumption of contaminated organisms (bioaccumulation and biomagnification). Direct exposure routes include ingestion, inhalation, dermal contact, and absorption. Examples of direct exposure include animals incidentally ingesting contaminated soil or sediment (e.g., during burrowing or dust-bathing activities); animals ingesting surface water; plants absorbing contaminants by uptake from contaminated sediment or soil; and the dermal contact of aquatic organisms with contaminated surface water or sediment. Food web exposure can occur when terrestrial or aquatic fauna consume contaminated biota. Examples of food web exposure include animals at higher trophic levels consuming plants or animals that bioaccumulate contaminants.

Exposure pathways consist of four primary components: source and mechanism of contaminant release, transport or exposure medium, potential receptors, and exposure route. A chemical may also be transferred between several intermediate media before reaching the potential receptor. All of these components are addressed in this SLERA. The major fate and transport properties associated with site contaminants are presented in subsequent sections. These properties directly affect a contaminant's behavior in each of the exposure pathway components.

For terrestrial faunal receptors, calculation of exposure rates relied upon determination of an organism's exposure to COPECs found in surface soil and on transfer factors used to estimate potential food-chain exposure. Exposure rates for terrestrial wildlife receptors were based on ingestion of contaminants from these media and from consumption of other organisms. Given the scarcity of available data for dermal and inhalation exposure of wildlife, potential risk from these pathways was not estimated. In addition, dermal and inhalation pathways were generally considered to be incidental for most species, with the possible exception of burrowing animals and dust-bathing birds.

The first step in estimating exposure rates for terrestrial wildlife involved the determination of food ingestion and drinking water intake rates for assessment receptors. EPA (1993) includes exposure parameters for a number of avian and mammalian species. Available data for feeding and watering rates and dietary composition were obtained for species, or were estimated using allometric equations (Nagy, 1987). Data gathered on incidental ingestion of soil were also incorporated for the assessment receptors. Species-specific exposure parameters are presented in Table 3-1.

Equations have been developed for terrestrial vertebrate receptors accounting for exposure via incidental ingestion of contaminated soil, ingestion of contaminated water, ingestion of plants grown in contaminated soil, and prey items. Singular equations have been developed for soil to plant uptake and for animal bioaccumulation (transfer factors). The basic equation for estimating dose through the dietary pathway is:

$$D_p = \sum_{k=1}^{m} (C_k \cdot F_k \cdot I_k)/W \qquad \textbf{Eq 3 .1}$$

where:

D_p = the potential average daily dose (milligram per kilogram per day [mg/kg-day])

C_k = the average COPEC concentration in the kth food type (milligrams per kilogram [mg/kg] dry weight)

F_k = the fraction of the kth food type that is contaminated

I_k = the ingestion rate of the kth food type (kilogram [kg] dry weight/day)

W = the body weight of the receptor (kg wet weight)

For sediment or soil, the percent carbon present is critical to partitioning. For these matrices, the octanol/water partition coefficient (K_{ow}) was converted to a soil adsorption coefficient (K_{oc}) value (EPA, 1996b) as follows:

$$Log\,K_{oc} = 0.00028 + (0.983x \log K_{ow}) \qquad \textbf{Eq. 3.2}$$

where:

K_{oc} = chemical-specific organic carbon partition coefficient

K_{ow} = chemical-specific octanol/water partition coefficient

This equation was chosen because it is the best fit for site-related compounds (semivolatile, nonionizing organic compounds).

Per EPA (1995) guidance, aquatic bioaccumulation factors (BAFs) were estimated by one of four methods, listed in order of preference:

- A measured BAF for an inorganic or organic chemical derived from a field study.
- A predicted BAF for an organic chemical derived from a field-measured biota-sediment accumulation factor.
- A predicted BAF for an inorganic or organic chemical derived from a laboratory-measured bioconcentration factor (BCF) and a food chain multiplier (FCM).
- A predicted BAF for an organic chemical derived from a K_{ow} and an FCM.

The EPA guidance notes that for chemicals for which no K_{ow} is available and for which no BCF is calculable, a default FCM of 1.0 should be used. Accordingly, for inorganics not thought to biomagnify and/or for which no literature value was available, the value of 1.0 was used at each trophic level.

In addition to the aquatic food web, FCMs were also related to an organism's trophic status as predator/prey, producer/consumer, etc., in the terrestrial food web. Although exposures of terrestrial floral and faunal receptors are significant considerations for many hazardous waste sites, well accepted models for predicting the fate of many contaminants in terrestrial systems are less developed. Trophic level compartments and transfer between compartments based on uptake, storage, and loss processes are not as well defined in terrestrial systems as in aquatic systems. In addition, the relationship between K_{ow} and bioconcentration is less well delineated by trophic level in terrestrial ecosystems. For this SLERA, soil-to-plant and food-to-muscle BAFs were obtained from EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (1999b) or estimated for organic constituents using the log K_{ow} relationships developed by Travis and Arms (1988). Soil-to-insect BAFs were obtained from EPA (1999b) or based on log K_{ow} relationships developed by Connell and Markwell (1990). Inorganic constituent BAFs were obtained from EPA (1999b) or based on literature values such as those found in Baes, et al. (1984), International Atomic Energy Agency (1994), and Ma (1982).

Literature values for receptor-specific sediment ingestion rates were used, where available; however, such values generally were not available. Where sediment ingestion rates could not be found, the receptor-specific incidental soil ingestion rate was used for sediment ingestion as well, where the receptor's life history profile suggested a significant aquatic component.

Tissue concentrations in vertebrate prey species were estimated from the daily intake of the COPECs through the use of transfer factors obtained from EPA (1999b) (Table 3-2). The total concentration of COPEC intake (including ingested soil and surface water) was then used in the calculation of tissue concentrations in prey species and the dietary exposure rate in all assessment receptors.

Exposure to four categories of environmental media are addressed in this SLERA, as discussed in the following subsections.

Soil Exposure Pathway. Soil exposure pathways are potentially important for terrestrial plants and animals at the site. For non-burrowing animal exposure, only surface soil samples were used. For burrowing animals such as the shrew, surface and subsurface soil samples were used.

For plant exposure, surface and subsurface soil samples were used because feeder roots may reach deeply into the subsurface. Thus, the white-tailed deer was assumed to ingest vegetation translocating COPECs from subsoils (Figure 2-4).

Environmental conditions including soil moisture, soil pH, and cation exchange capacities significantly influence whether potential soil contaminants remain chemically bound in the soil matrix or can be chemically mobilized in a bioavailable form and released for plant absorption. Literature values for soil-to-plant transfer rates for inorganic soil contaminants were used (Table 3-2).

Sediment Exposure Pathway. Sediment consists of materials precipitated or settled out of suspension in surface water or native soils underlying flowing or standing surface water bodies. Potential contaminant sources for sediment include buried or stored waste, and contaminated surface water, groundwater, and soil. The release mechanisms include storm-water runoff, groundwater discharge, and airborne deposition. Potential receptors to chemicals in contaminated sediment include aquatic flora and fauna. Direct exposure routes for contaminated sediment include contact by benthic-dwelling organisms such as amphipod invertebrates, uptake by aquatic flora, and ingestion by aquatic fauna. Indirect exposure pathways from sediment include consumption of bioaccumulated contaminants by consumers in the food chain. Chemical bioavailability of many nonpolar organic compounds such as PCBs and pesticides decreases with increasing concentrations of total organic carbon in the sediment; however, these compounds can still bioaccumulate up the food chain (Landrum and Robbins, 1990).

Surface Water Exposure Pathway. Surface water represents a potential exposure and transport medium for COPECs. However, no surface water data exists because the drainage ditches associated with 2BG are ephemeral and were dry at the time of sampling. Potential sources for contaminated surface water include buried or stored waste, contaminated soil and groundwater, and deposition of airborne contaminants. Release mechanisms include stormwater runoff, leaching, and groundwater seepage. Potential receptors of contaminated surface water include terrestrial and aquatic fauna and aquatic flora. Exposure routes for contaminated surface water include ingestion by terrestrial fauna and uptake and absorption by aquatic flora and fauna. Consumption of bioaccumulated contaminants represents a potential indirect exposure pathway for faunal receptors. Piscivorous receptor's exposure to fish was not quantified because of the lack of suitable habitat at the site. Chemical bioavailability of some metals and other chemicals is controlled by water hardness, pH, and total suspended solids.

Groundwater Exposure Pathway. Groundwater represents a potential transport medium for COPECs. Potential contaminant sources for groundwater include contaminated soil and buried or stored waste. The release mechanism for contaminants into groundwater is direct transfer of contaminants from waste materials to water as water passes through the materials.

Groundwater is not an exposure medium for ecological receptors. However, contaminant transport along the shallow groundwater pathway was considered an exposure route to aquatic life, wetlands, and some wildlife where the groundwater discharges to surface water. A groundwater assessment was not included in this SLERA due to the absence springs or other water resources at Site 2BG.

3.2 Exposure Characterization Summary

The estimated chemical intakes for each potentially exposed assessment receptor for each exposure pathway and scenario are presented in Tables 3-3 through 3-9 for the area within the 2BG and Tables 3-10 through 3-16 for the area outside of the Burning Ground. The intake estimates were combined with the COPEC TRVs, discussed in the following section, to derive estimates of potential adverse ecological effects. The uncertainties associated with the estimation of potential adverse effects are discussed in Section 5.4. The basis for each uncertainty has been identified, with the degree of uncertainty estimated qualitatively (low, medium, or high) or quantitatively, and the impact of the uncertainty estimated qualitatively (overestimate or underestimate, as appropriate).

4.0 ECOLOGICAL EFFECTS CHARACTERIZATION

The ecological effects characterization includes the selection of literature benchmark values and TRVs.

4.1 Selection of Literature Benchmark Values

Appropriate sources for literature benchmark values included *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA, 1999b), *Toxicological Benchmarks for Wildlife* (Sample, et al., 1996); *Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California* (Engineering Field Activity, West, 1998); *Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife* (CH2M-Hill, 2000); and LD_{50} values from data bases such as the Registry of Toxic Effects Concentrations (RTEC) (extrapolated to chronic NOAEL or LOAEL values using recommended Tri-Service [Wentsel et al., 1996] uncertainty factors). The primary source of benchmark values for this SLERA was EPA (1999b).

4.2 Selection of Toxicity Reference Values

The primary source of TRVs for this SLERA was EPA (1999b). These TRVs focus on the growth, survival, and reproduction of species and/or populations. TRVs were available for the specific receptor-endpoint combinations in most instances. However, for some COPECs, data on surrogate species was used. The NOAEL is the dose for a COPEC that has produced no known adverse effects in the test species. The NOAEL was judged to be an appropriate toxicological endpoint since it provides the greatest degree of protection to the receptor species. In instances where TRVs were unavailable for a site-associated COPEC, toxicological information for surrogate chemicals was used. This process is described in the following paragraphs.

Toxicity information pertinent to identified receptors was gathered for those analytes identified as COPECs. As previously noted, where data were unavailable for the exposure of a receptor to a COPEC, data for a surrogate chemical (e.g., benzo(a)pyrene for other PAHs) were gathered for use in the SLERA. No TRVs were calculated for this SLERA (Table 4-1).

Test species body weights used for COPEC TRVs are provided in Table 4-1. These factors were used together to derive a final adjusted TRV, also presented in Table 4-1. TRV uncertainties are discussed in Section 5.4.

Exposure rate TRVs provide a reference point for the comparison of potential toxicological effects from exposure to a contaminant. To complete this comparison, receptor exposures to site contaminants were calculated or, as in the case of plant receptors, exposure was estimated using the soil concentration.

The potential toxicity of essential nutrients is assessed in Appendix C, with maximum tolerance levels presented for several essential nutrients.

The equilibrium partitioning approach has been used by the EPA and OME in the preparation of sediment quality criteria for the protection of aquatic life. These criteria were used, as available, to assess sediment risks to aquatic receptors.

5.0 RISK CHARACTERIZATION

Risk characterization integrates information on exposure, exposure-effects relationships, and defined or presumed target populations. The result is an estimate of the likelihood, severity, and characteristics of potential adverse effects from environmental stressors present at a site. Qualitative and semiquantitative approaches were taken to estimate the likelihood of adverse effects occurring as a result of potential exposure of the assessment receptors to COPECs. Potential adverse affects to terrestrial plants were qualitatively assessed by comparing plant toxicity benchmarks with COPEC concentrations. Potential adverse impacts to aquatic biota were qualitatively assessed by comparing sediment quality criteria for the protection of aquatic life to sediment COPEC concentrations.

For the semiquantitative predictive assessment, TRVs and estimated exposure rates were used to generate hazard quotients (HQs) by dividing the receptor exposure rate for each contaminant by the TRV. HQs are a means of estimating the potential for adverse effects to organisms at a contaminated site and for assessing the potential for toxicological effects to occur.

Risk characterizations have been completed for soils inside the burn area and outside the burn area. For both areas, soils to a maximum depth of 5-feet bgs were used.

5.1 Terrestrial Plant Impact Assessment

The EPCs were compared with available benchmark concentrations developed for the protection of terrestrial plants to assess the potential impact of COPEC concentrations in surface soil on terrestrial plant species inside and outside the burn area. As shown in Table 2-2, benchmarks were exceeded by the COPEC EPC for multiple constituents. Additionally, benchmarks were not available for some of the COPECs retained for the SLERA. However, no signs of vegetative stress were noted inside or outside the burn area based on site reconnaissance surveys performed in May and October 2008 (Section 2.1.4).

5.2 Aquatic Biota Impact Assessment

The EPCs from 2BG were compared with available benchmark concentrations developed for the protection of aquatic life in sediments (benthic organisms) to assess the potential impact of COPEC concentrations in sediment on aquatic biota. Only sediment was evaluated because the drainage ditches are ephemeral and were dry at the time of sampling and dry at the time of the ecological surveys in the spring and fall. The ecological surveys concluded that there is limited to no aquatic habitat present at Site 2BG. As shown in Table 2-2, sediment concentrations for select metals, PAHs, 2,3,7,8-TCDD, and VOCs (acetone, methyl ethyl ketone, and cyclohexane) were initially identified as sediment COPECs. Of the metals, only selenium exceeded its background value and selenium is not a risk driver at the site. The VOCs identified as COPECs are commonly associated with laboratory contamination. No explosives were detected in the sediment samples. It is important to note that aquatic habitat is very poor at 2BG and is not a major habitat type.

5.3 Predictive Risk Estimation for Terrestrial Wildlife

Estimates of potential for risks associated with exposure to 2BG environmental media inside the burn area and outside the burn area were evaluated (Tables 5-1 through 5-14) through a series of quantitative HQ calculations that compared receptor-specific exposure values with TRVs.

The HQs were compared according to HQ guidelines for assessing the risk posed from contaminants. HQs less than or equal to 1 represent no probable risk. HQs from 1 up to but less than 10 represent a low potential for adverse ecological effects. HQs from 10 up to but less than 100 represent a significant potential that effects could result from greater exposure. HQs greater than 100 represent the highest potential for expected effects (Wentsel, et al., 1996). OEPA considers HQs greater than 1.0 to be potentially significant. It should also be noted that HQs are not measures of risk, are not population-based statistics, or linearly scaled statistics. Accordingly, an HQ above 1, even exceedingly so, does not necessarily mean that there is even one individual expressing the toxicological effect associated with a given chemical to which it was exposed (Tannenbaum, 2001; Bartell, 1996).

Conservative NOAEL-based HQs greater than 10 for terrestrial receptors inside the Burning Ground and outside of the burn area at 2BG were:

	HQ	
	Inside 2BG	**Outside the Burn Area**
Deer Mouse	(Table 5-4)	(Table 5-11)
2,3,7,8-TCDD TEQ	45	
2,4-Dinitrotoluene	19,010	59
2,6-Dinitrotoluene	661	23
Aluminum	121	128
Barium	20	
Iron	20	17
Acenaphthene	139	
Naphthalene	33	
Short-Tailed Shrew	(Table 5-1)	(Table 5-8)
2,4-Dinitrotoluene	87	14
2,6-Dinitrotoluene	20	4
Aluminum	275	5
Iron	36	21
Marsh Wren	(Table 5-3)	(Table 5-10)
2,3,7,8-TCDD TEQ	58	
2,4-Dinitrotoluene	10,460	32
2,6-Dinitrotoluene	292	10
Aluminum	137	145
Barium	13	
Iron	23	20
Acenaphthene	181	
Naphthalene	42	
Raccoon	(Table 5-7)	(Table 5-14)
2,3,7,8-TCDD TEQ	11	
2,4-Dinitrotoluene	105	
2,4,6-Trinitrotoluene		4,532
Aluminum		505
Iron		3,686
Eastern Cottontail	(Table 5-5)	(Table 5-12)
2,4-Dinitrotoluene	8,230	26

	HQ	
	Inside 2BG	**Outside the Burn Area**
2,6-Dinitrotoluene	326	11
Aluminum	34	36
White Tailed Deer	(Table 5-2)	(Table 5-9)
2,4-Dinitrotoluene	63	
Red Tailed Hawk	(Table 5-6)	(Table 5-13)
2,4-Dinitrotoluene	121	

Important routes of exposure for COPECS in soils were invertebrate and plant intake. Only terrestrial hazards were estimated for the raccoon because of the limited extent of aquatic habitat at the site.

5.4 Uncertainty Analysis

The results of the SLERA are influenced to some degree by variability and uncertainty. In theory, investigators might reduce variability by increasing sample size of the media or species sampled. Alternatively, uncertainty within the risk analysis can be reduced by using species-specific and site-specific data to better quantify contamination of media, vegetation, and prey through direct field measurements, toxicity testing of site-specific media, and field studies using site-specific receptor species. Detailed media, prey, and receptor field studies are costly; therefore, the preliminary predictive analyses of risk were conducted to limit the potential use of these resource-intensive techniques to only those COPECs that continue to show a relatively high potential for ecological risk. The results of the screening and predictive assessments are considered conservative because assessment criteria were developed based on conservative assumptions. This has the effect of maximizing the likelihood of accepting a false positive (Type I error: the rejection of a true H_o) and simultaneously minimizing the likelihood of accepting a true negative (Type II error: the acceptance of a false H_o).

A number of factors contribute to the overall variability and uncertainty inherent in ecological risk assessments. Variability is due primarily to measurement error. Laboratory media analyses and receptor study design are the major sources of this kind of error. Uncertainty, on the other hand, is associated primarily with deficiency or irrelevancy of effects, exposure, or habitat data to actual ecological conditions at the site. Species physiology, feeding patterns, and nesting behavior are poorly predictable; therefore, all toxicity information derived from toxicity testing, field studies, or observation will have uncertainties associated with them. Laboratory studies conducted to obtain site-specific, measured information often suffer from poor relevance to the actual exposure and uptake conditions on site (i.e., bioavailability, exposure, assimilation, etc., are generally greater under laboratory conditions as compared to field conditions). Calculating an estimated value based on a large number of assumptions is often the only alternative to the accurate, albeit costly, method of direct field or laboratory observation, measurement, or testing. Finally, habitat- or site-specific species may be misidentified if, for example, the observational assessment results are based on only one or even two brief site reconnaissance surveys.

The uncertainty analysis lists:

- many of the major assumptions made for the SLERA;

- the direction of bias caused by each assumption, i.e., whether the uncertainty results in an overestimate or underestimate of risk;
- the likely magnitude of impact as high, medium, low, or unknown; and,
- where possible, a description of recommendations for minimizing the identified uncertainties if the SLERA progresses to higher level assessment phases (EPA, 1992b).

The uncertainty analysis identifies and, where possible, quantifies the uncertainty in the individual preliminary scoping assessment, problem formulation, exposure and effects assessment, and risk characterization of this SLERA. The most important uncertainties associated with this SLERA are discussed in the following subsections.

Assumptions of bioavailability. The assumption that COPECs are 100 percent bioavailable likely overestimates the potential for adverse effects. The duration since the contaminant release affects bioavailability as the contaminant becomes sequestrated or transformed within the environmental media. Sequestration, transformation, and bioavailability are influenced by medium characteristics including pH, temperature, and organic carbon content.

Use of laboratory-derived or empirically-estimated partitioning and transfer factors. The use of laboratory-derived or empirically-estimated partitioning and transfer factors to predict COPEC concentrations in plants, invertebrates, prey species, and sediment pore water likely overestimates potential risks. As discussed above, the incorporation of COPECs into the food chain is influenced by the characteristics of the exposure medium which likely differs from that used in the laboratory to derive partitioning and transfer factors.

Use of laboratory-derived toxicity reference values. The use of laboratory-derived TRVs may over- or under-estimate the potential for adverse effects. The method of administration of the contaminant in the laboratory is significantly different than that experienced in the wild by the receptors.

Use of the HQ method to estimate risks to populations or communities. Many of the HQs presented in this SLERA are unrealistically high and toxicologically impossible. Estimated HQs greater than 1000 should be considered suspect.

Sampling and Analytical Limitations. It is not possible to completely characterize the nature and extent of contamination on any site. Uncertainties arise from limits on the number of locations that can be sampled. The sampling protocol used at 2BG, however, was designed to optimize efficiency of the sampling effort and reduce uncertainty by focusing on areas around former process buildings, storage structures, and potential transfer piping. Focusing on these most likely contaminated areas will bias potential soil contaminant concentrations higher than that for the entire region to provide a more conservative estimate of potential risk.

The sampling and analytical data are sufficient to identify explosives as the major contaminants in soil inside the burn area and to a lesser extent outside the burn area. Select metals were also identified as risk drivers but none of the metals exceeded their respective background values. 2,3,7,8-TCDD was also identified as a risk driver in soils inside the burn area but was not identified as a risk drivers for soils outside the burn area.

Selection and Quantification of Chemicals of Potential Ecological Concern. Uncertainty associated with the processes used to identify COPECs and estimate EPCs arises from the following:

1. Identifying background chemicals. Metals are judged to be present at concentrations comparable to background if the MDC does not exceed the BSC, or if statistical testing demonstrates that the site data and background data are drawn from the same population. Statistical testing of site data versus background was performed for this RA. All inorganic constituents detected in environmental media were initially carried through the ecological risk assessment to provide a conservative estimate of potential risks associated with exposure to site media. However after this was completed, the MDCs for all metals in soils and sediments were compared to their respective background criteria and all metals were determined to be below background with the exception of lead. However, lead was not a risk driver in soils or sediments. Some organic chemicals, such as PAHs, may be considered to be anthropogenic background. A limited number of PAHs were identified in soil and sediment at 2BG. There are no site-specific background data for the PAHs, and several were selected as contaminants of concern (COCs). PAH concentrations at 2BG fall within global background levels for urban areas. Only acenaphthene and naphthalene were risk drivers for soils inside the burn area.

2. Estimated EPCs are uncertain. For statistical purposes, if a constituent is positively identified at a site and has at least a single positive hit, all the samples with nondetects are assumed to have a value equal to half the reporting limit and are included in the data set. This process may introduce a conservative bias into the risk assessment. Computed UCL_{95} values are only estimates of the actual UCLs associated with each data set. Examples of factors affecting the uncertainty of these estimates include the number of samples, proportion of nondetects, conformance with an assumed mathematical distribution, imprecision of laboratory data, elevated detection limits (from dilutions, matrix interference, etc.), and statistical methodology. The confidence of computed UCLs for this project were qualitatively evaluated and identified as high, moderate, low and indeterminate. For indeterminate data sets, the MDC was used for the UCL. Uncertainties associated with the statistical determination of EPCs for the COCs in each medium are:

    a. A limited number of samples may not completely characterize the site because they provide less information about the population from which they are drawn than do larger sample sets. Accordingly, small sets tend to have a greater variability, which results in the calculation of wide confidence intervals on the mean concentration and high EPCs. In some cases, the UCL_{95} was greater than the maximum value for the SLERA; thus, the maximum value was chosen as the EPC. High confidence limits may introduce a conservative bias into the risk assessment.

    b. Biased soil sampling was completed within the burn area of 2BG. For each burn area soil sample the ash layer was visually identified and soil samples collected from that layer. The biased sampling approach likely overestimates chemical concentrations in the burn area resulting in greater chemical concentrations and predicted risk.

    c. Laboratory analytical techniques have a degree of uncertainty associated with them. These uncertainties are documented by using data qualifiers to reflect the degree of certainty of measurement. For example, some data were estimated (e.g.,

J-qualified), while other data were rejected (i.e., R-qualified). The direction of bias is unclear.

Consistent with EPA guidance (1992a), the UCL_{95} was used for the EPC. Therefore, the exposure assessment is likely to underestimate the EPCs in 5 percent of the cases and overestimate exposures in 95 percent of cases, imparting an overall conservative bias to the risk assessment. It should be noted that many of the maximum concentrations of COPECs measured in sediment were used as source-term concentrations due to the limited number of samples; an additional sampling effort could potentially reduce the hazard estimate.

6.0 SUMMARY AND CONCLUSIONS

This section briefly summarizes the results of the SLERA and interprets the results in light of the uncertainties associated with their estimation. Conclusions are derived from the risk assessment based on the responses to the assessment hypotheses.

The predictive assessment results may serve as the foci of discussions among risk managers and regulatory agencies concerning the potential need for additional investigation at 2BG to reduce the uncertainty associated with ecological risk estimates. The uncertainties associated with this SLERA likely resulting in an overestimation of the potential for adverse ecological effects include: assuming that COPECs are 100 percent bioavailable; use of laboratory-derived or empirically-estimated partitioning and transfer factors to predict COPEC concentrations in plants, invertebrates, prey species, and sediment pore water; use of laboratory-derived TRVs; and use of the HQ method to estimate risks to populations or communities. It is important to note that many conservative assumptions and modeling approaches were used in the predictive assessment, and that actual hazards to wildlife may be orders of magnitude lower than predicted herein. Estimated HQs greater than 1000 should be considered particularly suspect.

For soils, ecological risk was evaluated separately between the burn area and areas outside the burn area. Hence, two separate risk characterizations were completed for soils associated with 2BG. Soil data, from the 0 to 5-ft bgs interval, were used to characterize potential ecological risk in the burn area and outside the burn area. This was completed because the burn area itself is expected to contain greater chemical concentrations than areas outside the burn area, and therefore, greater risk to ecological receptors. The separate risk evaluation of the two areas (the burn area and outside the burn area) was completed to assist in future remedial decision-making for the site, if warranted. Ecological risk associated with drainage ditch sediments have been assessed across the entire 2 BG site.

Soil COPEC impacts to terrestrial plants are estimated to be generally insignificant as no vegetative stress was observed inside or outside the burn areas associated with 2BG.

Inside the burn area, terrestrial receptors are predicted to incur elevated hazards from exposure to 2,3,7,8-TCDD, explosives, and two PAHs (acenaphthene and naphthalene), based on the NOAEL-based HQ approach (Section 5.3). Several metals had elevated HQs but the metals concentrations are within the range of naturally occurring background. Estimated HQs are above 1,000 for some receptors using the NOAEL-based approach. However, the estimated HQs that are above 1,000 using the NOAEL-based approach are considered unrealistic and toxicologically impossible. The white-tailed deer and red-tailed hawk had no HQ exceedances greater than 10 outside of the burn area and only an HQ greater than 10 for 2,4-dinitrotoluene inside 2BG.

Outside the burn area, terrestrial receptors are predicted to incur elevated hazards from exposure to explosives only with 2,4,6-trinitrotoluene being the greatest risk driver for the raccoon only. The white-tailed deer and red-tailed hawk had no HQ exceedances greater than 10.

Sediment-dwelling aquatic receptors are predicted to have potentially elevated hazards from exposure to 2,3,7,8-TCDD and PAHs based on a comparison of sediment data to RBSLs. However, given the limited to poor quality aquatic habitat at the site, the potential for adverse impacts to aquatic biota is considered negligible.

Based on uncertainties associated with estimates of EPCs and potential COPEC toxicity, and on the fact that no wildlife RTE species have been confirmed at the site, remedial actions solely to address ecological concerns do not appear to be warranted at this time. However, a removal action within the burn area is anticipated based on the results of the human health risk assessment. If completed, calculated cleanup goals in support of the removal action will be protective of both human health and ecological receptors.

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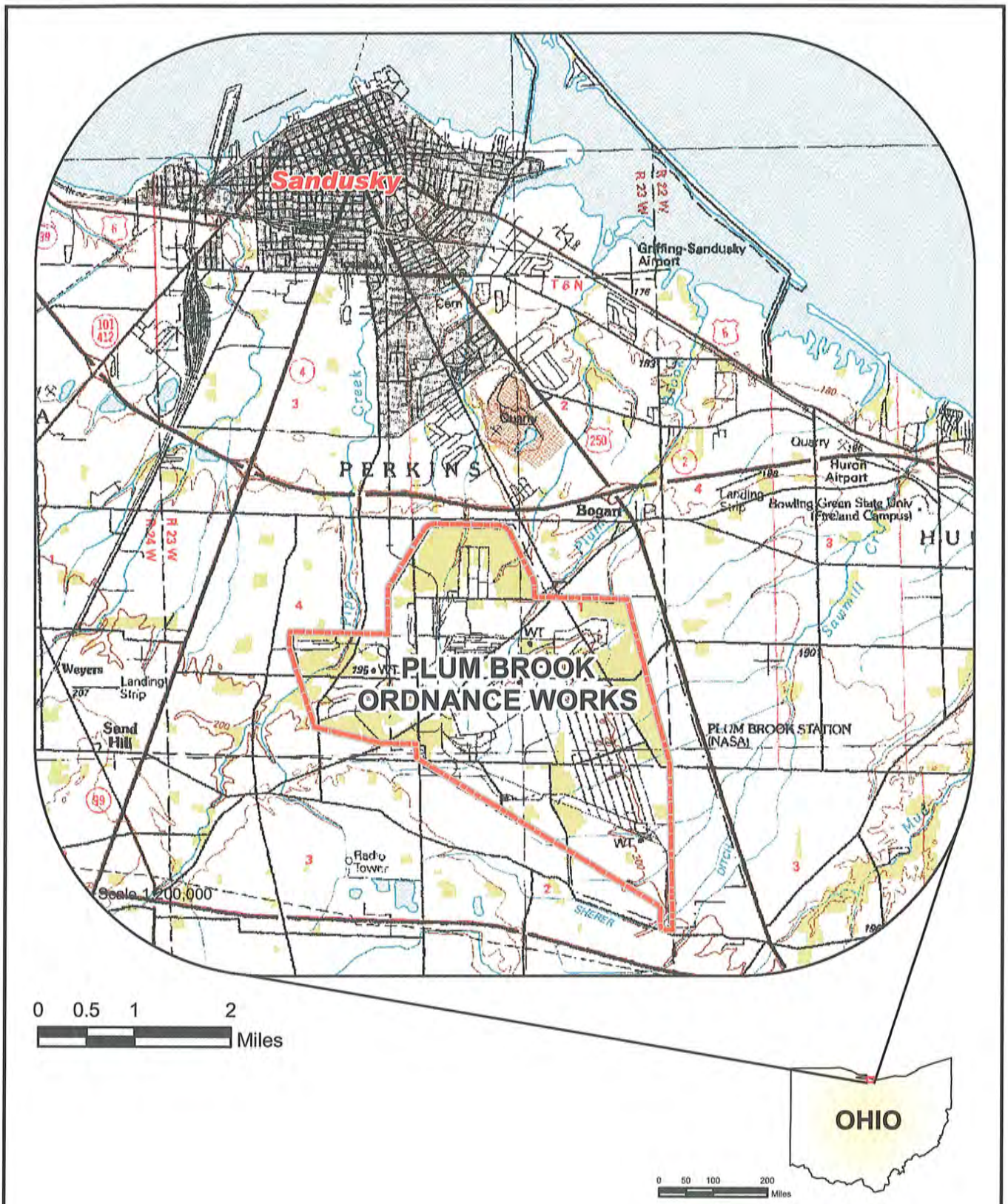
FIGURES



Legend

Plum Brook Ordnance Works Boundary

N

JACOBS

Location Map,
Plum Brook Ordnance Works
Sandusky, Ohio

Plumbrook Ordnance Works
Sandusky, Ohio

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Figure 1-1

1910000 .0000 1920000 .0000 1930000 .0000

630000 .0000

620000 .0000

PENTOLITE AREA

ACID AREA #3

ACID AREA #2

RESERVOIR #2 BURNING GROUND

WEST AREA RED WATER PONDS

G-8 BURNING GROUND AREA

TNT MANUFACTURING AREA C

LOWER TOLUENE TANKS AREA

TAYLOR ROAD BURNING GROUND AREA

TNT MANUFACTURING AREA B

MAINTENANCE SHOP AREA

ACID AREA #1

PENTOLITE ROAD RED WATER PONDS

UPPER TOLUENE TANKS AREA

TNT MANUFACTURING AREA A

ADDITIONAL BURNING GROUND AREA

SNAKE ROAD BURNING GROUND AREA

PATROL ROAD

BOGART ROAD

PLUM BROOK

DITCH

RANSOM BROOK

LINDSLEY

SANDUSKY - NORWALK ROAD

PENTOLITE ROAD

MAINTENANCE ROAD

PIPE CREEK

CAMPBELL STREET

TAYLOR ROAD

SHORT CUT

FOX ROAD

SNAKE ROAD

MAGAZINE ROAD

COLUMBUS AVE.

U.S. 250

CENTER MAGAZINE ROAD

SCHEID DITCH

WEST SCHEID ROAD

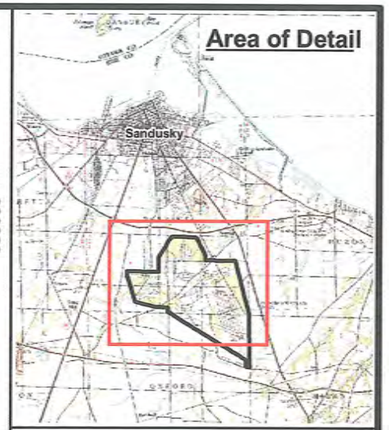
EAST SCHEID ROAD

TAFT ROAD

PATROL ROAD

COLUMBUS AVE.

Area of Detail



Legend

Area of Concern

Creek, Ditch, Conveyance

N

0 2,000 4,000 Feet

Sources

Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS

Location Map, Reservoir No. 2 Burning Ground

Plum Brook Ordnance Works
Sandusky, Ohio

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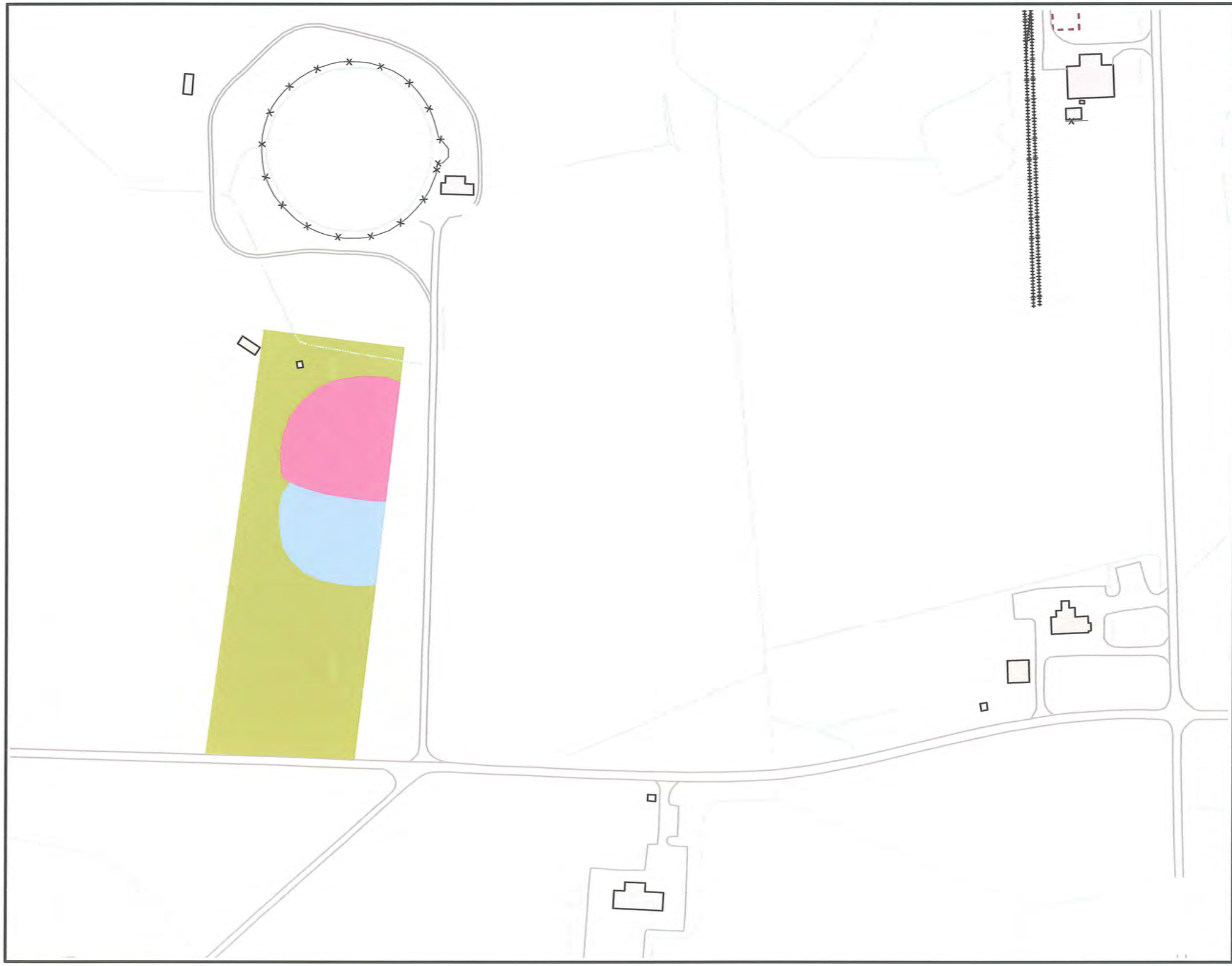
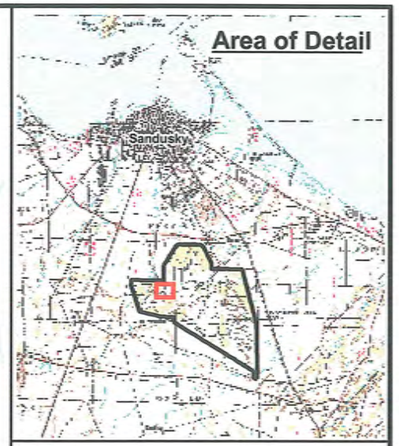
Figure 1-2



Area of Detail



Legend

- Upland Old Fields
- Shrub Thickets
- Successional Woods

Note:
bgs = below ground surface
Bkg. = Background Sample (values are provided in units consistent with the reported sample values)
PRG = Preliminary Remediation Goal (values are provided in units consistent with the reported sample values)

- Storage Tank Areas from Engineering Drawings
- Creek, Ditch, Conveyance
- Buildings
- Railway

N

0 50 100 200 Feet

Sources
Data mapped to Ohio State Plane North NAD83, map grid units in feet.

JACOBS

Reservoir #2
Burning Ground - Habitat Map

Plum Brook Ordnance Works
Sandusky, Ohio

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Figure 2-1

Figure 2-2

Simplified Terrestrial Food Web Conceptual Site Model (CSM)
Plum Brook Ordinance Works, Sandusky, Ohio

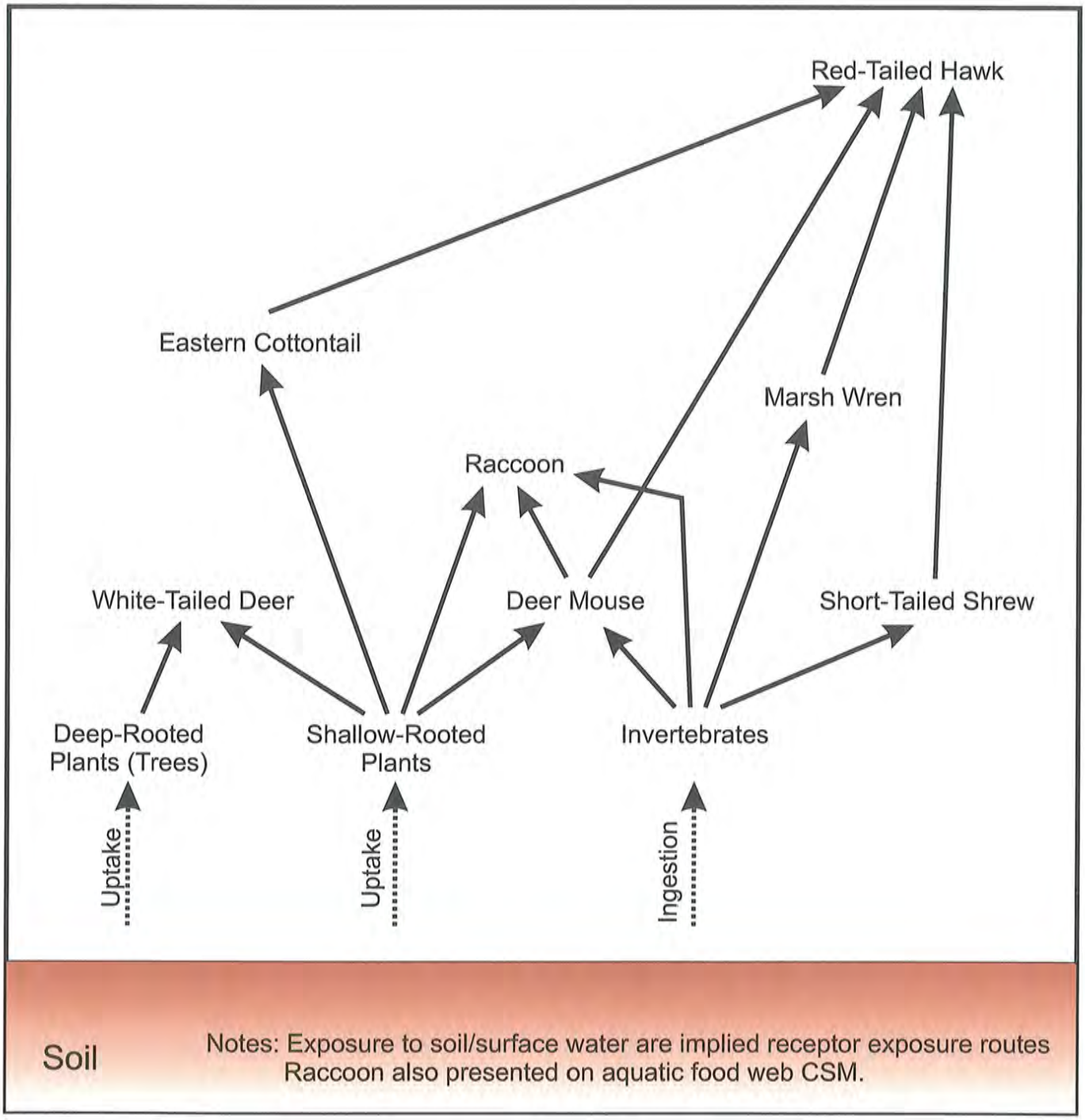
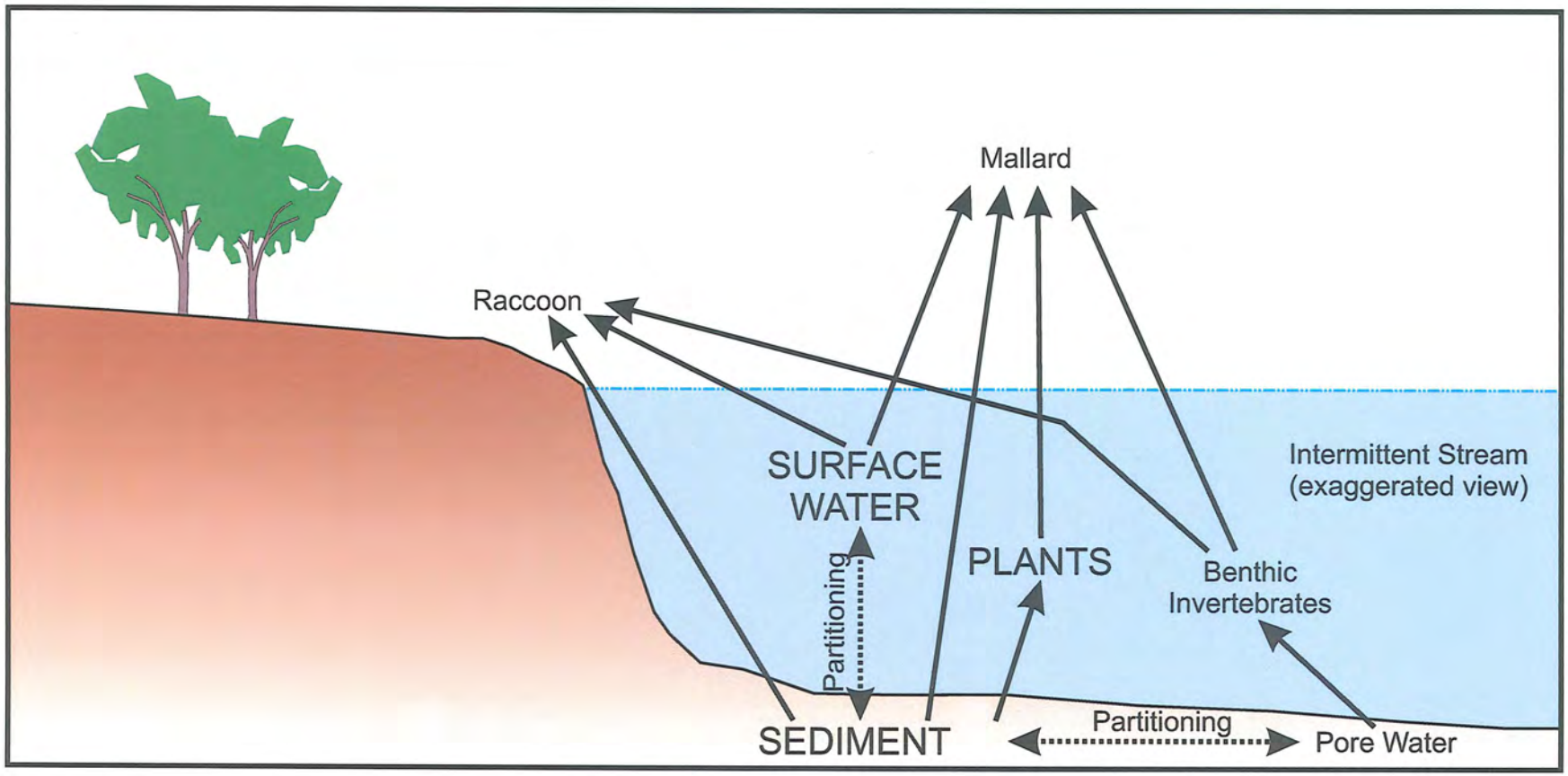


Figure 2-3

Simplified Aquatic Food Web Conceptual Site Model (CSM)
Plum Brook Ordinance Works, Sandusky, Ohio



Notes: Raccoon also presented on terrestrial food web CSM.

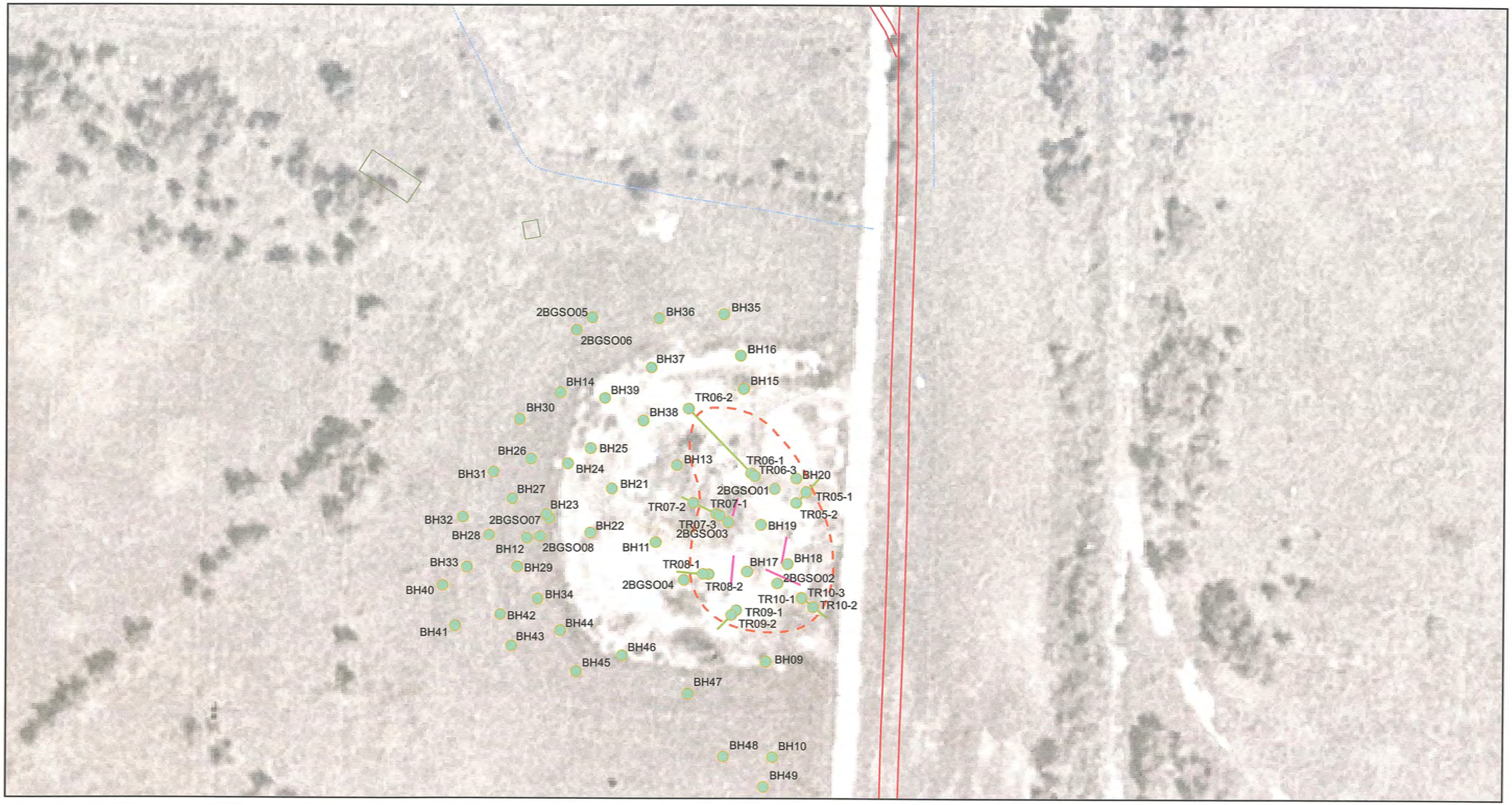
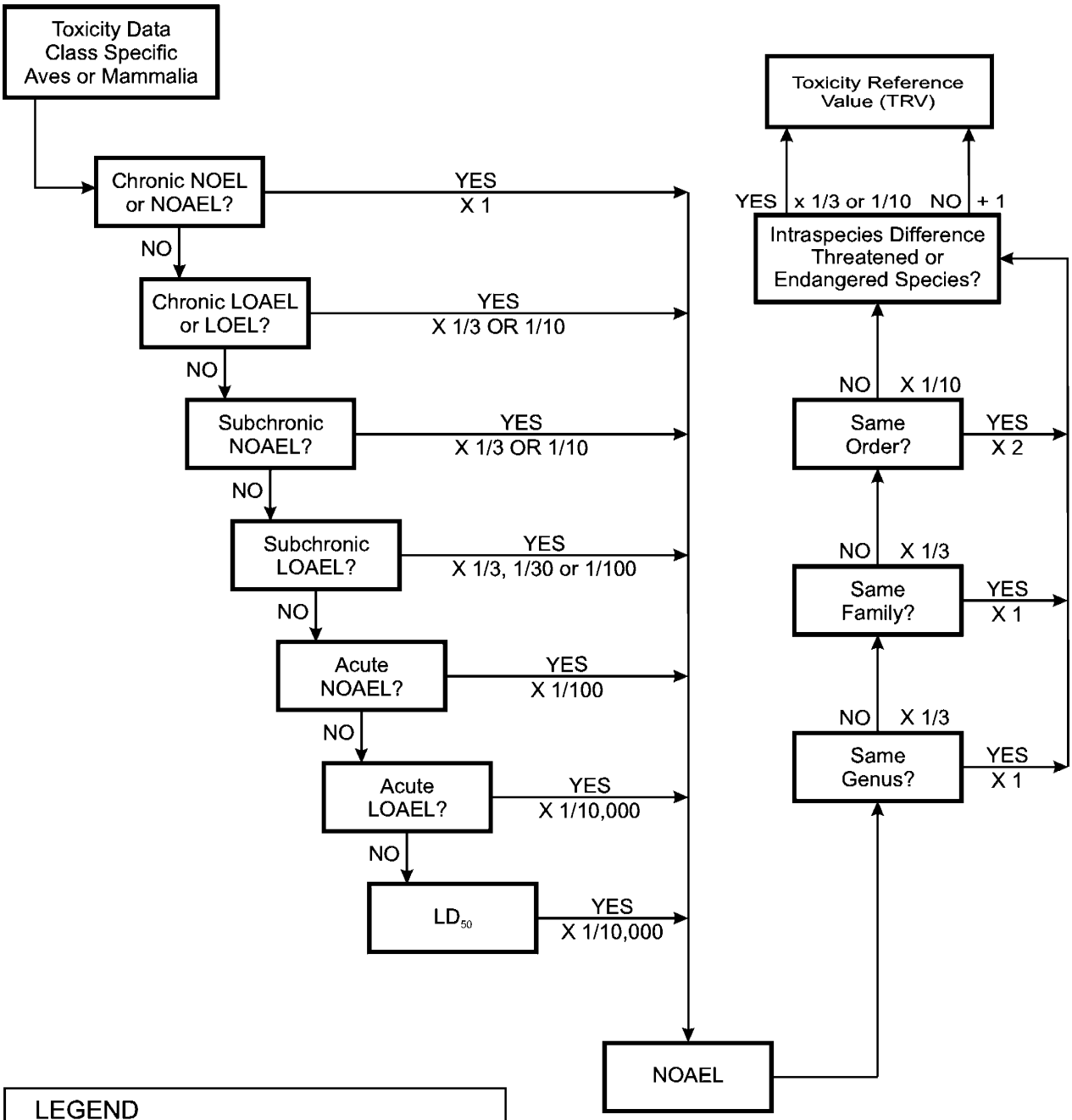

2BGSO05
BH36
BH35
2BGSO06
BH37
BH16
BH14
BH39
BH15
TR06-2
BH30
BH38
BH26
BH25
BH13
TR06-1
TR06-3
BH20
BH31
BH24
BH21
2BGSO01
TR05-1
BH27
TR07-2
TR07-1
BH23
TR05-2
BH32
2BGSO07
TR07-3
BH19
BH22
2BGSO03
BH28
BH12
2BGSO08
BH11
BH33
BH29
TR08-1
BH17
BH18
2BGSO04
TR08-2
2BGSO02
BH40
TR10-1
TR10-3
BH34
TR10-2
TR09-1
BH42
BH44
TR09-2
BH41
BH43
BH46
BH45
BH09
BH47
BH48
BH10
BH49
Area of Detail
Legend
Creek, Ditch, Conveyance
Buildings
1997 Trenches
Jacobs Trenches 2004
Soil Samples
0
50
100
200
Feet
Notes: Aerial Photography from 2005.
Data mapped to Ohio State Plane North NAD83, map units are feet.
3
JACOBS
Sampling Locations
Burning Ground Reservoir No. 2
Plum Brook Ordnance Works
Sandusky, Ohio
12/19/08 DMF S:/GIS/Projects/Plumbrook/Projects/ResNo2_BurningGround_RI_Report/ArcGIS/ResNo2GB_Sampling_Locs 0-5ft.mxd
Figure 2-4

Figure 4-1

Procedural Flow Chart for Deriving Toxicity Reference Values (TRVs)
from Class-Specific Toxicity Data
Plum Brook Ordinance Works, Sandusky, Ohio



LEGEND
NOEL - No Observed Effect Level
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
LD_{50} - Lethal Dose 50%

Credit: Adapted from Ohio ERA & ERR Ecological Risk Assessment and Guidance, 2003

TABLES

Table 2-1
NASA Plum Brook
Sandusky, Ohio
Reservoir No. 2 Burning Ground Species List
May 14 and October 2, 2008

Scientific Name	Common Name
FAUNAL SPECIES	
Buteo jamaicensis	red-tailed hawk
Cardinalis cardinalis	Northern cardinal
Catharus guttatus	Hermit thrush
Colaptes auratus	common flicker
Columba livia	rock dove
Cyanocitta cristata	blue jay
Dumetella carolinensis	gray catbird
Hylocichla mustelina	wood thrush
Icterus galbula	Northern oriole
Melanerpes erythrocephalus	red-headed woodpecker
Melospiza melodia	song sparrow
Molothrus ater	brown-headed cowbird
Passerina cyanea	indigo bunting
Pheucticus ludovicianus	rose-breasted grosbeak
Piranga olivacea	scarlet tanager
Quiscalus quiscula	common grackle
Sitta carolinensis	white-breasted nuthatch
Spinus tristis	American goldfinch
Spizella pusilla	field sparrow
Sturnus vulgaris	European starling
Troglodytes aedon	house wren
Turdus migratorius	American robin
Zenaida macroura	mourning dove
Odocoileus virginianus	white-tailed deer
Procyon lotor	raccoon
FLORAL SPECIES	
Acer negundo	box elder
Acer rubrum	red maple
Achillea millefolium	yarrow
Agrimonia parviflora	small-flowered groovebur
Alliaria petiolata	garlic mustard
Allium vineale	field garlic

Scientific Name	Common Name
Andropogon virginicus	broom sedge
Apocynum cannabinum	dogbane
Asplenium platyneuron	ebony spleenwort
Aster divaricatus	white wood aster
Aster lateriflorus	calico aster
Aster pilosus	heath aster
Berberis thunbergii	barberry
Botrychium virginianum	grape fern
Brassica nigra	yellow rocket
Carex gracillima	graceful sedge
Carex hirtifolia	sedge
Carex radiata	sedge
Carya ovata	shagbark hickory
Cirsium arvense	creeping thistle
Cornus racemosa	gray dogwood
Crataegus sp.	hawthorn
Cryptotaenia canadensis	honewort
Dactylis glomerata	orchard grass
Daucus carota	Queen Anne's lace
Dryopteris carthusiana	spinulose wood fern
Eleagnus umbellata	autumn olive
Elymus riparius	river bank wild rye
Equisetum arvense	field horsetail
Erigeron philadelphicus	common fleabane
Eupatorium rugosum	white snakeroot
Festuca sp.	fescue
Fragaria virginiana	strawberry
Fraxinus pennsylvanica	green ash
Galium aparine	cleavers
Galium asprellum	rough bedstraw
Galium circaezans	wild licorice
Galium triflorum	sweet bedstraw
Glechoma hederacea	ground ivy
Gleditsia triacanthos	honeylocust
Juglans nigra	black walnut
Leersia virginica	white grass
Lonicera tatarica	Tartarian honeysuckle
Maclura pomifera	osage orange
Medicago lupulina	black medick
Monarda fistulosa	wild bergamot
Morus alba	mulberry
Oxalis stricta	sorrel
Panicum virgatum	switch grass
Parthenocissus quinquefolia	Virginia creeper
Penstemon digitalis	beard tongue
Phleum pratense	timothy
Phryma leptostachya	lopseed

Scientific Name	Common Name
Plantago lanceolata	English plantain
Plantago major	common plantain
Platanus occidentalis	American sycamore
Poa alsodes	blue grass
Polygonatum biflorum	Solomon's seal
Polygonum virginianum	Virginia knotweed
Populus deltoides	cottonwood
Potentilla norvegica	cinquefoil
Prunus avium	pin cherry
Prunus serotina	black cherry
Pyrus coronaria	crabapple
Quercus palustris	pin oak
Ranunculus abortivus	kidney leaved buttercup
Ranunculus recurvatus	cursed crowfoot
Rosa multiflora	multiflora rose
Rosa setigera	prairie rose
Rubus allegheniensis	Allegheny blackberry
Rubus flagellaris	dewberry
Rubus occidentalis	black raspberry
Satureja vulgaris	wild basil
Setaria glauca	yellow bristle grass
Solanum carolinense	horse nettle
Taraxacum officinale	dandelion
Teucrium canadense	germander
Toxicodendron radicans	poison ivy
Trifolium repens	white clover
Ulmus americana	American elm
Verbesina alternifolia	wingstem
Vernonia gigantea	ironweed
Viola papilionacea	blue violet
Vitis aestivalus	summer grape
Vitis riparia	riverbank grape

Table 2-2
Summary Statistics and Identification of COPECs for Constituents Detected in Environmental Media at the Reservoir Number 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

Type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	95% UCL on Arithmetic Mean	Background	Toxicity Screening Level	COPEC
Inside the Burn Area												
Surface Soil												
DIO	2,3,7,8-TCDD TEQ	14	14	100	ng/Kg		0.69882	1187.33234	131.34547		0.199	YES
HE	1,3,5-Trinitrobenzene	19	5	26	ug/Kg	125 - 50000	686	85400	12584.92105		376	YES
HE	1,3-Dinitrobenzene	19	1	5	ug/Kg	125 - 50000	3545	3545	2995.78947		655	YES
HE	2,4,6-Trinitrotoluene	19	16	84	ug/Kg	125 - 250	394	35400000	4163046.526			YES
HE	2,4-Dinitrotoluene	19	14	74	ug/Kg	125 - 50000	370	9700000	919530.1579		1280	YES
HE	2,6-Dinitrotoluene	19	7	37	ug/Kg	125 - 50000	352	1400000	105162.7105		32.8	YES
HE	2-Amino-4,6-Dinitrotoluene	13	7	54	ug/Kg	125 - 125	2960	342000	45055			YES
HE	2-Nitrotoluene	19	3	16	ug/Kg	125 - 50000	782	7040	3432.21053			YES
HE	3-Nitrotoluene	19	1	5	ug/Kg	125 - 50000	777	777	2850.10526			YES
HE	4-Amino-2,6-Dinitrotoluene	19	4	21	ug/Kg	125 - 250000	2180	10600	12564.34211			YES
HE	4-Nitrotoluene	13	3	23	ug/Kg	125 - 12500	444	6670	1868			YES
INO	Aluminum	19	19	100	mg/Kg		4640	17390	10141.31579	15500	50	YES
INO	Antimony	19	6	32	mg/Kg	0.404 - 7.7	0.963	5.55	1.98047	9.3	0.142	YES
INO	Arsenic	19	19	100	mg/Kg		4.7	27.8	10.03474	36.5	5.7	YES
INO	Barium	19	19	100	mg/Kg		57.8	3965	468.8	826	1.04	YES
INO	Beryllium	19	16	84	mg/Kg	0.59 - 0.64	0.548	1.27	0.66584	1	1.06	YES
INO	Cadmium	19	14	74	mg/Kg	0.59 - 0.64	0.0657	2.04	0.53402		0.00222	YES
INO	Calcium	19	19	100	mg/Kg		2945	21120	7977.10526	52300		YES
INO	Chromium	19	19	100	mg/Kg		8.86	81.45	22.60579	29	0.4	YES
INO	Cobalt	19	18	95	mg/Kg	6.3 - 6.3	6.23	25.2	10.78632	116	0.14	YES
INO	Copper	19	19	100	mg/Kg		9.815	1580	157.07974	56.2	5.4	YES
INO	Iron	19	19	100	mg/Kg		13130	36260	23037.10526	234000	200	YES
INO	Lead	19	19	100	mg/Kg		8.94	8220	929.54053	48.6	0.0537	YES
INO	Magnesium	19	19	100	mg/Kg		2300	7830	4433.42105	10400		YES
INO	Manganese	19	19	100	mg/Kg		152	1000	334.81579	3506	100	YES
INO	Mercury	19	17	89	mg/Kg	0.039 - 0.04	0.0218	0.409	0.13854	0.1	0.1	YES
INO	Moisture, Percent	19	19	100	PERCENT		15.6	29.98	20.6			YES
INO	Nickel	19	19	100	mg/Kg		16.4	103	41.47368	55.1	13.6	YES
INO	Potassium	19	18	95	mg/Kg	626 - 626	928	2870	1614.78947	3390		YES
INO	Selenium	19	18	95	mg/Kg	0.59 - 0.59	0.267	4.47	1.4145	2	0.0276	YES
INO	Silver	19	13	68	mg/Kg	0.108 - 1.3	0.132	1.285	0.53195	11.1	2	
INO	Sodium	19	13	68	mg/Kg	592 - 639	64.7	1390	400.21842			YES
INO	Thallium	19	14	74	mg/Kg	1.18 - 1.26	1.3	3.32	1.69	1.3	0.0569	YES
INO	Tin	3	1	33	mg/Kg	0.467 - 0.472	5.31	5.31	1.9265		7.62	
INO	Vanadium	19	19	100	mg/Kg		10.5	40.8	24.95789	40.9	1.59	YES
INO	Zinc	19	19	100	mg/Kg		48.55	1540	308.02368	322	6.62	YES

Table 2-2
Summary Statistics and Identification of COPECs for Constituents Detected in Environmental Media at the Reservoir Number 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
PAH	Acenaphthene	19	11	58	ug/Kg	73.1 - 420	90.9	67400	7898.44737		20000	YES
PAH	Acenaphthylene	19	12	63	ug/Kg	39.9 - 420	42.2	131000	14785.69737		682000	
PAH	Anthracene	19	6	32	ug/Kg	4.55 - 410	4.69	73.2	75.39974		1480000	
PAH	Benzo(a)anthracene	19	8	42	ug/Kg	8.04 - 420	9.7	501	128.85342		5210	
PAH	Benzo(a)pyrene	19	5	26	ug/Kg	9.65 - 420	18.9	108	109.18342		1520	
PAH	Benzo(b)fluoranthene	19	10	53	ug/Kg	3.82 - 420	4	212	113.83158		59800	
PAH	Benzo(g,h,i)perylene	19	3	16	ug/Kg	13.9 - 601	47.4	103	116.70526		119000	
PAH	Benzo(k)fluoranthene	19	9	47	ug/Kg	13.8 - 420	42.3	469	143.34737		148000	
PAH	Chrysene	19	10	53	ug/Kg	5.68 - 410	38.9	928	157.82421		4730	
PAH	Dibenz(a,h)anthracene	19	3	16	ug/Kg	3.18 - 420	16.1	302	106.30921		18400	
PAH	Fluoranthene	19	9	47	ug/Kg	22.5 - 973	56	720	215.92632		122000	
PAH	Fluorene	19	4	21	ug/Kg	24.7 - 1040	25.6	317	160.42895		30000	
PAH	Indeno(1,2,3-cd)pyrene	19	4	21	ug/Kg	3.43 - 420	33.9	151	88.44289		109000	
PAH	Naphthalene	19	10	53	ug/Kg	26 - 420	234	51300	5908.93421		99.4	YES
PAH	Phenanthrene	19	10	53	ug/Kg	19.2 - 420	68.8	1550	349.79737		45700	
PAH	Pyrene	19	4	21	ug/Kg	26.6 - 1150	44	203	140.9		78500	
PCB	PCB-1254 (Aroclor 1254)	19	2	11	ug/Kg	40 - 14200	1660	3670	2003.78947		40000	
PCB	PCB-1260 (Aroclor 1260)	19	11	58	ug/Kg	39 - 8620	632	11600	2932.86842			YES
VOC	1,1,1-Trichloroethane	19	3	16	ug/Kg	0.463 - 31	1.085	140	9.32663		29800	
VOC	1,1-Dichloroethane	19	1	5	ug/Kg	0.411 - 31	10.1	10.1	2.34782		20100	
VOC	1,1-Dichloroethene	19	7	37	ug/Kg	0.508 - 31	0.62	2.55	2.28505		8280	
VOC	2-Butanone (Methyl ethyl ketone)	19	3	16	ug/Kg	3.27 - 120	3.6	54	10.61658		89600	
VOC	Acetone	19	8	42	ug/Kg	3.07 - 26	8.7	300	38.35447		2500	
VOC	Benzene	19	7	37	ug/Kg	0.393 - 31	1.4	20.6	3.83095		255	
VOC	Chloroform	19	1	5	ug/Kg	0.454 - 31	2	2	1.96245		1190	
VOC	Cyclohexane	13	5	38	ug/Kg	0.419 - 1.05	0.83	24.9	4.58158			YES
VOC	Ethylbenzene	19	1	5	ug/Kg	0.332 - 31	2.3	2.3	1.90529		5160	
VOC	Isopropylbenzene (Cumene)	12	1	8	ug/Kg	0.393 - 1.11	1.3	1.3	0.39075			YES
VOC	Methylcyclohexane	10	4	40	ug/Kg	0.445 - 1.12	1.1	23.9	3.01935			YES
VOC	Methylene Chloride	19	1	5	ug/Kg	1.18 - 31	1.9	1.9	2.33263		4050	
VOC	Tetrachloroethene (PCE)	19	1	5	ug/Kg	0.332 - 31	0.87	0.87	1.84076		9920	
VOC	Toluene	19	7	37	ug/Kg	0.297 - 31	0.99	1570	88.90084		5450	
VOC	Xylenes, Total	19	2	11	ug/Kg	0.341 - 31	0.78	12.5	2.46963		10000	

Table 2-2
Summary Statistics and Identification of COPECs for Constituents Detected in Environmental Media at the Reservoir Number 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
Outside the Burn Area												
Surface Soil												
HE	1,3,5-Trinitrobenzene	55	13	24	ug/Kg	87 - 5000	210	15000	576.32727		376	YES
HE	1,3-Dinitrobenzene	55	3	5	ug/Kg	83 - 12000	120	220	228.22727		655	
HE	2,4,6-Trinitrotoluene	55	33	60	ug/Kg	87 - 250	140	2270000	50035.18182			YES
HE	2,4-Dinitrotoluene	55	25	45	ug/Kg	110 - 250	240	200000	5302.47273		1280	YES
HE	2,6-Dinitrotoluene	55	14	25	ug/Kg	110 - 12000	152	78000	1897.71818		32.8	YES
HE	2-Amino-4,6-Dinitrotoluene	45	16	36	ug/Kg	125 - 625	150	26000	1076.54444			YES
HE	2-Nitrotoluene	55	6	11	ug/Kg	87 - 12000	110	2000	268.23636			YES
HE	4-Amino-2,6-Dinitrotoluene	55	16	29	ug/Kg	87 - 110000	130	27000	2130.89091			YES
HE	4-Nitrotoluene	45	1	2	ug/Kg	87 - 625	260	260	69.08889			YES
HE	HMX	55	4	7	ug/Kg	87 - 25000	150	820	424.15455			YES
HE	Nitrobenzene	65	1	2	ug/Kg	92 - 12000	180	180	221.70769		1310	
HE	RDX	55	2	4	ug/Kg	87 - 25000	270	540	416.21818			YES
INO	Aluminum	45	45	100	mg/Kg		8840	16450	11571.33333	15500	50	YES
INO	Antimony	45	3	7	mg/Kg	0.401 - 7.8	0.534	0.782	1.37022	9.3	0.142	YES
INO	Arsenic	45	45	100	mg/Kg		5.13	21.7	8.62778	36.5	5.7	YES
INO	Barium	45	45	100	mg/Kg		47.1	263	102.50889	826	1.04	YES
INO	Beryllium	45	40	89	mg/Kg	0.6 - 0.65	0.515	0.946	0.62764	1	1.06	
INO	Cadmium	45	35	78	mg/Kg	0.0572 - 0.65	0.0771	1.74	0.40024		0.00222	YES
INO	Calcium	45	45	100	mg/Kg		2320	61200	8862.55556	52300		YES
INO	Chromium	45	45	100	mg/Kg		10.7	26.7	17.78667	29	0.4	YES
INO	Cobalt	45	45	100	mg/Kg		4.02	30.1	8.51567	116	0.14	YES
INO	Copper	45	45	100	mg/Kg		13	534	48.11222	56.2	5.4	YES
INO	Iron	45	45	100	mg/Kg		11550	33300	20664.66667	234000	200	YES
INO	Lead	55	55	100	mg/Kg		7.88	603	143.99918	48.6	0.0537	YES
INO	Magnesium	45	45	100	mg/Kg		993	20100	3962.84444	10400		YES
INO	Manganese	45	45	100	mg/Kg		147	3870	423.45556	3506	100	YES
INO	Mercury	45	40	89	mg/Kg	0.038 - 0.041	0.0152	0.518	0.10182	0.1	0.1	YES
INO	Moisture, Percent	30	30	100	PERCENT		12.2	35.66	20.85033			YES
INO	Nickel	45	45	100	mg/Kg		11.6	96.5	24.46111	55.1	13.6	YES
INO	Potassium	45	45	100	mg/Kg		598	2620	1562.43333	3390		YES
INO	Selenium	45	21	47	mg/Kg	0.202 - 0.83	0.527	2.13	0.72742	2	0.0276	YES
INO	Silver	45	8	18	mg/Kg	0.105 - 1.3	0.138	0.973	0.25151	11.1	2	
INO	Sodium	45	21	47	mg/Kg	245 - 646	45.9	402	154.13222			YES
INO	Thallium	45	10	22	mg/Kg	0.31 - 23.6	1.2	2.1	0.91422	1.3	0.0569	YES
INO	Tin	4	1	25	mg/Kg	0.474 - 0.486	3.78	3.78	1.12425		7.62	
INO	Vanadium	45	45	100	mg/Kg		20.3	41.4	27.39444	40.9	1.59	YES
INO	Zinc	45	45	100	mg/Kg		35.7	498	120.45556	322	6.62	YES
INX	Cyanide	25	12	48	mg/Kg	0.15 - 0.65	0.17	1	0.2838		1.33	

Table 2-2
Summary Statistics and Identification of COPECs for Constituents Detected in Environmental Media at the Reservoir Number 2 Burning Ground
Plum Brook Ordnance Works, Sandusky, Ohio

type	Analyte	Number of Samples	Number of Detects	Percent Detect	Units	Range of Detection Limits	Minimum Detected Concentration	Maximum Detected Concentration	Average	Background	Toxicity Screening Level	COPEC
PAH	Acenaphthene	55	11	20	ug/Kg	24 - 430	34.2	697	100.57455		20000	
PAH	Acenaphthylene	55	12	22	ug/Kg	14.7 - 430	26.8	1960	166.22091		682000	
PAH	Anthracene	55	13	24	ug/Kg	1.67 - 430	2.74	55	44.26191		1480000	
PAH	Benzo(a)anthracene	55	21	38	ug/Kg	2.96 - 430	4.08	186	63.28927		5210	
PAH	Benzo(a)pyrene	55	26	47	ug/Kg	3.65 - 430	10.6	360	78.66227		1520	
PAH	Benzo(b)fluoranthene	55	24	44	ug/Kg	1.44 - 430	5.125	820	100.51936		59800	
PAH	Benzo(g,h,i)perylene	55	18	33	ug/Kg	5.25 - 430	13.05	270	65.90064		119000	
PAH	Benzo(k)fluoranthene	55	27	49	ug/Kg	1.37 - 430	30.9	430	101.49973		148000	
PAH	Chrysene	55	25	45	ug/Kg	2.15 - 430	8.3	297	78.23682		4730	
PAH	Dibenz(a,h)anthracene	55	5	9	ug/Kg	3.17 - 430	10.4	124	48.26945		18400	
PAH	Fluoranthene	55	29	53	ug/Kg	8.51 - 430	21.3	350	94.78282		122000	
PAH	Fluorene	55	9	16	ug/Kg	9.1 - 430	10.7	91.3	51.34627		30000	
PAH	Indeno(1,2,3-cd)pyrene	55	18	33	ug/Kg	1.3 - 430	8.2	230	60.74418		109000	
PAH	Naphthalene	55	11	20	ug/Kg	9.84 - 430	23.4	1737.5	104.26945		99.4	YES
PAH	Phenanthrene	55	25	45	ug/Kg	7.06 - 430	12.8	190	70.46264		45700	
PAH	Pyrene	55	25	45	ug/Kg	10.1 - 430	13	295	83.91182		78500	
PCB	PCB-1260 (Aroclor 1260)	55	33	60	ug/Kg	38 - 13300	13	44400	1596.83636			YES
SV	1,4-Dichlorobenzene	30	1	3	ug/Kg	0.304 - 430	0.42	0.42	67.29775		546	
SV	2-Methylnaphthalene	35	4	11	ug/Kg	24 - 430	36	110	72.75714		3240	
SV	bis(2-Ethylhexyl)phthalate	10	1	10	ug/Kg	380 - 430	61	61	186.6		925	
VOC	1,1,1-Trichloroethane	30	5	17	ug/Kg	0.435 - 32	0.8	11.9	3.5978		29800	
VOC	1,1-Dichloroethane	30	2	7	ug/Kg	0.386 - 32	0.66	0.67	2.85762		20100	
VOC	1,1-Dichloroethene	30	8	27	ug/Kg	0.446 - 32	0.48	1	2.95477		8280	
VOC	Acetone	30	6	20	ug/Kg	2.89 - 130	4.6	18	13.05567		2500	
VOC	Cyclohexane	20	2	10	ug/Kg	0.394 - 0.586	0.72	3.9	0.44798			YES
VOC	Styrene	30	1	3	ug/Kg	0.32 - 32	1	1	2.82807		4690	
VOC	Tetrachloroethene (PCE)	30	7	23	ug/Kg	0.312 - 32	0.39	3.4	3.13308		9920	
VOC	Toluene	30	2	7	ug/Kg	0.279 - 32	1.5	1.9	2.69532		5450	

Table 2-3
Burning Ground Reservoir No. 2 Proposed Ecological Assessment and Measurement Endpoints
NASA Plum Brook
Sandusky, Ohio

Assessment Endpoint	Selected Receptor and Exposure Routes	Measurement Endpoint
Protection of long-term survival and reproductive capabilities for soil invertebrates.	Terrestrial Invertebrates Ingestion of soil and direct exposure to soil.	Comparison of soil concentrations to critical effect values.
Protection of long-term survival and reproductive capabilities for herbivorous mammals.	Eastern cottontail (*Sylvilagus floridanus*) White-tailed deer (*Odocoileus virginianus*) Ingestion of plants, water, and incidental soil	Comparison of total daily dose to species-specific toxifity endpoint values.
Protection of long-term survival and reproductive capabilities for omnivorous mammals.	Raccoon (*Procyon lotor*) Ingestion of terrestrial plants, invertebrates, small mammals, water, and incidental soil. Deer mouse (*Peromyscus maniculatus*) Ingestion of terrestrial invertebrates, plants, water, and incidental soil.	Comparison of total daily dose to species-specific toxicity endpoint values.
Protection of long-term survival and reproductive capabilities for carnivorous birds.	Red-tailed hawk (*Buteo jamacencis*) Ingestion of small mammals, birds, water, incidental soil.	Comparison of total daily dose to species-specific toxicity endpoint values.
Protection of long-term survival and reproductive capabilities for small insectivorous mammals	Short-tailed shrew (*Blarnia brevicauda*) Ingestion of terrestrial invertebrates, water, and incidental soil.	Comparison of total daily dose to species-specific toxicity endpoint values.
Protection of long-term survival and reproductive capabilities for insectivorous birds.	March wren (*Cistorthorus palustris*) Ingestion of terrestrial invertebrates, water, and incidental soil.	Comparison of total daily dose to species-specific toxicity endpoint values.
Protection of long-term survival and reproductive capabilities for benthic invertebrates.	benthic invertebrates Ingestion of sediment and direct exposure to surface water.	Comparison of sediment concentrations to sediment critical effects values.
Protection of long-term survival and reproductive capabilities for aquatic invertebrates (crustaceans).	Aquatic invertebrates Direct exposure to water	Comparison of surface water concentrations to aquatic critical effects values.
Protection of long-term survival and reproductive capabilities for semi-aquatic omnivorous mammals.	Raccoon (*Procyon lotor*) Ingestion of aquatic invertebrates, water and incidental sediment	Comparison of total daily dose to species-specific toxicity endpoint values.
Protection of long-term survival and reproductive capabilities for aquatic birds	Mallard (*Anas platyrhynchos*) Ingestion of aquatic and benthic invertebrates, water, and incidental sediment.	Comparison of total daily dose to species-specific toxicity endpoint values.

Table 3-1
Species-Specific Exposure Parameters,
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Parameter	Value	Units	Source
Short-tailed shrew	Home range factor[1]	1	unitless	calculated value
Blarina brevicauda	Diet: Plants	0	percent	EPA 1993
	Invertebrates	100	percent	EPA 1993
	Vertebrates (fish)	0	percent	EPA 1993
	Sediment	10.4	percent	EPA 1993
	Ingestion Rate: Food	0.0022	kg/day (dry wt.)	EPA 1993
	Water	0.0023	L/day	EPA 1993
	Body weight	0.015	kg	EPA 1993
	Exposure duration	12	months	EPA 1993
	Home range (ha)	0.39	ha	EPA 1993
White-tailed deer	Home range factor[1]	.02/.03	unitless	calculated value
Odocoileus virginianus	Diet: Plants	100	percent	EPA 1993
	Invertebrates	0	percent	EPA 1993
	Vertebrates (fish)	0	percent	EPA 1993
	Soil	2	percent	EPA 1993
	Ingestion Rate: Food	2	kg/day (dry wt.)	EPA 1993
	Water	4	L/day	EPA 1993
	Body weight	61	g (wet wt.)	Gottschang, 1981
	Exposure duration	12	months	EPA 1993
	Home range (ha)	518	ha	Gottschang, 1981
Marsh wren	Home range factor[1]	1	unitless	calculated value
Cistothorus palustris	Diet: Plants	0	percent	EPA 1993
	Invertebrates	100	percent	EPA 1993
	Vertebrates (fish)	0	percent	EPA 1993
	Soil	2	percent	EPA 1993
	Ingestion Rate: Food	0.0029	g/day (wet wt.)	EPA 1993
	Water	0.0027	L/day	EPA 1993
	Body weight	0.01	g (wet wt.)	EPA 1993
	Exposure duration	4	months	EPA 1993
	Home range (ha)	0.054	ha	EPA 1993
Deer Mouse	Home range factor[1]	1	unitless	calculated value
Peromyscus maniculatus	Diet: Plants	61	percent	EPA 1993
	Invertebrates	39	percent	EPA 1993
	Vertebrates (fish)	0	percent	EPA 1993
	Soil	2	percent	EPA 1993
	Ingestion Rate: Food	0.0028	g/day (wet wt.)	EPA 1993
	Water	0.0022	L/day	EPA 1993
	Body weight	0.0148	g (wet wt.)	EPA 1993
	Exposure duration	12	months	EPA 1993
	Home range (ha)	0.062	ha	EPA 1993

Table 3-1
Species-Specific Exposure Parameters,
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Parameter	Value	Units	Source
Eastern Cottontail	Home range factor[1]	1	unitless	calculated value
Sylvilagus floridanus	Diet: Plants	100	percent	EPA 1993
	Invertebrates	0	percent	EPA 1993
	Vertebrates	0	percent	EPA 1993
	Soil	6.3	percent	EPA 1993
	Ingestion Rate: Food	0.096	kg/day (dry wt.)	EPA 1993
	Water	0.11	L/day	EPA 1993
	Body weight	1.132	g (wet wt.)	EPA 1993
	Exposure duration	12	months	EPA 1993
	Home range (ha)	3.1	ha	EPA 1993
Red-Tailed Hawk	Home range factor[1]	.01/.02	unitless	calculated value
Buteo jamaicensis	Diet: Plants	0	percent	EPA 1993
	Invertebrates	0	percent	EPA 1993
	Vertebrates (mammals)	100	percent	EPA 1993
	Soil	2	percent	EPA 1993
	Ingestion Rate: Food	0.057	kg/day (dry wt.)	EPA 1993
	Water	0.057	L/day	EPA 1993
	Body weight	0.957	kg	EPA 1993
	Exposure duration	12	months	EPA 1993
	Home range (ha)	842	ha	EPA 1993
Raccoon	Home range factor[1]	.06/.1	unitless	calculated value
Procyon lotor	Diet: Plants	42	percent	EPA 1993
	Invertebrates	51	percent	EPA 1993
	Vertebrates	5	percent	EPA 1993
	Sediment	9.4	percent	EPA 1993
	Ingestion Rate: Food	0.26	kg/day (dry wt.)	EPA 1993
	Water	0.43	L/day	EPA 1993
	Body weight	5.1	kg	EPA 1993
	Exposure duration	8	months	EPA 1993
	Home range (ha)	156	ha	EPA 1993
Mallard Duck	Home range factor[1]	.02/.03	unitless	calculated value
Anas platyrhynchos	Diet: Plants	62.5	percent	EPA 1993
	Invertebrates	37.5	percent	EPA 1993
	Vertebrates (fish)	0	percent	EPA 1993
	Sediment	2	percent	EPA 1993
	Ingestion Rate: Food	0.063	kg/day (dry wt.)	EPA 1993
	Water	0.064	L/day	EPA 1993
	Body weight	1.13	kg (wet wt.)	EPA 1993
	Exposure duration	7	months	EPA 1993
	Home range (ha)	580	ha	EPA 1993

Notes:

[1]Home range factors are based on an estimated affected area of 10.1 and 16.2 hectares for AA2 and AA3, respectively. If the home range of the species was less than the affected area of the habitat, the home range factor was set at 1.0. If the home range of the species was greater than the affected area of the habitat, the home range factor was calculated by dividing the affected area by the home range.

kg = kilograms
g/day = grams per day
ha = hectares
L/day = liters per day
NA = not available
wt. = weight

Table 3-2
Bioconcentration Factors for Chemicals of Potential Ecological Concern
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Octanol-Water Partition Coefficient (log K_{ow})[1]	Soil to Invertebrates (mg/kg wet tissue/mg/kg dry soil)[2]	Water to Invertebrates (mg/kg wet tissue/mg dissolved COPEC/L)[3]	Sediment to Invertebrates (mg/kg wet tissue/mg/kg dry sediment)[4]	Water to Fish (mg/kg wet tissue/mg dissolved COPEC/L)[5]	Soil/Sediment to Plants (mg/kg dry tissue/mg/kg dry soil or sediment)[6]	Water to Plants (mg/kg wet tissue/mg dissolved COPEC/L)[7]
Inorganics							
Aluminum	NA	0.22	4066.00	0.90	2.70	0.004	833
Antimony	NA	0.22	7.00	0.90	40.00	0.200	1475
Arsenic	NA	0.11	73.00	0.90	114.00	0.036	293
Barium	NA	0.22	200.00	0.90	633.00	0.150	260
Beryllium	NA	0.22	45.00	0.90	62.00	0.010	141
Cadmium	NA	0.96	3461.00	3.40	907.00	0.364	782
Chromium	NA	0.01	3000.00	0.39	19.00	0.008	4406
Cobalt	NA	0.22	4066.00	0.90	40.00	0.350	
Copper	NA	0.04	3718.00	0.30	710.00	0.400	541
Iron	NA	0.22	4066.00	0.90		0.001	
Lead	NA	0.03	5059.00	0.63	0.09	0.045	1706
Manganese	NA	0.32	4066.00	0.90	35.00	0.050	
Mercury	NA	0.04	20184.00	0.07	3530.00	0.038	24762
Nickel	NA	0.02	28.00	0.90	78.00	0.032	61
Selenium	NA	0.22	1262.00	0.90	129.00	0.016	1845
Thallium	NA	0.22	15000.00	0.90	10000.00	0.004	15000
Vanadium	NA	0.22	4066.00	0.90	633.00	0.003	
Zinc	NA	0.56	4578.00	0.57	2059.00	1.2E-12	2175
Cyanide	NA	1.12	4066.00	0.90	14.00		22
VOCs							
Acetone	-0.222	0.05	0.05	0.05	0.10	52.037	0.05
Benzene	2.13	3.97	3.97	3.97	14.20	2.274	3.97
Carbon Disulfide	2.24	4.88	4.88	4.88	17.88	1.965	4.88
Ethylbenzene	3.15	27.16	27.16	27.16	120.36	0.585	27.16
Methyl Acetate	-0.09	0.06	0.06	0.06	0.14	43.654	0.06
Toluene	2.73	12.30	12.30	12.30	49.92	1.023	12.30
Xylenes, Total	3.15	27.16	27.16	27.16	120.36	0.585	27.16
SVOCs							
1,3,5-Trinitrobenzene	1.18	0.66	13.00	58.00	21.04	8.053	2507
2-Butanone (Methyl ethyl ketone)	0.29	0.12	13.00	58.00	21.04	26.326	2507
2,4-Dinitrotoluene	1.996	3.08	13.00	58.00	21.04	2.718	2507
2,4,6-Trinitrotoluene	2.25	4.97	13.00	58.00	21.04	1.939	2507
2-Methylnaphthalene	3.9	111.71	111.71	111.71	579.43	0.216	111.71
3-nitrotoluene	2.45	7.25	7.25	7.25	27.77	1.486	7.25
2-Methylphenol (o-Cresol)	1.95	2.83	2.83	2.83	9.74	2.890	2.83
4-Methylphenol (p-Cresol)	1.963	2.90	2.90	2.90	9.54	2.840	2.90
4-Methyl-2-pentanone (Methyl isobutyl ketone)	1.19	0.67	0.67	0.67		7.947	0.67
Acenaphthene	3.92	116.01	116.01	116.01	604.22	0.210	116.01
Acenaphthylene	3.5	52.54	52.54	52.54	250.61	0.367	52.54
Acetophenone	1.58	1.41	1.41	1.41	4.49	4.729	1.41
Anthracene	4.55	380.58	380.58	380.58	2262.02	0.091	380.58
Benzaldehyde	1.48	1.16	1.16	1.16	3.64	5.402	1.16
Benzo(a)anthracene	5.679	0.03	12299.00	1.45	500.00	0.020	5258
Benzo(a)pyrene	6.129	0.07	4697.00	1.59	500.00	0.011	5258
Benzo(b)fluoranthene	6.202	0.07	4697.00	1.61	500.00	0.010	5258
Benzo(g,h,i)perylene	6.7	21943.20	21943.20	21943.20	204642.62	0.005	21943.20
Benzo(k)fluoranthene	6.2	0.08	13225.00	1.61	500.00	0.010	5258
Benzoic acid	1.87	2.43	2.43	2.43	8.24	3.215	2.43

Table 3-2
Bioconcentration Factors for Chemicals of Potential Ecological Concern
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Octanol-Water Partition Coefficient (log K_{ow})[1]	Soil to Invertebrates (mg/kg wet tissue/mg/kg dry soil)[2]	Water to Invertebrates (mg/kg wet tissue/mg dissolved COPEC/L)[3]	Sediment to Invertebrates (mg/kg wet tissue/mg/kg dry sediment)[4]	Water to Fish (mg/kg wet tissue/mg dissolved COPEC/L)[5]	Soil/Sediment to Plants (mg/kg dry tissue/mg/kg dry soil or sediment)[6]	Water to Plants (mg/kg wet tissue/mg dissolved COPEC/L)[7]
Benzyl butyl phthalate	4.84	657.60	657.60	657.60	4153.34	0.062	657.60
bis(2-ethylhexyl)phthalate	5.205	1309	318.00	1308.87	70.00	0.038	9931
Carbazole	3.59	62.26	62.26	62.26	302.62	0.326	62.26
Chrysene	5.739	0.04	980.00	1.38	500.00	0.019	5258
Cyclohexane	3.44	46.92	46.92	46.92	221.00	0.398	46.92
Dibenzofuran	4.2	196.70	196.70	196.70	1086.42	0.145	196.70
Dibenz(a,h)anthracene	6.547	0.07	710.00	1.61	500.00	0.006	5258
Di-n-butylphthalate	4.13	172.37	172.37	172.37	938.20	0.159	172.37
Fluoranthene	4.95	809.19	809.19	809.19	5229.94	0.053	809.19
Fluorene	4.21	200.44	200.44	200.44	1109.42	0.143	200.44
HMX	0.59	0.22	0.22	0.22	0.56	17.660	0.22
Indeno(1,2,3-cd)pyrene	6.915	0.08	4697.00	1.61	500.00	0.004	5258
methylcyclohexane	3.61	64.65	64.65	64.65	315.57	0.317	64.65
n-nitroso-di-n-propylamine	1.36	0.93	0.93	0.93	2.83	6.338	0.93
Naphthalene	3.3	36.03	36.03	36.03	164.82	0.479	36.03
PCB-1254	6.207	1.13	5538.00	0.53	230394.00	0.010	476829
PCB-1260	6.91	32605.44	32605.44	32605.44	317757.62	0.004	32605.44
Phenanthrene	4.57	395.21	395.21	395.21	2358.83	0.088	395.21
Phenol	1.46	1.12	1.12	1.12	3.49	5.548	1.12
Pyrene	5.11	1094.18	1094.18	1094.18	7313.02	0.043	1094.18
RDX	0.87	0.37	0.37	0.37	1.01	12.166	0.37

NA = not applicable

1. Values taken from Karickhoff and Long 1995, except for acetone and bis(2-ethylhexyl)phthalate whose values were obtained from EPA 1995a. Octanol-water partition coefficients for inorganics do not exist and therefore are not presented.
2. Value taken from EPA 1999c, Appendix C, Table C-1 or calculated using recommended equations.
3. Value taken from EPA 1999c, Appendix C, Table C-3 or calculated using recommended equations.
4. Value taken from EPA 1999c, Appendix C, Table C-6 or calculated using recommended equations.
5. Value taken from EPA 1999c, Appendix C, Table C-5 or calculated using recommended equations.
6. Value taken from EPA 1999c, Appendix C, Table C-2 or calculated using recommended equations.
7. Value taken from EPA 1999c, Appendix C, Table C-4 or calculated using recommended equations.

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Online URL: http://www.epa.gov/epaoswer/hazwaste/combust/ecorisk.htm

Table 3-3
Maximum Exposure Doses for Short-tailed Shrew (*Blarina brevicauda*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	1.59E+00	5.9E-04	1.00	0	0.104	0.0022	1.3E-06	8.5E-08	1.00E+00	1.000	0.015	9.2E-05
2,4-Dinitrotoluene	6.98E+03	3.08E+00	2.2E+04	1.00	0	0.104	0.0022	4.7E+01	1.6E+00	1.00E+00	1.000	0.015	3.3E+03
2,6-Dinitrotoluene	2.40E+02	2.50E+00	6.0E+02	1.00	0	0.104	0.0022	1.3E+00	5.5E-02	1.00E+00	1.000	0.015	9.2E+01
1,3,5-Trinitrobenzene	5.12E+01	6.61E-01	3.4E+01	1.00	0	0.104	0.0022	7.4E-02	1.2E-02	1.00E+00	1.000	0.015	5.7E+00
Aluminum	1.14E+04	2.20E-01	2.5E+03	1.00	0	0.104	0.0022	5.5E+00	2.6E+00	1.00E+00	1.000	0.015	5.4E+02
Arsenic	1.23E+01	1.10E-01	1.4E+00	1.00	0	0.104	0.0022	3.0E-03	2.8E-03	1.00E+00	1.000	0.015	3.9E-01
Barium	2.76E+03	2.20E-01	6.1E+02	1.00	0	0.104	0.0022	1.3E+00	6.3E-01	1.00E+00	1.000	0.015	1.3E+02
Beryllium	7.87E-01	2.20E-01	1.7E-01	1.00	0	0.104	0.0022	3.8E-04	1.8E-04	1.00E+00	1.000	0.015	3.7E-02
Cadmium	1.10E+00	9.60E-01	1.1E+00	1.00	0	0.104	0.0022	2.3E-03	2.5E-04	1.00E+00	1.000	0.015	1.7E-01
Cobalt	1.29E+01	2.20E-01	2.8E+00	1.00	0	0.104	0.0022	6.2E-03	3.0E-03	1.00E+00	1.000	0.015	6.1E-01
Chromium	2.91E+01	1.00E-02	2.9E-01	1.00	0	0.104	0.0022	6.4E-04	6.7E-03	1.00E+00	1.000	0.015	4.9E-01
Copper	2.83E+02	4.00E-02	1.1E+01	1.00	0	0.104	0.0022	2.5E-02	6.5E-02	1.00E+00	1.000	0.015	6.0E+00
Iron	2.58E+04	2.20E-01	5.7E+03	1.00	0	0.104	0.0022	1.3E+01	5.9E+00	1.00E+00	1.000	0.015	1.2E+03
Mercury	1.87E-01	4.00E-02	7.5E-03	1.00	0	0.104	0.0022	1.6E-05	4.3E-05	1.00E+00	1.000	0.015	3.9E-03
Manganese	5.59E+02	3.20E-01	1.8E+02	1.00	0	0.104	0.0022	3.9E-01	1.3E-01	1.00E+00	1.000	0.015	3.5E+01
Nickel	5.30E+01	2.00E-02	1.1E+00	1.00	0	0.104	0.0022	2.3E-03	1.2E-02	1.00E+00	1.000	0.015	9.6E-01
Lead	2.04E+03	3.00E-02	6.1E+01	1.00	0	0.104	0.0022	1.3E-01	4.7E-01	1.00E+00	1.000	0.015	4.0E+01
Antimony	2.50E+00	2.20E-01	5.5E-01	1.00	0	0.104	0.0022	1.2E-03	5.7E-04	1.00E+00	1.000	0.015	1.2E-01
Selenium	1.86E+00	2.20E-01	4.1E-01	1.00	0	0.104	0.0022	9.0E-04	4.3E-04	1.00E+00	1.000	0.015	8.8E-02
Thallium	2.14E+00	2.20E-01	4.7E-01	1.00	0	0.104	0.0022	1.0E-03	4.9E-04	1.00E+00	1.000	0.015	1.0E-01
Vanadium	2.79E+01	2.20E-01	6.1E+00	1.00	0	0.104	0.0022	1.3E-02	6.4E-03	1.00E+00	1.000	0.015	1.3E+00
Zinc	4.71E+02	5.60E-01	2.6E+02	1.00	0	0.104	0.0022	5.8E-01	1.1E-01	1.00E+00	1.000	0.015	4.6E+01
Acenaphthene	1.61E+01	1.16E+02	1.9E+03	1.00	0	0.104	0.0022	4.1E+00	3.7E-03	1.00E+00	1.000	0.015	2.7E+02
Naphthalene	1.21E+01	3.60E+01	4.4E+02	1.00	0	0.104	0.0022	9.6E-01	2.8E-03	1.00E+00	1.000	0.015	6.4E+01

BCF_{inv} = bioconcentration factor for contaminants from sediment into inve
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aqu
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weigl
ED = migration factor is the proportion of year in which exposure coul
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x
IW = daily intake concentration from direct water ingestion (WC x IRV
kg = kilograms

milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
milligrams per kilogram body weight per day
milligrams per liter of water
not applicable
contaminant not detected in medium at a concentration above its reporting limit
exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
concentration in plant material (SC x C x SCF_{sed})
maximum detected concentration in sediment
maximum detected concentration in surface water
weight
daily water ingestion rate

Table 3-4
Maximum Exposure Doses for White-tailed Deer (*Odocoileus virginianus*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	5.60E-03	2.08E-06	1	0.02	2	4.2E-06	1.5E-05	2.00E-02	1.000	61	6.2E-09
2,4-Dinitrotoluene	6.98E+03	2.72E+00	1.90E+04	1	0.02	2	3.8E+04	2.8E+02	2.00E-02	1.000	61	1.3E+01
2,6-Dinitrotoluene	2.40E+02	3.15E+00	7.55E+02	1	0.02	2	1.5E+03	9.6E+00	2.00E-02	1.000	61	5.0E-01
1,3,5-Trinitrobenzene	5.12E+01	8.05E+00	4.12E+02	1	0.02	2	8.2E+02	2.0E+00	2.00E-02	1.000	61	2.7E-01
Aluminum	1.14E+04	4.00E-03	4.55E+01	1	0.02	2	9.1E+01	4.6E+02	2.00E-02	1.000	61	1.8E-01
Arsenic	1.23E+01	3.60E-02	4.44E-01	1	0.02	2	8.9E-01	4.9E-01	2.00E-02	1.000	61	4.5E-04
Barium	2.76E+03	1.50E-01	4.15E+02	1	0.02	2	8.3E+02	1.1E+02	2.00E-02	1.000	61	3.1E-01
Beryllium	7.87E-01	1.00E-02	7.87E-03	1	0.02	2	1.6E-02	3.1E-02	2.00E-02	1.000	61	1.5E-05
Cadmium	1.10E+00	3.64E-01	4.02E-01	1	0.02	2	8.0E-01	4.4E-02	2.00E-02	1.000	61	2.8E-04
Cobalt	1.29E+01	3.50E-01	4.52E+00	1	0.02	2	9.0E+00	5.2E-01	2.00E-02	1.000	61	3.1E-03
Chromium	2.91E+01	7.50E-03	2.18E-01	1	0.02	2	4.4E-01	1.2E+00	2.00E-02	1.000	61	5.3E-04
Copper	2.83E+02	4.00E-01	1.13E+02	1	0.02	2	2.3E+02	1.1E+01	2.00E-02	1.000	61	7.8E-02
Iron	2.58E+04	1.00E-03	2.58E+01	1	0.02	2	5.2E+01	1.0E+03	2.00E-02	1.000	61	3.6E-01
Mercury	1.87E-01	3.75E-02	7.01E-03	1	0.02	2	1.4E-02	7.5E-03	2.00E-02	1.000	61	7.1E-06
Manganese	5.59E+02	5.00E-02	2.80E+01	1	0.02	2	5.6E+01	2.2E+01	2.00E-02	1.000	61	2.6E-02
Nickel	5.30E+01	3.20E-02	1.70E+00	1	0.02	2	3.4E+00	2.1E+00	2.00E-02	1.000	61	1.8E-03
Lead	2.04E+03	4.50E-02	9.18E+01	1	0.02	2	1.8E+02	8.2E+01	2.00E-02	1.000	61	8.7E-02
Antimony	2.50E+00	2.00E-01	5.00E-01	1	0.02	2	1.0E+00	1.0E-01	2.00E-02	1.000	61	3.6E-04
Selenium	1.86E+00	1.60E-02	2.97E-02	1	0.02	2	5.9E-02	7.4E-02	2.00E-02	1.000	61	4.4E-05
Thallium	2.14E+00	4.00E-03	8.56E-03	1	0.02	2	1.7E-02	8.6E-02	2.00E-02	1.000	61	3.4E-05
Vanadium	2.79E+01	3.00E-03	8.36E-02	1	0.02	2	1.7E-01	1.1E+00	2.00E-02	1.000	61	4.2E-04
Zinc	4.71E+02	1.20E-12	5.66E-10	1	0.02	2	1.1E-09	1.9E+01	2.00E-02	1.000	61	6.2E-03
Acenaphthene	1.61E+01	2.10E-01	3.39E+00	1	0.02	2	6.8E+00	6.5E-01	2.00E-02	1.000	61	2.4E-03
Naphthalene	1.21E+01	4.79E-01	5.79E+00	1	0.02	2	1.2E+01	4.8E-01	2.00E-02	1.000	61	4.0E-03

BCF_{inv} = bioconcentration factor for contaminants from sedi
BCF_{sed} = bioaccumulation factor for contaminants from sedi
BW = organism body weight
C = moisture content correction factor (dry weight basi
ED = migration factor is the proportion of year in which e
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; est
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x
IP = daily intake concentration from plant material (PC
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ing
IW = daily intake concentration from direct water ingesti
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-5
Maximum Exposure Doses for Marsh Wren (*Cistothorus palustris*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	P_{inv}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	1.59E+00	5.9E-04	1.00	0.02	0.0029	1.7E-06	2.2E-08	1.00E+00	0.333	0.01	5.8E-05
2,4-Dinitrotoluene	6.98E+03	3.08E+00	2.2E+04	1.00	0.02	0.0029	6.2E+01	4.0E-01	1.00E+00	0.333	0.01	2.1E+03
2,6-Dinitrotoluene	2.40E+02	2.50E+00	6.0E+02	1.00	0.02	0.0029	1.7E+00	1.4E-02	1.00E+00	0.333	0.01	5.8E+01
1,3,5-Trinitrobenzene	5.12E+01	6.61E-01	3.4E+01	1.00	0.02	0.0029	9.8E-02	3.0E-03	1.00E+00	0.333	0.01	3.4E+00
Aluminum	1.14E+04	2.20E-01	2.5E+03	1.00	0.02	0.0029	7.3E+00	6.6E-01	1.00E+00	0.333	0.01	2.6E+02
Arsenic	1.23E+01	1.10E-01	1.4E+00	1.00	0.02	0.0029	3.9E-03	7.2E-04	1.00E+00	0.333	0.01	1.6E-01
Barium	2.76E+03	2.20E-01	6.1E+02	1.00	0.02	0.0029	1.8E+00	1.6E-01	1.00E+00	0.333	0.01	6.4E+01
Beryllium	7.87E-01	2.20E-01	1.7E-01	1.00	0.02	0.0029	5.0E-04	4.6E-05	1.00E+00	0.333	0.01	1.8E-02
Cadmium	1.10E+00	9.60E-01	1.1E+00	1.00	0.02	0.0029	3.1E-03	6.4E-05	1.00E+00	0.333	0.01	1.0E-01
Cobalt	1.29E+01	2.20E-01	2.8E+00	1.00	0.02	0.0029	8.2E-03	7.5E-04	1.00E+00	0.333	0.01	3.0E-01
Chromium	2.91E+01	1.00E-02	2.9E-01	1.00	0.02	0.0029	8.4E-04	1.7E-03	1.00E+00	0.333	0.01	8.4E-02
Copper	2.83E+02	4.00E-02	1.1E+01	1.00	0.02	0.0029	3.3E-02	1.6E-02	1.00E+00	0.333	0.01	1.6E+00
Iron	2.58E+04	2.20E-01	5.7E+03	1.00	0.02	0.0029	1.6E+01	1.5E+00	1.00E+00	0.333	0.01	6.0E+02
Mercury	1.87E-01	4.00E-02	7.5E-03	1.00	0.02	0.0029	2.2E-05	1.1E-05	1.00E+00	0.333	0.01	1.1E-03
Manganese	5.59E+02	3.20E-01	1.8E+02	1.00	0.02	0.0029	5.2E-01	3.2E-02	1.00E+00	0.333	0.01	1.8E+01
Nickel	5.30E+01	2.00E-02	1.1E+00	1.00	0.02	0.0029	3.1E-03	3.1E-03	1.00E+00	0.333	0.01	2.0E-01
Lead	2.04E+03	3.00E-02	6.1E+01	1.00	0.02	0.0029	1.8E-01	1.2E-01	1.00E+00	0.333	0.01	9.9E+00
Antimony	2.50E+00	2.20E-01	5.5E-01	1.00	0.02	0.0029	1.6E-03	1.5E-04	1.00E+00	0.333	0.01	5.8E-02
Selenium	1.86E+00	2.20E-01	4.1E-01	1.00	0.02	0.0029	1.2E-03	1.1E-04	1.00E+00	0.333	0.01	4.3E-02
Thallium	2.14E+00	2.20E-01	4.7E-01	1.00	0.02	0.0029	1.4E-03	1.2E-04	1.00E+00	0.333	0.01	5.0E-02
Vanadium	2.79E+01	2.20E-01	6.1E+00	1.00	0.02	0.0029	1.8E-02	1.6E-03	1.00E+00	0.333	0.01	6.5E-01
Zinc	4.71E+02	5.60E-01	2.6E+02	1.00	0.02	0.0029	7.7E-01	2.7E-02	1.00E+00	0.333	0.01	2.6E+01
Acenaphthene	1.61E+01	1.16E+02	1.9E+03	1.00	0.02	0.0029	5.4E+00	9.4E-04	1.00E+00	0.333	0.01	1.8E+02
Naphthalene	1.21E+01	3.60E+01	4.4E+02	1.00	0.02	0.0029	1.3E+00	7.0E-04	1.00E+00	0.333	0.01	4.2E+01

BCF_{inv} = bioconcentration factor for contaminants from sediment into inver
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aqua
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight
ED = migration factor is the proportion of year in which exposure could
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_s
IW = daily intake concentration from direct water ingestion (WC x IRW
kg = kilograms

milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
milligrams per kilogram body weight per day
milligrams per liter of water
not applicable
contaminant not detected in medium at a concentration above its reporting limit
exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
concentration in plant material (SC x C x SCF_{sed})
maximum detected concentration in sediment
maximum detected concentration in surface water
weight
daily water ingestion rate

Table 3-6
Maximum Exposure Doses for Deer Mouse (*Peromyscus maniculatus*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	1.59E+00	5.9E-04	5.60E-03	2.08E-06	0.39	0.61	0.02	0.0028	6.4E-07	3.6E-09	2.1E-08	1.00E+00	1.000	0.0148	4.5E-05
2,4-Dinitrotoluene	6.98E+03	3.08E+00	2.2E+04	2.72E+00	1.90E+04	0.39	0.61	0.02	0.0028	2.3E+01	3.2E+01	3.9E-01	1.00E+00	1.000	0.0148	3.8E+03
2,6-Dinitrotoluene	2.40E+02	2.50E+00	6.0E+02	3.15E+00	7.55E+02	0.39	0.61	0.02	0.0028	6.5E-01	1.3E+00	1.3E-02	1.00E+00	1.000	0.0148	1.3E+02
1,3,5-Trinitrobenzene	5.12E+01	6.61E-01	3.4E+01	8.05E+00	4.12E+02	0.39	0.61	0.02	0.0028	3.7E-02	7.0E-01	2.9E-03	1.00E+00	1.000	0.0148	5.0E+01
Aluminum	1.14E+04	2.20E-01	2.5E+03	4.00E-03	4.55E+01	0.39	0.61	0.02	0.0028	2.7E+00	7.8E-02	6.4E-01	1.00E+00	1.000	0.0148	2.3E+02
Arsenic	1.23E+01	1.10E-01	1.4E+00	3.60E-02	4.44E-01	0.39	0.61	0.02	0.0028	1.5E-03	7.6E-04	6.9E-04	1.00E+00	1.000	0.0148	2.0E-01
Barium	2.76E+03	2.20E-01	6.1E+02	1.50E-01	4.15E+02	0.39	0.61	0.02	0.0028	6.6E-01	7.1E-01	1.5E-01	1.00E+00	1.000	0.0148	1.0E+02
Beryllium	7.87E-01	2.20E-01	1.7E-01	1.00E-02	7.87E-03	0.39	0.61	0.02	0.0028	1.9E-04	1.3E-05	4.4E-05	1.00E+00	1.000	0.0148	1.7E-02
Cadmium	1.10E+00	9.60E-01	1.1E+00	3.64E-01	4.02E-01	0.39	0.61	0.02	0.0028	1.2E-03	6.9E-04	6.2E-05	1.00E+00	1.000	0.0148	1.3E-01
Cobalt	1.29E+01	2.20E-01	2.8E+00	3.50E-01	4.52E+00	0.39	0.61	0.02	0.0028	3.1E-03	7.7E-03	7.2E-04	1.00E+00	1.000	0.0148	7.8E-01
Chromium	2.91E+01	1.00E-02	2.9E-01	7.50E-03	2.18E-01	0.39	0.61	0.02	0.0028	3.2E-04	3.7E-04	1.6E-03	1.00E+00	1.000	0.0148	1.6E-01
Copper	2.83E+02	4.00E-02	1.1E+01	4.00E-01	1.13E+02	0.39	0.61	0.02	0.0028	1.2E-02	1.9E-01	1.6E-02	1.00E+00	1.000	0.0148	1.5E+01
Iron	2.58E+04	2.20E-01	5.7E+03	1.00E-03	2.58E+01	0.39	0.61	0.02	0.0028	6.2E+00	4.4E-02	1.4E+00	1.00E+00	1.000	0.0148	5.2E+02
Mercury	1.87E-01	4.00E-02	7.5E-03	3.75E-02	7.01E-03	0.39	0.61	0.02	0.0028	8.2E-06	1.2E-05	1.0E-05	1.00E+00	1.000	0.0148	2.1E-03
Manganese	5.59E+02	3.20E-01	1.8E+02	5.00E-02	2.80E+01	0.39	0.61	0.02	0.0028	2.0E-01	4.8E-02	3.1E-02	1.00E+00	1.000	0.0148	1.9E+01
Nickel	5.30E+01	2.00E-02	1.1E+00	3.20E-02	1.70E+00	0.39	0.61	0.02	0.0028	1.2E-03	2.9E-03	3.0E-03	1.00E+00	1.000	0.0148	4.7E-01
Lead	2.04E+03	3.00E-02	6.1E+01	4.50E-02	9.18E+01	0.39	0.61	0.02	0.0028	6.7E-02	1.6E-01	1.1E-01	1.00E+00	1.000	0.0148	2.3E+01
Antimony	2.50E+00	2.20E-01	5.5E-01	2.00E-01	5.00E-01	0.39	0.61	0.02	0.0028	6.0E-04	8.5E-04	1.4E-04	1.00E+00	1.000	0.0148	1.1E-01
Selenium	1.86E+00	2.20E-01	4.1E-01	1.60E-02	2.97E-02	0.39	0.61	0.02	0.0028	4.5E-04	5.1E-05	1.0E-04	1.00E+00	1.000	0.0148	4.1E-02
Thallium	2.14E+00	2.20E-01	4.7E-01	4.00E-03	8.56E-03	0.39	0.61	0.02	0.0028	5.1E-04	1.5E-05	1.2E-04	1.00E+00	1.000	0.0148	4.4E-02
Vanadium	2.79E+01	2.20E-01	6.1E+00	3.00E-03	8.36E-02	0.39	0.61	0.02	0.0028	6.7E-03	1.4E-04	1.6E-03	1.00E+00	1.000	0.0148	5.7E-01
Zinc	4.71E+02	5.60E-01	2.6E+02	1.20E-12	5.66E-10	0.39	0.61	0.02	0.0028	2.9E-01	9.7E-13	2.6E-02	1.00E+00	1.000	0.0148	2.1E+01
Acenaphthene	1.61E+01	1.16E+02	1.9E+03	2.10E-01	3.39E+00	0.39	0.61	0.02	0.0028	2.0E+00	5.8E-03	9.0E-04	1.00E+00	1.000	0.0148	1.4E+02
Naphthalene	1.21E+01	3.60E+01	4.4E+02	4.79E-01	5.79E+00	0.39	0.61	0.02	0.0028	4.8E-01	9.9E-03	6.8E-04	1.00E+00	1.000	0.0148	3.3E+01

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet w
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry w
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-7
Maximum Exposure Doses for Eastern Cottontail (*Sylvilagus floridanus*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	5.60E-03	2.08E-06	1	0.063	0.096	2.0E-07	2.2E-06	1.00E+00	1.000	1.132	2.2E-06
2,4-Dinitrotoluene	6.98E+03	2.72E+00	1.90E+04	1	0.063	0.096	1.8E+03	4.2E+01	1.00E+00	1.000	1.132	1.6E+03
2,6-Dinitrotoluene	2.40E+02	3.15E+00	7.55E+02	1	0.063	0.096	7.2E+01	1.4E+00	1.00E+00	1.000	1.132	6.5E+01
1,3,5-Trinitrobenzene	5.12E+01	8.05E+00	4.12E+02	1	0.063	0.096	4.0E+01	3.1E-01	1.00E+00	1.000	1.132	3.5E+01
Aluminum	1.14E+04	4.00E-03	4.55E+01	1	0.063	0.096	4.4E+00	6.9E+01	1.00E+00	1.000	1.132	6.5E+01
Arsenic	1.23E+01	3.60E-02	4.44E-01	1	0.063	0.096	4.3E-02	7.5E-02	1.00E+00	1.000	1.132	1.0E-01
Barium	2.76E+03	1.50E-01	4.15E+02	1	0.063	0.096	4.0E+01	1.7E+01	1.00E+00	1.000	1.132	5.0E+01
Beryllium	7.87E-01	1.00E-02	7.87E-03	1	0.063	0.096	7.6E-04	4.8E-03	1.00E+00	1.000	1.132	4.9E-03
Cadmium	1.10E+00	3.64E-01	4.02E-01	1	0.063	0.096	3.9E-02	6.7E-03	1.00E+00	1.000	1.132	4.0E-02
Cobalt	1.29E+01	3.50E-01	4.52E+00	1	0.063	0.096	4.3E-01	7.8E-02	1.00E+00	1.000	1.132	4.5E-01
Chromium	2.91E+01	7.50E-03	2.18E-01	1	0.063	0.096	2.1E-02	1.8E-01	1.00E+00	1.000	1.132	1.7E-01
Copper	2.83E+02	4.00E-01	1.13E+02	1	0.063	0.096	1.1E+01	1.7E+00	1.00E+00	1.000	1.132	1.1E+01
Iron	2.58E+04	1.00E-03	2.58E+01	1	0.063	0.096	2.5E+00	1.6E+02	1.00E+00	1.000	1.132	1.4E+02
Mercury	1.87E-01	3.75E-02	7.01E-03	1	0.063	0.096	6.7E-04	1.1E-03	1.00E+00	1.000	1.132	1.6E-03
Manganese	5.59E+02	5.00E-02	2.80E+01	1	0.063	0.096	2.7E+00	3.4E+00	1.00E+00	1.000	1.132	5.4E+00
Nickel	5.30E+01	3.20E-02	1.70E+00	1	0.063	0.096	1.6E-01	3.2E-01	1.00E+00	1.000	1.132	4.3E-01
Lead	2.04E+03	4.50E-02	9.18E+01	1	0.063	0.096	8.8E+00	1.2E+01	1.00E+00	1.000	1.132	1.9E+01
Antimony	2.50E+00	2.00E-01	5.00E-01	1	0.063	0.096	4.8E-02	1.5E-02	1.00E+00	1.000	1.132	5.6E-02
Selenium	1.86E+00	1.60E-02	2.97E-02	1	0.063	0.096	2.9E-03	1.1E-02	1.00E+00	1.000	1.132	1.2E-02
Thallium	2.14E+00	4.00E-03	8.56E-03	1	0.063	0.096	8.2E-04	1.3E-02	1.00E+00	1.000	1.132	1.2E-02
Vanadium	2.79E+01	3.00E-03	8.36E-02	1	0.063	0.096	8.0E-03	1.7E-01	1.00E+00	1.000	1.132	1.6E-01
Zinc	4.71E+02	1.20E-12	5.66E-10	1	0.063	0.096	5.4E-11	2.9E+00	1.00E+00	1.000	1.132	2.5E+00
Acenaphthene	1.61E+01	2.10E-01	3.39E+00	1	0.063	0.096	3.3E-01	9.8E-02	1.00E+00	1.000	1.132	3.7E-01
Naphthalene	1.21E+01	4.79E-01	5.79E+00	1	0.063	0.096	5.6E-01	7.3E-02	1.00E+00	1.000	1.132	5.6E-01

BCF_{inv} = bioconcentration factor for contaminants from sed
BCF_{sed} = bioaccumulation factor for contaminants from sedi
BW = organism body weight
C = moisture content correction factor (dry weight basi
ED = migration factor is the proportion of year in which
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; es
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x
IP = daily intake concentration from plant material (PC
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ing
IW = daily intake concentration from direct water ingest
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-8
Maximum Exposure Doses for Red-tailed Hawk (*Buteo jamaicensis*) for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	VC mg/g_{vert} (dry wt)	Pvert	P_{soil}	IR kg_{dief}/day (Dry wt)	IR kg_{dief}/day (wet wt)	WI L/day	IV mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	1.59E+00	5.9E-04	5.60E-03	5.92E-04	1.00	0.02	0.057		5.7E-02	3.4E-05	4.2E-07	1.00E-02	1.000	0.957	3.6E-07
2,4-Dinitrotoluene	6.98E+03	3.08E+00	2.2E+04	2.72E+00	4.05E+04	1.00	0.02	0.057		5.7E-02	2.3E+03	8.0E+00	1.00E-02	1.000	0.957	2.4E+01
2,6-Dinitrotoluene	2.40E+02	2.50E+00	6.0E+02	3.15E+00	1.35E+03	1.00	0.02	0.057		5.7E-02	7.7E+01	2.7E-01	1.00E-02	1.000	0.957	8.1E-01
1,3,5-Trinitrobenzene	5.12E+01	6.61E-01	3.4E+01	8.05E+00	4.46E+02	1.00	0.02	0.057		5.7E-02	2.5E+01	5.8E-02	1.00E-02	1.000	0.957	2.7E-01
Aluminum	1.14E+04	2.20E-01	2.5E+03	4.00E-03	2.55E+03	1.00	0.02	0.057		5.7E-02	1.5E+02	1.3E+01	1.00E-02	1.000	0.957	1.7E+00
Arsenic	1.23E+01	1.10E-01	1.4E+00	3.60E-02	1.80E+00	1.00	0.02	0.057		5.7E-02	1.0E-01	1.4E-02	1.00E-02	1.000	0.957	1.2E-03
Barium	2.76E+03	2.20E-01	6.1E+02	1.50E-01	1.02E+03	1.00	0.02	0.057		5.7E-02	5.8E+01	3.2E+00	1.00E-02	1.000	0.957	6.4E-01
Beryllium	7.87E-01	2.20E-01	1.7E-01	1.00E-02	1.81E-01	1.00	0.02	0.057		5.7E-02	1.0E-02	9.0E-04	1.00E-02	1.000	0.957	1.2E-04
Cadmium	1.10E+00	9.60E-01	1.1E+00	3.64E-01	1.46E+00	1.00	0.02	0.057		5.7E-02	8.3E-02	1.3E-03	1.00E-02	1.000	0.957	8.8E-04
Cobalt	1.29E+01	2.20E-01	2.8E+00	3.50E-01	7.36E+00	1.00	0.02	0.057		5.7E-02	4.2E-01	1.5E-02	1.00E-02	1.000	0.957	4.5E-03
Chromium	2.91E+01	1.00E-02	2.9E-01	7.50E-03	5.10E-01	1.00	0.02	0.057		5.7E-02	2.9E-02	3.3E-02	1.00E-02	1.000	0.957	6.5E-04
Copper	2.83E+02	4.00E-02	1.1E+01	4.00E-01	1.25E+02	1.00	0.02	0.057		5.7E-02	7.1E+00	3.2E-01	1.00E-02	1.000	0.957	7.8E-02
Iron	2.58E+04	2.20E-01	5.7E+03	1.00E-03	5.71E+03	1.00	0.02	0.057		5.7E-02	3.3E+02	2.9E+01	1.00E-02	1.000	0.957	3.7E+00
Mercury	1.87E-01	4.00E-02	7.5E-03	3.75E-02	1.45E-02	1.00	0.02	0.057		5.7E-02	8.3E-04	2.1E-04	1.00E-02	1.000	0.957	1.1E-05
Manganese	5.59E+02	3.20E-01	1.8E+02	5.00E-02	2.07E+02	1.00	0.02	0.057		5.7E-02	1.2E+01	6.4E-01	1.00E-02	1.000	0.957	1.3E-01
Nickel	5.30E+01	2.00E-02	1.1E+00	3.20E-02	2.75E+00	1.00	0.02	0.057		5.7E-02	1.6E-01	6.0E-02	1.00E-02	1.000	0.957	2.3E-03
Lead	2.04E+03	3.00E-02	6.1E+01	4.50E-02	1.53E+02	1.00	0.02	0.057		5.7E-02	8.7E+00	2.3E+00	1.00E-02	1.000	0.957	1.2E-01
Antimony	2.50E+00	2.20E-01	5.5E-01	2.00E-01	1.05E+00	1.00	0.02	0.057		5.7E-02	6.0E-02	2.9E-03	1.00E-02	1.000	0.957	6.6E-04
Selenium	1.86E+00	2.20E-01	4.1E-01	1.60E-02	4.38E-01	1.00	0.02	0.057		5.7E-02	2.5E-02	2.1E-03	1.00E-02	1.000	0.957	2.8E-04
Thallium	2.14E+00	2.20E-01	4.7E-01	4.00E-03	4.80E-01	1.00	0.02	0.057		5.7E-02	2.7E-02	2.4E-03	1.00E-02	1.000	0.957	3.1E-04
Vanadium	2.79E+01	2.20E-01	6.1E+00	3.00E-03	6.21E+00	1.00	0.02	0.057		5.7E-02	3.5E-01	3.2E-02	1.00E-02	1.000	0.957	4.0E-03
Zinc	4.71E+02	5.60E-01	2.6E+02	1.20E-12	2.64E+02	1.00	0.02	0.057		5.7E-02	1.5E+01	5.4E-01	1.00E-02	1.000	0.957	1.6E-01
Acenaphthene	1.61E+01	1.16E+02	1.9E+03	2.10E-01	1.88E+03	1.00	0.02	0.057		5.7E-02	1.1E+02	1.8E-02	1.00E-02	1.000	0.957	1.1E+00
Naphthalene	1.21E+01	3.60E+01	4.4E+02	4.79E-01	4.41E+02	1.00	0.02	0.057		5.7E-02	2.5E+01	1.4E-02	1.00E-02	1.000	0.957	2.6E-01

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet w
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry w
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{dief}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-9
Maximum Exposure Doses for Racoon (*Procyon lotor*) for
Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	VC mg/g_{vert} (dry wt)	PC mg/g_{plant} (dry wt)	P_{vert}	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IV mg/day vert	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,3,7,8-TCDD TEQ	3.71E-04	1.59E+00	5.9E-04	5.60E-03	9.84E-03	2.08E-06	0.05	0.51	0.42	0.094	0.26	7.8E-05	1.3E-03	2.3E-07	9.1E-06	6.00E-02	0.667	5.1	1.1E-05
2,4-Dinitrotoluene	6.98E+03	2.72E+00	1.9E+04	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	2.5E+03	0.0E+00	0.0E+00	1.7E+02	6.00E-02	0.667	5.1	2.1E+01
2,6-Dinitrotoluene	2.40E+02	3.15E+00	7.5E+02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.0E+02	0.0E+00	0.0E+00	5.9E+00	6.00E-02	0.667	5.1	8.3E-01
2,4,6-Trinitrotoluene	6.05E+03	1.94E+00	1.2E+04	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.6E+03	0.0E+00	0.0E+00	1.5E+02	6.00E-02	0.667	5.1	1.3E+01
1,3,5-Trinitrobenzene	5.12E+01	8.05E+00	4.1E+02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	5.5E+01	0.0E+00	0.0E+00	1.3E+00	6.00E-02	0.667	5.1	4.4E-01
Aluminum	1.14E+04	4.00E-03	4.6E+01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	6.0E+00	0.0E+00	0.0E+00	2.8E+02	6.00E-02	0.667	5.1	2.2E+00
Arsenic	1.23E+01	3.60E-02	4.4E-01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	5.9E-02	0.0E+00	0.0E+00	3.0E-01	6.00E-02	0.667	5.1	2.8E-03
Barium	2.76E+03	1.50E-01	4.1E+02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	5.5E+01	0.0E+00	0.0E+00	6.8E+01	6.00E-02	0.667	5.1	9.6E-01
Beryllium	7.87E-01	1.00E-02	7.9E-03	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.0E-03	0.0E+00	0.0E+00	1.9E-02	6.00E-02	0.667	5.1	1.6E-04
Cadmium	1.10E+00	3.64E-01	4.0E-01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	5.3E-02	0.0E+00	0.0E+00	2.7E-02	6.00E-02	0.667	5.1	6.3E-04
Cobalt	1.29E+01	3.50E-01	4.5E+00	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	6.0E-01	0.0E+00	0.0E+00	3.2E-01	6.00E-02	0.667	5.1	7.2E-03
Chromium	2.91E+01	7.50E-03	2.2E-01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	2.9E-02	0.0E+00	0.0E+00	7.1E-01	6.00E-02	0.667	5.1	5.8E-03
Copper	2.83E+02	4.00E-01	1.1E+02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.5E+01	0.0E+00	0.0E+00	6.9E+00	6.00E-02	0.667	5.1	1.7E-01
Iron	2.58E+04	1.00E-03	2.6E+01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	3.4E+00	0.0E+00	0.0E+00	6.3E+02	6.00E-02	0.667	5.1	5.0E+00
Mercury	1.87E-01	3.75E-02	7.0E-03	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	9.3E-04	0.0E+00	0.0E+00	4.6E-03	6.00E-02	0.667	5.1	4.3E-05
Manganese	5.59E+02	5.00E-02	2.8E+01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	3.7E+00	0.0E+00	0.0E+00	1.4E+01	6.00E-02	0.667	5.1	1.4E-01
Nickel	5.30E+01	3.20E-02	1.7E+00	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	2.2E-01	0.0E+00	0.0E+00	1.3E+00	6.00E-02	0.667	5.1	1.2E-02
Lead	2.04E+03	4.50E-02	9.2E+01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.2E+01	0.0E+00	0.0E+00	5.0E+01	6.00E-02	0.667	5.1	4.9E-01
Antimony	2.50E+00	2.00E-01	5.0E-01	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	6.6E-02	0.0E+00	0.0E+00	6.1E-02	6.00E-02	0.667	5.1	1.0E-03
Selenium	1.86E+00	1.60E-02	3.0E-02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	3.9E-03	0.0E+00	0.0E+00	4.5E-02	6.00E-02	0.667	5.1	3.9E-04
Thallium	2.14E+00	4.00E-03	8.6E-03	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.1E-03	0.0E+00	0.0E+00	5.2E-02	6.00E-02	0.667	5.1	4.2E-04
Vanadium	2.79E+01	3.00E-03	8.4E-02	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	1.1E-02	0.0E+00	0.0E+00	6.8E-01	6.00E-02	0.667	5.1	5.4E-03
Zinc	4.71E+02	1.20E-12	5.7E-10	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	7.5E-11	0.0E+00	0.0E+00	1.2E+01	6.00E-02	0.667	5.1	9.0E-02
Acenaphthene	1.61E+01	2.10E-01	3.4E+00	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	4.5E-01	0.0E+00	0.0E+00	3.9E-01	6.00E-02	0.667	5.1	6.6E-03
Naphthalene	1.21E+01	4.79E-01	5.8E+00	0.00E+00	0.00E+00	0.00E+00	0.05	0.51	0.42	0.094	0.26	7.7E-01	0.0E+00	0.0E+00	3.0E-01	6.00E-02	0.667	5.1	8.3E-03

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = mg/day = milligr milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = mg/g = milligr milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = mg/kg/day = milligr milligrams per kilogram body weight per day
mg/L = mg/L = milligr milligrams per liter of water
NA = NA = not ap not applicable
ND = ND = contar contaminant not detected in medium at a concentration above its reporting limit
OD = OD = expos exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = P = propor proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = PC = conce concentration in plant material (SC x C x SCF_{sed})
SC_{max} = SC_{max} = maxim maximum detected concentration in sediment
WC_{max} = WC_{max} = maxim maximum detected concentration in surface water
wt = wt = weight weight
WI = WI = daily v daily water ingestion rate

Table 3-10
Maximum Exposure Doses for Short-tailed Shrew (*Blarina brevicauda*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	3.08E+00	6.7E+01	1.00	0	0.104	0.0022	1.5E-01	5.0E-03	1.00E+00	1.000	0.015	1.0E+01
2,6-Dinitrotoluene	8.22E+00	2.50E+00	2.1E+01	1.00	0	0.104	0.0022	4.5E-02	1.9E-03	1.00E+00	1.000	0.015	3.1E+00
1,3,5-Trinitrobenzene	1.27E+00	6.61E-01	8.4E-01	1.00	0	0.104	0.0022	1.8E-03	2.9E-04	1.00E+00	1.000	0.015	1.4E-01
Aluminum	1.21E+04	2.20E-01	2.7E+03	1.00	0	0.104	0.0022	5.8E+00	2.8E+00	1.00E+00	1.000	0.015	5.7E+02
Arsenic	9.38E+00	1.10E-01	1.0E+00	1.00	0	0.104	0.0022	2.3E-03	2.1E-03	1.00E+00	1.000	0.015	2.9E-01
Barium	1.14E+02	2.20E-01	2.5E+01	1.00	0	0.104	0.0022	5.5E-02	2.6E-02	1.00E+00	1.000	0.015	5.4E+00
Cadmium	4.77E-01	9.60E-01	4.6E-01	1.00	0	0.104	0.0022	1.0E-03	1.1E-04	1.00E+00	1.000	0.015	7.4E-02
Cobalt	9.73E+00	2.20E-01	2.1E+00	1.00	0	0.104	0.0022	4.7E-03	2.2E-03	1.00E+00	1.000	0.015	4.6E-01
Chromium	1.87E+01	1.00E-02	1.9E-01	1.00	0	0.104	0.0022	4.1E-04	4.3E-03	1.00E+00	1.000	0.015	3.1E-01
Copper	9.99E+01	4.00E-02	4.0E+00	1.00	0	0.104	0.0022	8.8E-03	2.3E-02	1.00E+00	1.000	0.015	2.1E+00
Iron	2.20E+04	2.20E-01	4.8E+03	1.00	0	0.104	0.0022	1.1E+01	5.0E+00	1.00E+00	1.000	0.015	1.0E+03
Mercury	1.33E-01	4.00E-02	5.3E-03	1.00	0	0.104	0.0022	1.2E-05	3.0E-05	1.00E+00	1.000	0.015	2.8E-03
Manganese	7.85E+02	3.20E-01	2.5E+02	1.00	0	0.104	0.0022	5.5E-01	1.8E-01	1.00E+00	1.000	0.015	4.9E+01
Nickel	2.78E+01	2.00E-02	5.6E-01	1.00	0	0.104	0.0022	1.2E-03	6.4E-03	1.00E+00	1.000	0.015	5.1E-01
Lead	2.43E+02	3.00E-02	7.3E+00	1.00	0	0.104	0.0022	1.6E-02	5.6E-02	1.00E+00	1.000	0.015	4.8E+00
Selenium	9.67E-01	2.20E-01	2.1E-01	1.00	0	0.104	0.0022	4.7E-04	2.2E-04	1.00E+00	1.000	0.015	4.6E-02
Thallium	1.40E+00	2.20E-01	3.1E-01	1.00	0	0.104	0.0022	6.8E-04	3.2E-04	1.00E+00	1.000	0.015	6.7E-02
Vanadium	2.86E+01	2.20E-01	6.3E+00	1.00	0	0.104	0.0022	1.4E-02	6.5E-03	1.00E+00	1.000	0.015	1.4E+00
Zinc	1.89E+02	5.60E-01	1.1E+02	1.00	0	0.104	0.0022	2.3E-01	4.3E-02	1.00E+00	1.000	0.015	1.8E+01
Naphthalene	1.38E-01	3.60E+01	5.0E+00	1.00	0	0.104	0.0022	1.1E-02	3.2E-05	1.00E+00	1.000	0.015	7.3E-01

BCF_{inv} = bioconcentration factor for contaminants from sediment into inve
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aqu
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weigh
ED = migration factor is the proportion of year in which exposure coul
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x
IW = daily intake concentration from direct water ingestion (WC x IRW
kg = kilograms
milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
milligrams per kilogram body weight per day
milligrams per liter of water
not applicable
contaminant not detected in medium at a concentration above its reporting limit
exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
concentration in plant material (SC x C x SCF_{sed})
maximum detected concentration in sediment
maximum detected concentration in surface water
weight
daily water ingestion rate

Table 3-11
Maximum Exposure Doses for White-tailed Deer (*Odocoileus virginianus*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	2.72E+00	5.89E+01	1	0.02	2	1.2E+02	8.7E-01	2.00E-02	1.000	61	3.9E-02
2,6-Dinitrotoluene	8.22E+00	3.15E+00	2.59E+01	1	0.02	2	5.2E+01	3.3E-01	2.00E-02	1.000	61	1.7E-02
1,3,5-Trinitrobenzene	1.27E+00	8.05E+00	1.02E+01	1	0.02	2	2.0E+01	5.1E-02	2.00E-02	1.000	61	6.7E-03
Aluminum	1.21E+04	4.00E-03	4.83E+01	1	0.02	2	9.7E+01	4.8E+02	2.00E-02	1.000	61	1.9E-01
Arsenic	9.38E+00	3.60E-02	3.38E-01	1	0.02	2	6.8E-01	3.8E-01	2.00E-02	1.000	61	3.4E-04
Barium	1.14E+02	1.50E-01	1.71E+01	1	0.02	2	3.4E+01	4.5E+00	2.00E-02	1.000	61	1.3E-02
Cadmium	4.77E-01	3.64E-01	1.74E-01	1	0.02	2	3.5E-01	1.9E-02	2.00E-02	1.000	61	1.2E-04
Cobalt	9.73E+00	3.50E-01	3.41E+00	1	0.02	2	6.8E+00	3.9E-01	2.00E-02	1.000	61	2.4E-03
Chromium	1.87E+01	7.50E-03	1.40E-01	1	0.02	2	2.8E-01	7.5E-01	2.00E-02	1.000	61	3.4E-04
Copper	9.99E+01	4.00E-01	4.00E+01	1	0.02	2	8.0E+01	4.0E+00	2.00E-02	1.000	61	2.8E-02
Iron	2.20E+04	1.00E-03	2.20E+01	1	0.02	2	4.4E+01	8.8E+02	2.00E-02	1.000	61	3.0E-01
Mercury	1.33E-01	3.75E-02	4.99E-03	1	0.02	2	1.0E-02	5.3E-03	2.00E-02	1.000	61	5.0E-06
Manganese	7.85E+02	5.00E-02	3.93E+01	1	0.02	2	7.9E+01	3.1E+01	2.00E-02	1.000	61	3.6E-02
Nickel	2.78E+01	3.20E-02	8.91E-01	1	0.02	2	1.8E+00	1.1E+00	2.00E-02	1.000	61	9.5E-04
Lead	2.43E+02	4.50E-02	1.09E+01	1	0.02	2	2.2E+01	9.7E+00	2.00E-02	1.000	61	1.0E-02
Selenium	9.67E-01	1.60E-02	1.55E-02	1	0.02	2	3.1E-02	3.9E-02	2.00E-02	1.000	61	2.3E-05
Thallium	1.40E+00	4.00E-03	5.61E-03	1	0.02	2	1.1E-02	5.6E-02	2.00E-02	1.000	61	2.2E-05
Vanadium	2.86E+01	3.00E-03	8.59E-02	1	0.02	2	1.7E-01	1.1E+00	2.00E-02	1.000	61	4.3E-04
Zinc	1.89E+02	1.20E-12	2.27E-10	1	0.02	2	4.5E-10	7.6E+00	2.00E-02	1.000	61	2.5E-03
Naphthalene	1.38E-01	4.79E-01	6.60E-02	1	0.02	2	1.3E-01	5.5E-03	2.00E-02	1.000	61	4.5E-05

BCF_{inv} = bioconcentration factor for contaminants from sedi
BCF_{sed} = bioaccumulation factor for contaminants from sedi
BW = organism body weight
C = moisture content correction factor (dry weight basi
ED = migration factor is the proportion of year in which e
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; est
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x
IP = daily intake concentration from plant material (PC
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ing
IW = daily intake concentration from direct water ingesti
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-12
Maximum Exposure Doses for Marsh Wren (*Cistothorus palustris*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	P_{inv}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	3.08E+00	6.7E+01	1.00	0.02	0.0029	1.9E-01	1.3E-03	1.00E+00	0.333	0.01	6.5E+00
2,6-Dinitrotoluene	8.22E+00	2.50E+00	2.1E+01	1.00	0.02	0.0029	6.0E-02	4.8E-04	1.00E+00	0.333	0.01	2.0E+00
1,3,5-Trinitrobenzene	1.27E+00	6.61E-01	8.4E-01	1.00	0.02	0.0029	2.4E-03	7.4E-05	1.00E+00	0.333	0.01	8.4E-02
Aluminum	1.21E+04	2.20E-01	2.7E+03	1.00	0.02	0.0029	7.7E+00	7.0E-01	1.00E+00	0.333	0.01	2.8E+02
Arsenic	9.38E+00	1.10E-01	1.0E+00	1.00	0.02	0.0029	3.0E-03	5.4E-04	1.00E+00	0.333	0.01	1.2E-01
Barium	1.14E+02	2.20E-01	2.5E+01	1.00	0.02	0.0029	7.3E-02	6.6E-03	1.00E+00	0.333	0.01	2.6E+00
Cadmium	4.77E-01	9.60E-01	4.6E-01	1.00	0.02	0.0029	1.3E-03	2.8E-05	1.00E+00	0.333	0.01	4.5E-02
Cobalt	9.73E+00	2.20E-01	2.1E+00	1.00	0.02	0.0029	6.2E-03	5.6E-04	1.00E+00	0.333	0.01	2.3E-01
Chromium	1.87E+01	1.00E-02	1.9E-01	1.00	0.02	0.0029	5.4E-04	1.1E-03	1.00E+00	0.333	0.01	5.4E-02
Copper	9.99E+01	4.00E-02	4.0E+00	1.00	0.02	0.0029	1.2E-02	5.8E-03	1.00E+00	0.333	0.01	5.8E-01
Iron	2.20E+04	2.20E-01	4.8E+03	1.00	0.02	0.0029	1.4E+01	1.3E+00	1.00E+00	0.333	0.01	5.1E+02
Mercury	1.33E-01	4.00E-02	5.3E-03	1.00	0.02	0.0029	1.5E-05	7.7E-06	1.00E+00	0.333	0.01	7.7E-04
Manganese	7.85E+02	3.20E-01	2.5E+02	1.00	0.02	0.0029	7.3E-01	4.6E-02	1.00E+00	0.333	0.01	2.6E+01
Nickel	2.78E+01	2.00E-02	5.6E-01	1.00	0.02	0.0029	1.6E-03	1.6E-03	1.00E+00	0.333	0.01	1.1E-01
Lead	2.43E+02	3.00E-02	7.3E+00	1.00	0.02	0.0029	2.1E-02	1.4E-02	1.00E+00	0.333	0.01	1.2E+00
Selenium	9.67E-01	2.20E-01	2.1E-01	1.00	0.02	0.0029	6.2E-04	5.6E-05	1.00E+00	0.333	0.01	2.2E-02
Thallium	1.40E+00	2.20E-01	3.1E-01	1.00	0.02	0.0029	8.9E-04	8.1E-05	1.00E+00	0.333	0.01	3.3E-02
Vanadium	2.86E+01	2.20E-01	6.3E+00	1.00	0.02	0.0029	1.8E-02	1.7E-03	1.00E+00	0.333	0.01	6.6E-01
Zinc	1.89E+02	5.60E-01	1.1E+02	1.00	0.02	0.0029	3.1E-01	1.1E-02	1.00E+00	0.333	0.01	1.1E+01
Naphthalene	1.38E-01	3.60E+01	5.0E+00	1.00	0.02	0.0029	1.4E-02	8.0E-06	1.00E+00	0.333	0.01	4.8E-01

BCF_{inv} = bioconcentration factor for contaminants from sediment into inver
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aqua
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight
ED = migration factor is the proportion of year in which exposure could
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P
IW = daily intake concentration from direct water ingestion (WC x IRW
kg = kilograms

milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
milligrams per kilogram body weight per day
milligrams per liter of water
not applicable
contaminant not detected in medium at a concentration above its reporting limit
exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
concentration in plant material (SC x C x SCF_{sed})
maximum detected concentration in sediment
maximum detected concentration in surface water
weight
daily water ingestion rate

Table 3-13
Maximum Exposure Doses for Deer Mouse (*Peromyscus maniculatus*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	II mg/day inv	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	3.08E+00	6.7E+01	2.72E+00	5.89E+01	0.39	0.61	0.02	0.0028	7.3E-02	1.0E-01	1.2E-03	1.00E+00	1.000	0.0148	1.2E+01
2,6-Dinitrotoluene	8.22E+00	2.50E+00	2.1E+01	3.15E+00	2.59E+01	0.39	0.61	0.02	0.0028	2.2E-02	4.4E-02	4.6E-04	1.00E+00	1.000	0.0148	4.5E+00
1,3,5-Trinitrobenzene	1.27E+00	6.61E-01	8.4E-01	8.05E+00	1.02E+01	0.39	0.61	0.02	0.0028	9.2E-04	1.7E-02	7.1E-05	1.00E+00	1.000	0.0148	1.2E+00
Aluminum	1.21E+04	2.20E-01	2.7E+03	4.00E-03	4.83E+01	0.39	0.61	0.02	0.0028	2.9E+00	8.2E-02	6.8E-01	1.00E+00	1.000	0.0148	2.5E+02
Arsenic	9.38E+00	1.10E-01	1.0E+00	3.60E-02	3.38E-01	0.39	0.61	0.02	0.0028	1.1E-03	5.8E-04	5.3E-04	1.00E+00	1.000	0.0148	1.5E-01
Barium	1.14E+02	2.20E-01	2.5E+01	1.50E-01	1.71E+01	0.39	0.61	0.02	0.0028	2.7E-02	2.9E-02	6.4E-03	1.00E+00	1.000	0.0148	4.2E+00
Cadmium	4.77E-01	9.60E-01	4.6E-01	3.64E-01	1.74E-01	0.39	0.61	0.02	0.0028	5.0E-04	3.0E-04	2.7E-05	1.00E+00	1.000	0.0148	5.6E-02
Cobalt	9.73E+00	2.20E-01	2.1E+00	3.50E-01	3.41E+00	0.39	0.61	0.02	0.0028	2.3E-03	5.8E-03	5.5E-04	1.00E+00	1.000	0.0148	5.9E-01
Chromium	1.87E+01	1.00E-02	1.9E-01	7.50E-03	1.40E-01	0.39	0.61	0.02	0.0028	2.0E-04	2.4E-04	1.0E-03	1.00E+00	1.000	0.0148	1.0E-01
Copper	9.99E+01	4.00E-02	4.0E+00	4.00E-01	4.00E+01	0.39	0.61	0.02	0.0028	4.4E-03	6.8E-02	5.6E-03	1.00E+00	1.000	0.0148	5.3E+00
Iron	2.20E+04	2.20E-01	4.8E+03	1.00E-03	2.20E+01	0.39	0.61	0.02	0.0028	5.3E+00	3.8E-02	1.2E+00	1.00E+00	1.000	0.0148	4.4E+02
Mercury	1.33E-01	4.00E-02	5.3E-03	3.75E-02	4.99E-03	0.39	0.61	0.02	0.0028	5.8E-06	8.5E-06	7.4E-06	1.00E+00	1.000	0.0148	1.5E-03
Manganese	7.85E+02	3.20E-01	2.5E+02	5.00E-02	3.93E+01	0.39	0.61	0.02	0.0028	2.7E-01	6.7E-02	4.4E-02	1.00E+00	1.000	0.0148	2.6E+01
Nickel	2.78E+01	2.00E-02	5.6E-01	3.20E-02	8.91E-01	0.39	0.61	0.02	0.0028	6.1E-04	1.5E-03	1.6E-03	1.00E+00	1.000	0.0148	2.5E-01
Lead	2.43E+02	3.00E-02	7.3E+00	4.50E-02	1.09E+01	0.39	0.61	0.02	0.0028	8.0E-03	1.9E-02	1.4E-02	1.00E+00	1.000	0.0148	2.7E+00
Selenium	9.67E-01	2.20E-01	2.1E-01	1.60E-02	1.55E-02	0.39	0.61	0.02	0.0028	2.3E-04	2.6E-05	5.4E-05	1.00E+00	1.000	0.0148	2.1E-02
Thallium	1.40E+00	2.20E-01	3.1E-01	4.00E-03	5.61E-03	0.39	0.61	0.02	0.0028	3.4E-04	9.6E-06	7.9E-05	1.00E+00	1.000	0.0148	2.9E-02
Vanadium	2.86E+01	2.20E-01	6.3E+00	3.00E-03	8.59E-02	0.39	0.61	0.02	0.0028	6.9E-03	1.5E-04	1.6E-03	1.00E+00	1.000	0.0148	5.8E-01
Zinc	1.89E+02	5.60E-01	1.1E+02	1.20E-12	2.27E-10	0.39	0.61	0.02	0.0028	1.2E-01	3.9E-13	1.1E-02	1.00E+00	1.000	0.0148	8.5E+00
Naphthalene	1.38E-01	3.60E+01	5.0E+00	4.79E-01	6.60E-02	0.39	0.61	0.02	0.0028	5.4E-03	1.1E-04	7.7E-06	1.00E+00	1.000	0.0148	3.7E-01

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-14
Maximum Exposure Doses for Eastern Cottontail (*Sylvilagus floridanus*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{plants} mg/kg (dry wt)	PC mg/g_{plant} (dry wt)	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	2.72E+00	5.89E+01	1	0.063	0.096	5.7E+00	1.3E-01	1.00E+00	1.000	1.132	5.1E+00
2,6-Dinitrotoluene	8.22E+00	3.15E+00	2.59E+01	1	0.063	0.096	2.5E+00	5.0E-02	1.00E+00	1.000	1.132	2.2E+00
1,3,5-Trinitrobenzene	1.27E+00	8.05E+00	1.02E+01	1	0.063	0.096	9.8E-01	7.7E-03	1.00E+00	1.000	1.132	8.7E-01
Aluminum	1.21E+04	4.00E-03	4.83E+01	1	0.063	0.096	4.6E+00	7.3E+01	1.00E+00	1.000	1.132	6.9E+01
Arsenic	9.38E+00	3.60E-02	3.38E-01	1	0.063	0.096	3.2E-02	5.7E-02	1.00E+00	1.000	1.132	7.9E-02
Barium	1.14E+02	1.50E-01	1.71E+01	1	0.063	0.096	1.6E+00	6.9E-01	1.00E+00	1.000	1.132	2.1E+00
Cadmium	4.77E-01	3.64E-01	1.74E-01	1	0.063	0.096	1.7E-02	2.9E-03	1.00E+00	1.000	1.132	1.7E-02
Cobalt	9.73E+00	3.50E-01	3.41E+00	1	0.063	0.096	3.3E-01	5.9E-02	1.00E+00	1.000	1.132	3.4E-01
Chromium	1.87E+01	7.50E-03	1.40E-01	1	0.063	0.096	1.3E-02	1.1E-01	1.00E+00	1.000	1.132	1.1E-01
Copper	9.99E+01	4.00E-01	4.00E+01	1	0.063	0.096	3.8E+00	6.0E-01	1.00E+00	1.000	1.132	3.9E+00
Iron	2.20E+04	1.00E-03	2.20E+01	1	0.063	0.096	2.1E+00	1.3E+02	1.00E+00	1.000	1.132	1.2E+02
Mercury	1.33E-01	3.75E-02	4.99E-03	1	0.063	0.096	4.8E-04	8.0E-04	1.00E+00	1.000	1.132	1.1E-03
Manganese	7.85E+02	5.00E-02	3.93E+01	1	0.063	0.096	3.8E+00	4.7E+00	1.00E+00	1.000	1.132	7.5E+00
Nickel	2.78E+01	3.20E-02	8.91E-01	1	0.063	0.096	8.6E-02	1.7E-01	1.00E+00	1.000	1.132	2.2E-01
Lead	2.43E+02	4.50E-02	1.09E+01	1	0.063	0.096	1.1E+00	1.5E+00	1.00E+00	1.000	1.132	2.2E+00
Selenium	9.67E-01	1.60E-02	1.55E-02	1	0.063	0.096	1.5E-03	5.8E-03	1.00E+00	1.000	1.132	6.5E-03
Thallium	1.40E+00	4.00E-03	5.61E-03	1	0.063	0.096	5.4E-04	8.5E-03	1.00E+00	1.000	1.132	8.0E-03
Vanadium	2.86E+01	3.00E-03	8.59E-02	1	0.063	0.096	8.2E-03	1.7E-01	1.00E+00	1.000	1.132	1.6E-01
Zinc	1.89E+02	1.20E-12	2.27E-10	1	0.063	0.096	2.2E-11	1.1E+00	1.00E+00	1.000	1.132	1.0E+00
Naphthalene	1.38E-01	4.79E-01	6.60E-02	1	0.063	0.096	6.3E-03	8.3E-04	1.00E+00	1.000	1.132	6.3E-03

BCF_{inv} = bioconcentration factor for contaminants from sedi
BCF_{sed} = bioaccumulation factor for contaminants from sedi
BW = organism body weight
C = moisture content correction factor (dry weight basi
ED = migration factor is the proportion of year in which e
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; est
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x
IP = daily intake concentration from plant material (PC
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ing
IW = daily intake concentration from direct water ingesti
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-15
Maximum Exposure Doses for Red-tailed Hawk (*Buteo jamaicensis*) for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	VC mg/g_{vert} (dry wt)	Pvert	P_{soil}	IR kg_{diet}/day (Dry wt)	IR kg_{diet}/day (wet wt)	WI L/day	IV mg/day inv	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	3.08E+00	6.7E+01	2.72E+00	1.26E+02	1.00	0.02	0.057		5.7E-02	7.2E+00	2.5E-02	1.00E-02	1.000	0.957	7.5E-02
2,6-Dinitrotoluene	8.22E+00	2.50E+00	2.1E+01	3.15E+00	4.65E+01	1.00	0.02	0.057		5.7E-02	2.6E+00	9.4E-03	1.00E-02	1.000	0.957	2.8E-02
1,3,5-Trinitrobenzene	1.27E+00	6.61E-01	8.4E-01	8.05E+00	1.11E+01	1.00	0.02	0.057		5.7E-02	6.3E-01	1.4E-03	1.00E-02	1.000	0.957	6.6E-03
Aluminum	1.21E+04	2.20E-01	2.7E+03	4.00E-03	2.70E+03	1.00	0.02	0.057		5.7E-02	1.5E+02	1.4E+01	1.00E-02	1.000	0.957	1.8E+00
Arsenic	9.38E+00	1.10E-01	1.0E+00	3.60E-02	1.37E+00	1.00	0.02	0.057		5.7E-02	7.8E-02	1.1E-02	1.00E-02	1.000	0.957	9.3E-04
Barium	1.14E+02	2.20E-01	2.5E+01	1.50E-01	4.21E+01	1.00	0.02	0.057		5.7E-02	2.4E+00	1.3E-01	1.00E-02	1.000	0.957	2.6E-02
Cadmium	4.77E-01	9.60E-01	4.6E-01	3.64E-01	6.32E-01	1.00	0.02	0.057		5.7E-02	3.6E-02	5.4E-04	1.00E-02	1.000	0.957	3.8E-04
Cobalt	9.73E+00	2.20E-01	2.1E+00	3.50E-01	5.55E+00	1.00	0.02	0.057		5.7E-02	3.2E-01	1.1E-02	1.00E-02	1.000	0.957	3.4E-03
Chromium	1.87E+01	1.00E-02	1.9E-01	7.50E-03	3.28E-01	1.00	0.02	0.057		5.7E-02	1.9E-02	2.1E-02	1.00E-02	1.000	0.957	4.2E-04
Copper	9.99E+01	4.00E-02	4.0E+00	4.00E-01	4.40E+01	1.00	0.02	0.057		5.7E-02	2.5E+00	1.1E-01	1.00E-02	1.000	0.957	2.7E-02
Iron	2.20E+04	2.20E-01	4.8E+03	1.00E-03	4.86E+03	1.00	0.02	0.057		5.7E-02	2.8E+02	2.5E+01	1.00E-02	1.000	0.957	3.2E+00
Mercury	1.33E-01	4.00E-02	5.3E-03	3.75E-02	1.03E-02	1.00	0.02	0.057		5.7E-02	5.9E-04	1.5E-04	1.00E-02	1.000	0.957	7.7E-06
Manganese	7.85E+02	3.20E-01	2.5E+02	5.00E-02	2.91E+02	1.00	0.02	0.057		5.7E-02	1.7E+01	9.0E-01	1.00E-02	1.000	0.957	1.8E-01
Nickel	2.78E+01	2.00E-02	5.6E-01	3.20E-02	1.45E+00	1.00	0.02	0.057		5.7E-02	8.3E-02	3.2E-02	1.00E-02	1.000	0.957	1.2E-03
Lead	2.43E+02	3.00E-02	7.3E+00	4.50E-02	1.82E+01	1.00	0.02	0.057		5.7E-02	1.0E+00	2.8E-01	1.00E-02	1.000	0.957	1.4E-02
Selenium	9.67E-01	2.20E-01	2.1E-01	1.60E-02	2.28E-01	1.00	0.02	0.057		5.7E-02	1.3E-02	1.1E-03	1.00E-02	1.000	0.957	1.5E-04
Thallium	1.40E+00	2.20E-01	3.1E-01	4.00E-03	3.14E-01	1.00	0.02	0.057		5.7E-02	1.8E-02	1.6E-03	1.00E-02	1.000	0.957	2.0E-04
Vanadium	2.86E+01	2.20E-01	6.3E+00	3.00E-03	6.38E+00	1.00	0.02	0.057		5.7E-02	3.6E-01	3.3E-02	1.00E-02	1.000	0.957	4.1E-03
Zinc	1.89E+02	5.60E-01	1.1E+02	1.20E-12	1.06E+02	1.00	0.02	0.057		5.7E-02	6.0E+00	2.2E-01	1.00E-02	1.000	0.957	6.5E-02
Naphthalene	1.38E-01	3.60E+01	5.0E+00	4.79E-01	5.03E+00	1.00	0.02	0.057		5.7E-02	2.9E-01	1.6E-04	1.00E-02	1.000	0.957	3.0E-03

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet w
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry w
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = milligrams per kilogram body weight per day
mg/L = milligrams per liter of water
NA = not applicable
ND = contaminant not detected in medium at a concentration above its reporting limit
OD = exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = concentration in plant material (SC x C x SCF_{sed})
SC_{max} = maximum detected concentration in sediment
WC_{max} = maximum detected concentration in surface water
wt = weight
WI = daily water ingestion rate

Table 3-16
Maximum Exposure Doses for Raccoon (*Procyon lotor*) for
Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Conc. Soil mg/g_{sed} (dry wt)	BCF_{inv} mg/kg wet	IC mg/g_{inv} (wet wt)	BCF_{plants} mg/kg (dry wt)	VC mg/g_{vert} (dry wt)	PC mg/g_{plant} (dry wt)	P_{vert}	P_{inv}	P_{plant}	P_{soil}	IR kg_{diet}/day (Dry wt)	WI L/day	II mg/day inv	IV mg/day vert	IP mg/day plant	IS mg/day soil	HRF	ED fraction of year	BW kg	OD mg/kg/day
2,4-Dinitrotoluene	2.17E+01	3.08E+00	6.7E+01	2.72E+00	1.51E+03	5.89E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	8.9E+00	2.0E+02	6.4E+00	5.3E-01	1.00E-01	0.667	5.1	2.8E+00
2,6-Dinitrotoluene	8.22E+00	2.50E+00	2.1E+01	3.15E+00	1.95E+02	2.59E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	2.7E+00	2.6E+01	2.8E+00	2.0E-01	1.00E-01	0.667	5.1	4.1E-01
2,4,6-Trinitrotoluene	6.06E+02	4.97E+00	3.0E+03	1.94E+00	1.83E+06	1.17E+03	0.05	0.51	0.42	0.094	0.26	4.3E-01	4.0E+02	2.4E+05	1.3E+02	1.5E+01	1.00E-01	0.667	5.1	3.2E+03
1,3,5-Trinitrobenzene	1.27E+00	6.61E-01	8.4E-01	8.05E+00	1.13E+01	1.02E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	1.1E-01	1.5E+00	1.1E+00	3.1E-02	1.00E-01	0.667	5.1	3.6E-02
Aluminum	1.21E+04	2.20E-01	2.7E+03	4.00E-03	3.21E+07	4.83E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	3.5E+02	4.3E+06	5.3E+00	3.0E+02	1.00E-01	0.667	5.1	5.6E+04
Arsenic	9.38E+00	1.10E-01	1.0E+00	3.60E-02	1.00E+01	3.38E-01	0.05	0.51	0.42	0.094	0.26	4.3E-01	1.4E-01	1.3E+00	3.7E-02	2.3E-01	1.00E-01	0.667	5.1	2.3E-02
Barium	1.14E+02	2.20E-01	2.5E+01	1.50E-01	2.86E+03	1.71E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	3.3E+00	3.8E+02	1.9E+00	2.8E+00	1.00E-01	0.667	5.1	5.1E+00
Cadmium	4.77E-01	9.60E-01	4.6E-01	3.64E-01	3.92E-01	1.74E-01	0.05	0.51	0.42	0.094	0.26	4.3E-01	6.1E-02	5.2E-02	1.9E-02	1.2E-02	1.00E-01	0.667	5.1	1.9E-03
Cobalt	9.73E+00	2.20E-01	2.1E+00	3.50E-01	2.42E+01	3.41E+00	0.05	0.51	0.42	0.094	0.26	4.3E-01	2.8E-01	3.2E+00	3.7E-01	2.4E-01	1.00E-01	0.667	5.1	5.4E-02
Chromium	1.87E+01	1.00E-02	1.9E-01	7.50E-03	3.64E+00	1.40E-01	0.05	0.51	0.42	0.094	0.26	4.3E-01	2.5E-02	4.8E-01	1.5E-02	4.6E-01	1.00E-01	0.667	5.1	1.3E-02
Copper	9.99E+01	4.00E-02	4.0E+00	4.00E-01	4.39E+02	4.00E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	5.3E-01	5.8E+01	4.4E+00	2.4E+00	1.00E-01	0.667	5.1	8.6E-01
Iron	2.20E+04	2.20E-01	4.8E+03	1.00E-03	1.06E+08	2.20E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	6.4E+02	1.4E+07	2.4E+00	5.4E+02	1.00E-01	0.667	5.1	1.8E+05
Mercury	1.33E-01	4.00E-02	5.3E-03	3.75E-02	5.70E-03	4.99E-03	0.05	0.51	0.42	0.094	0.26	4.3E-01	7.1E-04	7.6E-04	5.4E-04	3.3E-03	1.00E-01	0.667	5.1	6.9E-05
Manganese	7.85E+02	3.20E-01	2.5E+02	5.00E-02	1.97E+05	3.93E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	3.3E+01	2.6E+04	4.3E+00	1.9E+01	1.00E-01	0.667	5.1	3.4E+02
Nickel	2.78E+01	2.00E-02	5.6E-01	3.20E-02	1.64E+01	8.91E-01	0.05	0.51	0.42	0.094	0.26	4.3E-01	7.4E-02	2.2E+00	9.7E-02	6.8E-01	1.00E-01	0.667	5.1	4.0E-02
Lead	2.43E+02	3.00E-02	7.3E+00	4.50E-02	1.79E+03	1.09E+01	0.05	0.51	0.42	0.094	0.26	4.3E-01	9.7E-01	2.4E+02	1.2E+00	5.9E+00	1.00E-01	0.667	5.1	3.2E+00
Selenium	9.67E-01	2.20E-01	2.1E-01	1.60E-02	2.21E-01	1.55E-02	0.05	0.51	0.42	0.094	0.26	4.3E-01	2.8E-02	2.9E-02	1.7E-03	2.4E-02	1.00E-01	0.667	5.1	1.1E-03
Thallium	1.40E+00	2.20E-01	3.1E-01	4.00E-03	4.38E-01	5.61E-03	0.05	0.51	0.42	0.094	0.26	4.3E-01	4.1E-02	5.8E-02	6.1E-04	3.4E-02	1.00E-01	0.667	5.1	1.7E-03
Vanadium	2.86E+01	2.20E-01	6.3E+00	3.00E-03	1.80E+02	8.59E-02	0.05	0.51	0.42	0.094	0.26	4.3E-01	8.3E-01	2.4E+01	9.4E-03	7.0E-01	1.00E-01	0.667	5.1	3.3E-01
Zinc	1.89E+02	5.60E-01	1.1E+02	1.20E-12	2.01E+04	2.27E-10	0.05	0.51	0.42	0.094	0.26	4.3E-01	1.4E+01	2.7E+03	2.5E-11	4.6E+00	1.00E-01	0.667	5.1	3.5E+01

BCF_{inv} = bioconcentration factor for contaminants from sediment into invertebrates (wet v
BCF_{sed} = bioaccumulation factor for contaminants from sediment into aquatic plants (dry
BW = organism body weight
C = moisture content correction factor (dry weight basis to wet weight basis)
ED = migration factor is the proportion of year in which exposure could occur
g_{diet}/day = grams of dietary intake per day
HRF = home range factor (site area/home range area; estimated to be 0.85)
IC = concentration in invertebrate tissue (SC x BAF_{inv})
II = daily intake concentration from invertebrates (IC x P_{inv} x IR)
IP = daily intake concentration from plant material (PC x P_{plant} x IR)
IR = daily ingestion rate (wet wt)
IS = daily intake concentration from direct sediment ingestion (SC x P_{sed} x IR)
IW = daily intake concentration from direct water ingestion (WC x IRW)
kg = kilograms
mg/day = mg/day = milligr milligrams per day from food item (inv = invertebrate; plant; sed = sediment)
mg/g = mg/g = milligr milligrams per gram of food item (inv = invertebrate; plant; sed = sediment)
mg/kg/day = mg/kg/day = milligr milligrams per kilogram body weight per day
mg/L = mg/L = milligr milligrams per liter of water
NA = NA = not ap not applicable
ND = ND = contar contaminant not detected in medium at a concentration above its reporting limit
OD = OD = expos exposure dose to the omnivore = ([II+IP+IS+IW] x HRF x ED) / BW
P = P = propor proportion of ingestion composed of food item (inv = invertebrate; plant; sed = sediment)
PC = PC = conce concentration in plant material (SC x C x SCF_{sed})
SC_{max} = SC_{max} = maxim maximum detected concentration in sediment
WC_{max} = WC_{max} = maxim maximum detected concentration in surface water
wt = wt = weigh weight
WI = WI = daily v daily water ingestion rate

Table 4-1
Toxicity Reference Values,
Plum Brook Ordnance Works, Sandusky, Ohio

		Mammals			Birds			Source	
Method Group	Chemical Name	NOAEL (mg/kg/d)	Test Species	Body Wt. (kg)	NOAEL (mg/kg/d)	Test Species	Body Wt. (kg)	Mammals	Birds
DIO	2,3,7,8-TCDD TEQ	1.00E-06	rat	0.35					
HE	1,3,5-Trinitrobenzene	--	--	--	--	--	--	--	--
HE	2,4,6-Trinitrotoluene	1.60E+00	rat	0.35	7.00E-01	Bobwhite quail	0.19	Talmage et. al (1996)	Talmage et. al (1996)
HE	2,4-Dinitrotoluene	2.00E-01	beagle dog	11	7.00E-01	Bobwhite quail	0.19	IRIS	2,4,6-TNT as surrogate
HE	2,6-Dinitrotoluene	2.00E-01	beagle dog	11	7.00E-01	Bobwhite quail	0.19	2,4-DNT as surrogate	2,4,6-TNT as surrogate
MET	Aluminum	1.93E+00	mouse	0.03	1.10E+02	ringed dove	0.155	Sample et al. 1996	Sample et al. 1996
MET	Antimony	1.25E+00	mouse	0.03	--	--	--	ORNL TM86r3	--
MET	Arsenic	1.25E+00	mouse	0.03	2.46E+00	Brown-headed cowbird	--	ORNL TM86r3	EPA 1999
MET	Barium	5.10E+00	rat	0.435	2.08E+01	chicks	0.121	Sample et al. 1996	Sample et al. 1996
MET	Beryllium	6.60E-02	rat	0.273	--	--	--	Sample et al. 1996	Sample et al. 1996
MET	Cadmium	1.00E+00	rat	0.303	1.45E+00	mallard duck	1.153	Sample et al. 1996	Sample et al. 1996
MET	Chromium	2.74E+00	rat	0.35	1.00E+00	black duck	1.25	Sample et al. 1996	Sample et al. 1996
MET	Cobalt	1.20E+00	rat	0.35	--	--	--	Sample et al. 1996	Sample et al. 1996
MET	Copper	1.17E+01	mink	1	4.70E+01	chicks	0.534	Sample et al. 1996	Sample et al. 1996
MET	Iron	2.60E+01	rabbit	3.8	5.00E+01	poultry	1.6	Sample et al. 1996	Sample et al. 1996
MET	Lead	8.00E+00	rat	0.35	3.85E+00	Am. Kestrel	0.13	Sample et al. 1996	Sample et al. 1996
MET	Manganese	8.80E+01	rat	0.35	9.77E+02	Jap. Quail	0.072	Sample et al. 1996	Sample et al. 1996
MET	Mercury	1.00E+00	mink	1	4.50E-01	Jap. Quail	0.15	Sample et al. 1996	Sample et al. 1996
MET	Nickel	4.00E+01	rat	0.35	7.74E+01	mallard duck	0.782	Sample et al. 1996	Sample et al. 1996
MET	Selenium	2.00E-01	rat	0.35	5.00E-01	mallard duck	1	Sample et al. 1996	Sample et al. 1996
MET	Thallium	7.40E-02	rat	0.365	3.50E-01	Starling	--	Sample et al. 1996	EPA 1999
MET	Vanadium	2.10E-01	rat	0.26	1.14E+01	Mallard Duck	1.17	ORNL TM86r3	ORNL TM86r3
MET	Zinc	1.60E+02	rat	0.35	1.45E+01	hens	1.935	Sample et al. 1996	Sample et al. 1996
PAH	Acenaphthene	1.00E+00	mouse	0.03	--	--	--	Benzo(a)pyrene as surrogate	--
SV	Naphthalene	1.00E+00	mouse	0.03	--	--	--	Benzo(a)pyrene as surrogate	--

Table 5-1
Hazard Quotients for Short-tailed Shrew (*Blarina brevicauda*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	1.75E+01	**9E+01**
2,6-Dinitrotoluene	2.00E-01	4.08E+00	**2E+01**
1,3,5-Trinitrobenzene	--	1.68E-01	NA
Silver	3.75E-01	9.41E-03	3E-02
Aluminum	1.93E+00	5.30E+02	**3E+02**
Arsenic	1.25E+00	2.46E-01	2E-01
Barium	5.10E+00	5.54E+00	**1E+00**
Beryllium	6.60E-02	3.11E-02	5E-01
Cadmium	1.00E+00	7.72E-02	8E-02
Cobalt	1.20E+00	3.66E-01	3E-01
Chromium	2.74E+00	3.01E-01	1E-01
Copper	1.17E+01	2.70E+00	2E-01
Iron	2.60E+01	9.40E+02	**4E+01**
Mercury	1.00E+00	3.51E-03	4E-03
Manganese	8.80E+01	1.91E+01	2E-01
Nickel	4.00E+01	4.07E-01	1E-02
Lead	8.00E+00	4.67E+00	6E-01
Selenium	2.00E-01	4.41E-02	2E-01
Thallium	7.40E-02	6.62E-02	9E-01
Vanadium	2.10E-01	1.23E+00	**6E+00**
Zinc	1.60E+02	1.84E+01	1E-01
Naphthalene	1.00E+00	9.08E-01	9E-01

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-2
Hazard Quotients for White-tailed Deer (*Odocoileus virginianus*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	6.23E-09	6E-03
2,4-Dinitrotoluene	2.00E-01	1.25E+01	**6E+01**
2,6-Dinitrotoluene	2.00E-01	4.98E-01	**2E+00**
1,3,5-Trinitrobenzene	--	2.71E-01	NA
Aluminum	1.93E+00	1.79E-01	9E-02
Arsenic	1.25E+00	4.53E-04	4E-04
Barium	5.10E+00	3.08E-01	6E-02
Beryllium	6.60E-02	1.55E-05	2E-04
Cadmium	1.00E+00	2.78E-04	3E-04
Cobalt	1.20E+00	3.13E-03	3E-03
Chromium	2.74E+00	5.25E-04	2E-04
Copper	1.17E+01	7.80E-02	7E-03
Iron	2.60E+01	3.56E-01	1E-02
Mercury	1.00E+00	7.05E-06	7E-06
Manganese	8.80E+01	2.57E-02	3E-04
Nickel	4.00E+01	1.81E-03	5E-05
Lead	8.00E+00	8.69E-02	1E-02
Antimony	1.25E+00	3.61E-04	3E-04
Selenium	2.00E-01	4.39E-05	2E-04
Thallium	7.40E-02	3.37E-05	5E-04
Vanadium	2.10E-01	4.20E-04	2E-03
Zinc	1.60E+02	6.18E-03	4E-05
Acenaphthene	1.00E+00	2.43E-03	2E-03
Naphthalene	1.00E+00	3.95E-03	4E-03

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-3
Hazard Quotients for Marsh Wren (*Cistothorus palustris*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	5.78E-05	**6E+01**
2,4-Dinitrotoluene	2.00E-01	2.09E+03	**1E+04**
2,6-Dinitrotoluene	2.00E-01	5.84E+01	**3E+02**
1,3,5-Trinitrobenzene	--	3.37E+00	NA
Aluminum	1.93E+00	2.64E+02	**1E+02**
Arsenic	1.25E+00	1.55E-01	1E-01
Barium	5.10E+00	6.41E+01	**1E+01**
Beryllium	6.60E-02	1.83E-02	3E-01
Cadmium	1.00E+00	1.05E-01	1E-01
Cobalt	1.20E+00	3.00E-01	2E-01
Chromium	2.74E+00	8.45E-02	3E-02
Copper	1.17E+01	1.64E+00	1E-01
Iron	2.60E+01	5.99E+02	**2E+01**
Mercury	1.00E+00	1.08E-03	1E-03
Manganese	8.80E+01	1.84E+01	2E-01
Nickel	4.00E+01	2.05E-01	5E-03
Lead	8.00E+00	9.86E+00	**1E+00**
Antimony	1.25E+00	5.80E-02	5E-02
Selenium	2.00E-01	4.31E-02	2E-01
Thallium	7.40E-02	4.97E-02	7E-01
Vanadium	2.10E-01	6.46E-01	**3E+00**
Zinc	1.60E+02	2.64E+01	2E-01
Acenaphthene	1.00E+00	1.81E+02	**2E+02**
Naphthalene	1.00E+00	4.21E+01	**4E+01**

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-4
Hazard Quotients for Deer Mouse (*Peromyscus maniculatus*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	4.52E-05	**5E+01**
2,4-Dinitrotoluene	2.00E-01	3.80E+03	**2E+04**
2,6-Dinitrotoluene	2.00E-01	1.32E+02	**7E+02**
1,3,5-Trinitrobenzene	--	5.02E+01	NA
Aluminum	1.93E+00	2.33E+02	**1E+02**
Arsenic	1.25E+00	1.98E-01	2E-01
Barium	5.10E+00	1.03E+02	**2E+01**
Beryllium	6.60E-02	1.67E-02	3E-01
Cadmium	1.00E+00	1.29E-01	1E-01
Cobalt	1.20E+00	7.80E-01	6E-01
Chromium	2.74E+00	1.57E-01	6E-02
Copper	1.17E+01	1.50E+01	**1E+00**
Iron	2.60E+01	5.20E+02	**2E+01**
Mercury	1.00E+00	2.07E-03	2E-03
Manganese	8.80E+01	1.85E+01	2E-01
Nickel	4.00E+01	4.74E-01	1E-02
Lead	8.00E+00	2.28E+01	**3E+00**
Antimony	1.25E+00	1.08E-01	9E-02
Selenium	2.00E-01	4.06E-02	2E-01
Thallium	7.40E-02	4.38E-02	6E-01
Vanadium	2.10E-01	5.67E-01	**3E+00**
Zinc	1.60E+02	2.13E+01	1E-01
Acenaphthene	1.00E+00	1.39E+02	**1E+02**
Naphthalene	1.00E+00	3.28E+01	**3E+01**

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-5
Hazard Quotients for Eastern Cottontail (*Sylvilagus floridanus*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	2.16E-06	**2E+00**
2,4-Dinitrotoluene	2.00E-01	1.65E+03	**8E+03**
2,6-Dinitrotoluene	2.00E-01	6.53E+01	**3E+02**
1,3,5-Trinitrobenzene	--	3.52E+01	NA
Aluminum	1.93E+00	6.47E+01	**3E+01**
Arsenic	1.25E+00	1.04E-01	8E-02
Barium	5.10E+00	4.99E+01	**1E+01**
Beryllium	6.60E-02	4.87E-03	7E-02
Cadmium	1.00E+00	4.00E-02	4E-02
Cobalt	1.20E+00	4.52E-01	4E-01
Chromium	2.74E+00	1.74E-01	6E-02
Copper	1.17E+01	1.11E+01	1E+00
Iron	2.60E+01	1.40E+02	**5E+00**
Mercury	1.00E+00	1.59E-03	2E-03
Manganese	8.80E+01	5.36E+00	6E-02
Nickel	4.00E+01	4.27E-01	1E-02
Lead	8.00E+00	1.87E+01	**2E+00**
Antimony	1.25E+00	5.58E-02	4E-02
Selenium	2.00E-01	1.24E-02	6E-02
Thallium	7.40E-02	1.22E-02	2E-01
Vanadium	2.10E-01	1.56E-01	7E-01
Zinc	1.60E+02	2.52E+00	2E-02
Acenaphthene	1.00E+00	3.74E-01	4E-01
Naphthalene	1.00E+00	5.55E-01	6E-01

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-6
Hazard Quotients for Red-tailed Hawk (*Buteo jamaicensis*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	3.57E-07	4E-01
2,4-Dinitrotoluene	2.00E-01	2.42E+01	**1E+02**
2,6-Dinitrotoluene	2.00E-01	8.09E-01	**4E+00**
1,3,5-Trinitrobenzene	--	2.66E-01	NA
Aluminum	1.93E+00	1.65E+00	9E-01
Arsenic	1.25E+00	1.22E-03	1E-03
Barium	5.10E+00	6.42E-01	1E-01
Beryllium	6.60E-02	1.17E-04	2E-03
Cadmium	1.00E+00	8.84E-04	9E-04
Cobalt	1.20E+00	4.54E-03	4E-03
Chromium	2.74E+00	6.51E-04	2E-04
Copper	1.17E+01	7.76E-02	7E-03
Iron	2.60E+01	3.71E+00	1E-01
Mercury	1.00E+00	1.09E-05	1E-05
Manganese	8.80E+01	1.30E-01	1E-03
Nickel	4.00E+01	2.27E-03	6E-05
Lead	8.00E+00	1.15E-01	1E-02
Antimony	1.25E+00	6.56E-04	5E-04
Selenium	2.00E-01	2.83E-04	1E-03
Thallium	7.40E-02	3.11E-04	4E-03
Vanadium	2.10E-01	4.03E-03	2E-02
Zinc	1.60E+02	1.63E-01	1E-03
Acenaphthene	1.00E+00	1.12E+00	**1E+00**
Naphthalene	1.00E+00	2.63E-01	3E-01

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-7
Hazard Quotients for Raccoon (*Procyon lotor*)
for Exposures at Reservoir No. 2 Burning Ground, Inside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,3,7,8-TCDD TEQ	1.00E-06	1.09E-05	**1E+01**
2,4-Dinitrotoluene	2.00E-01	2.11E+01	**1E+02**
2,6-Dinitrotoluene	2.00E-01	8.31E-01	**4E+00**
2,4,6-Trinitrotoluene	1.60E+00	1.34E+01	**8E+00**
1,3,5-Trinitrobenzene	--	4.38E-01	NA
Aluminum	1.93E+00	2.23E+00	**1E+00**
Arsenic	1.25E+00	2.83E-03	2E-03
Barium	5.10E+00	9.61E-01	2E-01
Beryllium	6.60E-02	1.59E-04	2E-03
Cadmium	1.00E+00	6.30E-04	6E-04
Cobalt	1.20E+00	7.17E-03	6E-03
Chromium	2.74E+00	5.81E-03	2E-03
Copper	1.17E+01	1.72E-01	1E-02
Iron	2.60E+01	4.98E+00	2E-01
Mercury	1.00E+00	4.31E-05	4E-05
Manganese	8.80E+01	1.36E-01	2E-03
Nickel	4.00E+01	1.19E-02	3E-04
Lead	8.00E+00	4.86E-01	6E-02
Antimony	1.25E+00	1.00E-03	8E-04
Selenium	2.00E-01	3.87E-04	2E-03
Thallium	7.40E-02	4.19E-04	6E-03
Vanadium	2.10E-01	5.43E-03	3E-02
Zinc	1.60E+02	9.04E-02	6E-04
Acenaphthene	1.00E+00	6.62E-03	7E-03
Naphthalene	1.00E+00	8.33E-03	8E-03

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-8
Hazard Quotients for Short-tailed Shrew (*Blarina brevicauda*) for Exposures at Reservoir No. 2, Outside the Burn Area, Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	7.00E-01	1.01E+01	**1E+01**
2,6-Dinitrotoluene	7.00E-01	3.14E+00	**4E+00**
1,3,5-Trinitrobenzene	--	1.42E-01	NA
Aluminum	1.10E+02	5.74E+02	**5E+00**
Arsenic	2.46E+00	2.94E-01	1E-01
Barium	2.08E+01	5.40E+00	3E-01
Cadmium	1.45E+00	7.44E-02	5E-02
Cobalt	--	4.63E-01	NA
Chromium	1.00E+00	3.13E-01	3E-01
Copper	4.70E+01	2.11E+00	4E-02
Iron	5.00E+01	1.04E+03	**2E+01**
Mercury	4.50E-01	2.81E-03	6E-03
Manganese	9.77E+02	4.88E+01	5E-02
Nickel	7.74E+01	5.06E-01	7E-03
Lead	3.85E+00	4.78E+00	**1E+00**
Selenium	5.00E-01	4.60E-02	9E-02
Thallium	3.50E-01	6.66E-02	2E-01
Vanadium	1.14E+01	1.36E+00	1E-01
Zinc	1.45E+01	1.84E+01	**1E+00**
Naphthalene	--	7.30E-01	NA

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-9
Hazard Quotients for White-tailed Deer (*Odocoileus virginianus*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	3.89E-02	2E-01
2,6-Dinitrotoluene	2.00E-01	1.71E-02	9E-02
1,3,5-Trinitrobenzene	--	6.72E-03	NA
Aluminum	1.93E+00	1.90E-01	1E-01
Arsenic	1.25E+00	3.45E-04	3E-04
Barium	5.10E+00	1.27E-02	2E-03
Cadmium	1.00E+00	1.20E-04	1E-04
Cobalt	1.20E+00	2.36E-03	2E-03
Chromium	2.74E+00	3.38E-04	1E-04
Copper	1.17E+01	2.75E-02	2E-03
Iron	2.60E+01	3.03E-01	1E-02
Mercury	1.00E+00	5.01E-06	5E-06
Manganese	8.80E+01	3.60E-02	4E-04
Nickel	4.00E+01	9.49E-04	2E-05
Lead	8.00E+00	1.04E-02	1E-03
Selenium	2.00E-01	2.28E-05	1E-04
Thallium	7.40E-02	2.21E-05	3E-04
Vanadium	2.10E-01	4.32E-04	2E-03
Zinc	1.60E+02	2.48E-03	2E-05
Naphthalene	1.00E+00	4.51E-05	5E-05

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-10
Hazard Quotients for Marsh Wren (*Cistothorus palustris*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	6.50E+00	**3E+01**
2,6-Dinitrotoluene	2.00E-01	2.00E+00	**1E+01**
1,3,5-Trinitrobenzene	--	8.36E-02	NA
Aluminum	1.93E+00	2.80E+02	**1E+02**
Arsenic	1.25E+00	1.18E-01	9E-02
Barium	5.10E+00	2.64E+00	5E-01
Cadmium	1.00E+00	4.52E-02	5E-02
Cobalt	1.20E+00	2.26E-01	2E-01
Chromium	2.74E+00	5.43E-02	2E-02
Copper	1.17E+01	5.80E-01	5E-02
Iron	2.60E+01	5.10E+02	**2E+01**
Mercury	1.00E+00	7.71E-04	8E-04
Manganese	8.80E+01	2.58E+01	3E-01
Nickel	4.00E+01	1.08E-01	3E-03
Lead	8.00E+00	1.18E+00	1E-01
Selenium	2.00E-01	2.24E-02	1E-01
Thallium	7.40E-02	3.25E-02	4E-01
Vanadium	2.10E-01	6.64E-01	**3E+00**
Zinc	1.60E+02	1.06E+01	7E-02
Naphthalene	1.00E+00	4.80E-01	5E-01

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-11
Hazard Quotients for Deer Mouse (*Peromyscus maniculatus*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	1.18E+01	**6E+01**
2,6-Dinitrotoluene	2.00E-01	4.54E+00	**2E+01**
1,3,5-Trinitrobenzene	--	1.25E+00	NA
Aluminum	1.93E+00	2.47E+02	**1E+02**
Arsenic	1.25E+00	1.51E-01	1E-01
Barium	5.10E+00	4.24E+00	8E-01
Cadmium	1.00E+00	5.56E-02	6E-02
Cobalt	1.20E+00	5.88E-01	5E-01
Chromium	2.74E+00	1.01E-01	4E-02
Copper	1.17E+01	5.29E+00	5E-01
Iron	2.60E+01	4.43E+02	**2E+01**
Mercury	1.00E+00	1.47E-03	1E-03
Manganese	8.80E+01	2.60E+01	3E-01
Nickel	4.00E+01	2.49E-01	6E-03
Lead	8.00E+00	2.72E+00	3E-01
Selenium	2.00E-01	2.11E-02	1E-01
Thallium	7.40E-02	2.87E-02	4E-01
Vanadium	2.10E-01	5.83E-01	**3E+00**
Zinc	1.60E+02	8.54E+00	5E-02
Naphthalene	1.00E+00	3.75E-01	4E-01

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-12
Hazard Quotients for Eastern Cottontail (*Sylvilagus floridanus*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	5.11E+00	**3E+01**
2,6-Dinitrotoluene	2.00E-01	2.24E+00	**1E+01**
1,3,5-Trinitrobenzene	--	8.73E-01	NA
Aluminum	1.93E+00	6.86E+01	**4E+01**
Arsenic	1.25E+00	7.88E-02	6E-02
Barium	5.10E+00	2.05E+00	4E-01
Cadmium	1.00E+00	1.73E-02	2E-02
Cobalt	1.20E+00	3.41E-01	3E-01
Chromium	2.74E+00	1.12E-01	4E-02
Copper	1.17E+01	3.92E+00	3E-01
Iron	2.60E+01	1.19E+02	**5E+00**
Mercury	1.00E+00	1.13E-03	1E-03
Manganese	8.80E+01	7.53E+00	9E-02
Nickel	4.00E+01	2.24E-01	6E-03
Lead	8.00E+00	2.23E+00	3E-01
Selenium	2.00E-01	6.48E-03	3E-02
Thallium	7.40E-02	7.97E-03	1E-01
Vanadium	2.10E-01	1.60E-01	8E-01
Zinc	1.60E+02	1.01E+00	6E-03
Naphthalene	1.00E+00	6.34E-03	6E-03

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-13
Hazard Quotients for Red-tailed Hawk (*Buteo jamaicensis*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	2.00E-01	7.51E-02	4E-01
2,6-Dinitrotoluene	2.00E-01	2.78E-02	1E-01
1,3,5-Trinitrobenzene	--	6.60E-03	NA
Aluminum	1.93E+00	1.75E+00	9E-01
Arsenic	1.25E+00	9.28E-04	7E-04
Barium	5.10E+00	2.64E-02	5E-03
Cadmium	1.00E+00	3.82E-04	4E-04
Cobalt	1.20E+00	3.42E-03	3E-03
Chromium	2.74E+00	4.18E-04	2E-04
Copper	1.17E+01	2.74E-02	2E-03
Iron	2.60E+01	3.16E+00	1E-01
Mercury	1.00E+00	7.72E-06	8E-06
Manganese	8.80E+01	1.82E-01	2E-03
Nickel	4.00E+01	1.19E-03	3E-05
Lead	8.00E+00	1.38E-02	2E-03
Selenium	2.00E-01	1.47E-04	7E-04
Thallium	7.40E-02	2.04E-04	3E-03
Vanadium	2.10E-01	4.14E-03	2E-02
Zinc	1.60E+02	6.54E-02	4E-04
Naphthalene	1.00E+00	3.00E-03	3E-03

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

Table 5-14
Hazard Quotients for Racoon (*Procyon lotor*)
for Exposures at Reservoir No. 2 Burning Ground, Outside the Burn Area,
Plum Brook Ordnance Works, Sandusky, Ohio

Contaminant of Potential Ecological Concern (COPEC)	Effect Dose (mg/kg/day)	Exposure Dose Maximum (mg/kg/day)	HQ[1]
2,4-Dinitrotoluene	7.00E-01	2.82E+00	**4E+00**
2,6-Dinitrotoluene	7.00E-01	4.13E-01	6E-01
2,4,6-Trinitrotoluene	7.00E-01	3.17E+03	**5E+03**
1,3,5-Trinitrobenzene	--	3.60E-02	NA
Aluminum	1.10E+02	5.56E+04	**5E+02**
Arsenic	2.46E+00	2.26E-02	9E-03
Barium	2.08E+01	5.06E+00	2E-01
Cadmium	1.45E+00	1.87E-03	1E-03
Cobalt	--	5.37E-02	NA
Chromium	1.00E+00	1.28E-02	1E-02
Copper	4.70E+01	8.58E-01	2E-02
Iron	5.00E+01	1.84E+05	**4E+03**
Mercury	4.50E-01	6.87E-05	2E-04
Manganese	9.77E+02	3.43E+02	4E-01
Nickel	7.74E+01	3.95E-02	5E-04
Lead	3.85E+00	3.20E+00	8E-01
Selenium	5.00E-01	1.08E-03	2E-03
Thallium	3.50E-01	1.75E-03	5E-03
Vanadium	1.14E+01	3.33E-01	3E-02
Zinc	1.45E+01	3.51E+01	**2E+00**

Notes:

1-Values with bold and shading indicate an elevated potential for adverse ecological effects.

HQ = COPEC-specific hazard quotient

mg/kg/day = milligrams COPEC per kilogram body weight per day

APPENDICES

APPENDIX A
ECOLOGICAL SURVEY

DAVEY
RESOURCE GROUP
A Division of The Davey Tree Expert Company

November 17, 2008

Corporate Headquarters
1500 North Mantua Street
P.O. Box 5193
Kent, OH 44240-5193
330•673•5685
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Jon Russ
Jacobs Engineering
1527 Cole Boulevard, Building #2
Golden Colorado 80401

Dear Mr. Russ:

Please find enclosed information for the NASA Plum Brook ecological survey. Included are the plant lists for Acid Area 1 and Reservoir No. 2 Burning Ground based on our site visits on May 14 and October 2, 2008. Also enclosed are vegetation community maps for both sites and vegetation community descriptions. The vegetation community maps are approximate due to the poor quality of the aerial photographs.

If you have any questions or need additional information, please let me know. This should complete my work on this project.

Sincerely,

Todd Crandall
Natural Resource Consulting

NASA Plum Brook
Sandusky, Ohio
Plant Community Description
Acid Area 1 and Reservoir No. 2 Burning Ground
November, 2008

Upland Old Fields. These areas are dominated by grasses and herbs and have been recently disturbed by mowing and/or brush-hogging. Scattered shrubs, small trees, and groups of shrubs also occur here.

Shrub Thickets. Dense areas of shrub thickets occur in both Acid Area 1 and Reservoir No. 2 Burning Ground. *Cornus racemosa* (gray dogwood) dominates most of these areas. *Eleagnus umbellata* (autumn olive) is also common. Small trees and saplings also occur within the shrub thickets.

Successional Woods. Successional woods are comprised of small and moderate sized trees, primarily *Fraxinus pennsylvanica* (green ash), *Acer negundo* (box elder), and *Populus deltoides* (cottonwood). These areas generally have a moderate to dense shrubby understory. The herbaceous layer is dense in most areas. *Carex* spp. (sedges) dominate most of the understory.

Marsh. Small areas of marsh are found within Acid Area 1. These areas are generally dominated by cattails, with other species such as sedges and bulrushes also occurring. All of these areas were either created by, or influenced by, past disturbances.

Scrub/shrub Wetlands. Several areas of scrub/shrub wetlands are found within Acid Area 1. The drainage ditch along the south side of this site is also a scrub/shrub wetland. These areas contain *Cornus racemosa* (gray dogwood) along with herbaceous species such as sedges and horsetails.

NASA Plum Brook
Sandusky, Ohio
Reservoir No. 2 Burning Ground Plant List
May 14 and October 2, 2008

Scientific Name	Common Name
Acer negundo	box elder
Acer rubrum	red maple
Achillea millefolium	yarrow
Agrimonia parviflora	small-flowered groovebur
Alliaria petiolata	garlic mustard
Allium vineale	field garlic
Andropogon virginicus	broom sedge
Apocynum cannabinum	dogbane
Asplenium platyneuron	ebony spleenwort
Aster divaricatus	white wood aster
Aster lateriflorus	calico aster
Aster pilosus	heath aster
Berberis thunbergii	barberry
Botrychium virginianum	grape fern
Brassica nigra	yellow rocket
Carex gracillima	graceful sedge
Carex hirtifolia	sedge
Carex radiata	sedge
Carya ovata	shagbark hickory
Cirsium arvense	creeping thistle
Cornus racemosa	gray dogwood
Crataegus sp.	hawthorn
Cryptotaenia canadensis	honewort
Dactylis glomerata	orchard grass
Daucus carota	Queen Anne's lace
Dryopteris carthusiana	spinulose wood fern
Eleagnus umbellata	autumn olive
Elymus riparius	river bank wild rye
Equisetum arvense	field horsetail
Erigeron philadelphicus	common fleabane
Eupatorium rugosum	white snakeroot
Festuca sp.	fescue
Fragaria virginiana	strawberry
Fraxinus pennsylvanica	green ash
Galium aparine	cleavers
Galium asprellum	rough bedstraw
Galium circaezans	wild licorice
Galium triflorum	sweet bedstraw
Glechoma hederacea	ground ivy
Gleditsia triacanthos	honeylocust
Juglans nigra	black walnut
Leersia virginica	white grass
Lonicera tatarica	Tartarian honeysuckle

Scientific Name	Common Name
Maclura pomifera	osage orange
Medicago lupulina	black medick
Monarda fistulosa	wild bergamot
Morus alba	mulberry
Oxalis stricta	sorrel
Panicum virgatum	switch grass
Parthenocissus quinquefolia	Virginia creeper
Penstemon digitalis	beard tongue
Phleum pratense	timothy
Phryma leptostachya	lopseed
Plantago lanceolata	English plantain
Plantago major	common plantain
Platanus occidentalis	American sycamore
Poa alsodes	blue grass
Polygonatum biflorum	Solomon's seal
Polygonum virginianum	Virginia knotweed
Populus deltoides	cottonwood
Potentilla norvegica	cinquefoil
Prunus avium	pin cherry
Prunus serotina	black cherry
Pyrus coronaria	crabapple
Quercus palustris	pin oak
Ranunculus abortivus	kidney leaved buttercup
Ranunculus recurvatus	cursed crowfoot
Rosa multiflora	multiflora rose
Rosa setigera	prairie rose
Rubus allegheniensis	Allegheny blackberry
Rubus flagellaris	dewberry
Rubus occidentalis	black raspberry
Satureja vulgaris	wild basil
Setaria glauca	yellow bristle grass
Solanum carolinense	horse nettle
Taraxacum officinale	dandelion
Teucrium canadense	germander
Toxicodendron radicans	poison ivy
Trifolium repens	white clover
Ulmus americana	American elm
Verbesina alternifolia	wingstem
Vernonia gigantea	ironweed
Viola papilionacea	blue violet
Vitis aestivalus	summer grape
Vitis riparia	riverbank grape

APPENDIX B
ASSESSMENT RECEPTOR PROFILES

Appendix B

Assessment Receptor Profiles

Eastern Cottontail (*Sylvilagus floridanus*). These medium-size grazing herbivores are found over most of the eastern half of the United States and southern Canada, and have been widely introduced into the western U.S. Environmental Protection Agency ([EPA], 1993) . The eastern cottontail is unique to the genus because of the large variety of habitats that it occupies, including glades and woodlands, deserts, swamps, prairies, hardwood forests, rain forests, and boreal forests (EPA, 1993). Open grassy areas are generally are used for grazing at night, whereas dense, heavy cover typically is used for shelter during the day (EPA, 1993). During the summer seasons these rabbits consume herbaceous plants (e.g. grasses, clover, timothy, and alfalfa), whereas winter diet typically consists of woody vines, shrubs and trees (e.g. birch, maple, and apple) (EPA, 1993). Home range is 3 to 20 acres, with larger ranges in the summer and smaller ranges in the winter (Burt and Grossenheider, 1980). Populations fluctuate from 1 to 4 cottontail per four acres to several per acre in winter conditions (Burt and Grossenheider, 1980). The eastern cottontail breeds from February through September and usually produces 3 to 4 litters per year of 1 to 9 young (usually 4 to 5); however, this rabbit's' death rate vies with its birth rate, and few rabbits live for more than one year (Whitaker, 1995). The average longevity is 1.25 years (EPA, 1993).

References:

Burt, W. H. and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook,*** Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr., J. O., 1995, ***The Audubon Society Field Guide to North American Mammals,*** Alfred A. Knopf, Inc., New York.

Deer Mouse (Peromyscus maniculatus). This medium-sized mouse is found in the eastern United States from the Hudson Bay to Pennsylvania, the southern Appalachians, central Arkansas, and central Texas. In the west it is found from Mexico to the south Yukon and north-west territories (Whitaker, 1995). Deer mice habitat includes nearly every dry land habitat within its range, including forest, grasslands, or a mixture of the two (Burt and Grossenheider, 1980). Nocturnal and active year-round, deer mice construct nests in the ground, trees, stumps, and buildings (Burt and Grossenheider, 1980). Omnivorous, the deer mouse feeds on nuts and seeds (e.g., jewel weed and black cherry pits), fruits, beetles, caterpillars, and other insects. Deer mice may cache their food during the fall and winter in the more northern parts of their range (EPA, 1993). Home range is 0.15 to 3 acres (Burt and Grossenheider, 1980; EPA, 1993). Density of populations is 4 to 12 mice per acre, and average life span is 2 years in the wild (Burt and Grossenheider, 1980). The breeding season is from February to November, depending on latitude. Three to five young are born in each of two to four litters per year (Burt and Grossenheider, 1980). They are greyish to reddish-brown with a white belly, with a distinctly shorthaired, bicolor tail (Whitaker, 1995). Weight range is 14.8 (EPA, 1993) to 33 grams (Whitaker, 1995).

References:

Burt, W. H. and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr, J. O, 1995, The ***Audubon Society Field Guide to North American Mammals***, Alfred A. Knopf, Inc., New York.

Mallard Duck (Areas platyrhynchos). The mallard duck is widespread throughout most of the United States and is the most abundant of the United States ducks. It is large, migratory duck with an average body size of 58 centimeters from bill to tail tip. Wintering mallards prefer the natural bottom-land wetlands and rivers where water depths are 20 to 40 centimeters. The primary habitat requirement for nesting is thought to be dense grassy vegetation. Nests are generally located within a few kilometers of water (EPA, 1993).

In winter, mallards feed primarily on seeds, invertebrates, agricultural grains and, to a limited extent, leaves, stems, buds, rootlets, and tubers. In spring, females shift mostly to a diet of invertebrates to support molting and egg laying activities. Ducklings also feed mainly on invertebrates to help support their rapid growth rates. Mallards are serially monogamous and re-mate annually. Each pair of mallards establishes a territory and the drake defends it against other mallards. Average home range size varies, depending upon the type of habitat available. High rates of nest failure require the females to re-nest persistently, with average clutch size decreasing as the breeding season progresses. Annual adult mortality rates vary with year, depending on location, hunting pressure, age, and sex. Females suffer greater natural mortality rates than do males (EPA, 1993).

The typical home range of the mallard is from 540 to 620 hectares (ha) for adult female and male birds, respectively, for wetlands and river habitat in Minnesota (USEPA, 1993). For the current ERA, an average home range of 580 ha was used. The typical migration schedule is from mid-March through mid-May for the spring migration. The fall migration typically starts in mid-October, and peaks in November (USEPA, 1993).

References:

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Red-Tailed Hawk (*Buteo jamacensis*). This carnivorous hawk is one of the most common and widespread members of the genus Buteo in the continental United States and Canada (Brown and Amadon, 1968). Red-tailed hawks live in a variety of habitats, such as farmlands, woodlands, mountains, and deserts as long as there is open country interspersed with woods, bluffs, or streamside trees. They are primarily carnivorous, feeding on (greater than 85 percent) small rodents, as well as fish. Other prey items include amphibians, reptiles, crayfish, and other birds (Adamcik, et al., 1979; Ehrlich, et al., 1988). Home range has been reported as

approximately 66.8 acres, with a population density of 0.16 pairs per acre (Janes, 1984), although EPA (1993) reports an average territory size of 842 hectares (2,080 acres). Breeding population density is one nest per 0.009 acre or one individual per 0.004 acre. Body weight for male red-tails is 1,028.6 to 1,142.9 grams, and for females 1,371.4 to 1,600 grams (Brown and Amadon, 1968), although EPA (1993) reports an average body weight of 957 grams. They typically mate for life or until one of the pair dies, with pairs clinging to territories year after year (Austing, 1964).

References:

Adamcik, R. S., A. W. Todd, and L. B. Keith, 1979, "Demographic and Dietary Responses of Red-Tailed Hawks During a Snowshoe Hare Fluctuation," ***Canadian Field Naturalis***t, Vol. 93, pp. 16-27.

Austing, G. R., 1964, ***The World of the Red-Tailed Hawk***, J. B. Lippincott Co., Philadelphia.

Brown, L. and D. Amadon, 1968, Eagles, ***Hawks, and Falcons of the World***, Vol. 1, McGraw-Hill Book Company, New York.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye, 1988, ***The Birder's Handbook: A field guide to the Natural History of North American Birds***, Simon and Shuster, Inc., New York.

Janes, S . W., 1984, "Influences of Territory Composition and Interspecific Competition on Red-Tailed Hawk Reproductive Success," ***Ecology***, 65:862-870.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Raccoon (*Procyon lotor*). Raccoons are native only in the Americas. Their range extends from the southern edge of the southern provinces of Canada and most of the United States, except for portions of the Rocky Mountain States, central Nevada, and Utah (Whitaker, 1995). The raccoon weighs from 3 to 15 kilograms (Merritt, 1987; EPA, 1993) and has a head and body length of 46 to 71 centimeters and a tail length of 20 to 30 centimeters (Burt and Grossenheider, 1980). The raccoon is nocturnal and solitary, except when breeding or caring for its young. During particularly cold spells, the raccoon may sleep for several days at a time but does not hibernate (Whitaker, 1995). The raccoon is found along lakes near wooded areas or rock cliffs (Burt and Grossenheider, 1980), but prefers wooded streams (Whitaker, 1995). The raccoon is highly omnivorous and is an opportunistic feeder, consuming virtually any animal or plant matter that is available (Merritt, 1987; EPA, 1993). Animal matter predominates the diet during the spring and early summer; plant matter predominates during late summer, autumn, and winter (Merritt, 1987; EPA, 1993). The home range of the raccoon extends up to 3 .2 kilometers across, but usually it is less than 1 .6 kilometers. Population densities range from one per acre (highest) to one per 15 acres (considered high) (Burt and Grossenheider, 1980). Captive raccoons live for approximately 14 years (Burt and Grossenheider, 1980). Average body weight is 5 .1 kilograms (EPA, 1993).

References:

Burt, W. H., and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

Merritt, J. F., 1987, ***Guide to the Mammals of Pennsylvania***, University of Pittsburgh Press, Pennsylvania.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Volume I of II, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr., J. O., 1995, ***The Audubon Society Field Guide to North American Mammals,*** Alfred A. Knopf, Inc., New York.

Short-tailed Shrew (*Blarina brevicauda*). This shrew is the largest found in North America. It is solid grey above and below, with a short tail, and weighs between 15 and 29 grams (Whitaker, 1995). Total length of this shrew is 76 to 102 millimeters (Burt and Grossenheider, 1980). The range of this shrew extends from southeastern Canada and the northeastern U.S. to Nebraska, Missouri, Kentucky, and in the mountains to Alabama (Whitaker, 1995). Preferable habitat for the shrew includes forests, grasslands, marshes, and brushy areas. It will make a nest of dry leaves, grass, and hair beneath logs, stumps, rocks, or debris (Burt and Grossenheider, 1980). This underground tunneler may burrow as deep as 6 feet, and has a voracious appetite, eating one half of its own body weight per day of earthworms, other terrestrial vertebrates, and sometimes young mice (Whitaker, 1995). Mean population densities range "from 5.7 in the winter, to 28 per acre in the summer (EPA, 1993). Their home range varies from 0.5 to 1 acre (Burt and Grossenheider, 1980). Longevity is typically around 20 months (EPA, 1993), with five to eight young born to each of two to three litters (Burt and Grossenheider, 1980).

References:

Burt, W. H. and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr., J. O., 1995, ***The Audubon Society Field Guide to North American Mammals***, Alfred A. Knopf, Inc, New York.

White-tailed Deer (*Odocoileus virginianus*). The white-tailed deer is a member of the Family Cervidae. They are large, even-toed, hoofed mammals with long legs. Their coat is predominantly light brown or chestnut colored, with the under parts being white. Deer are primarily herbivorous grazers and browsers, constantly moving from one food source to the next. The deer's diet changes seasonally. When available, farm crops such as winter wheat, corn, alfalfa, soy beans, and hay are important components of the species diet. Other top food items include wild crab apples, sumac, grasses, green briar, clover, jewelweed, acorns, and dogwood. In regions where the climate varies from season to season, deer may make annual

migrations of 10 to 20 miles in the search for food. However, in Ohio, deer typically have rather small home ranges (2 to 3 square miles) and are reluctant to leave this range. The average weight for the species is 88 kilograms for males and 61 kilograms for females. Breeding season ranges from November through February, with the young offspring born in May and early June. Virtually all yearling and adult does conceive each year, and in Ohio usually carry twins. Triplets and quadruplets have also been recorded Gottschang (1981).

References:

Gottschang, J . L., 198, ***A Guide to the Mammals of Ohio***, The Ohio State University Press, pp.143-149.

Marsh Wren (*Cistothorus palustris*). The marsh wren is a small bird (4 to 4.5 inches in length) which inhabits freshwater cattail marshes and salt marshes. Nesting pairs are not likely to occupy other habitats and the species avoids the wet meadow and sedge meadow habitats preferred by sedge wrens. Marsh wrens breed throughout most of the northern half of the United States and in coastal areas as far south as Florida. The species eats mostly insects, and occasionally snails and other invertebrates. The average body weight is 0 .01 kilograms, and the average home range for the species is 0.054 hectares. Because the species is polygamous, there may be more females than males inhabiting a breeding marsh. Densities as high as 120 birds per hectare have been recorded (EPA, 1993). Marsh wrens' nests are globular structures placed at heights of 2 to 5 feet in dense vegetation. The males commonly build dummy nests in addition to the one where the eggs will be laid (Peterjohn and Rice, 1991).

References:

U.S. Environmental Protection Agency (EPA), Office of Research and Development, 1993, ***Wildlife Exposure FactorsHandbook***, EPA/600/R-93/187a.

Peterjohn, B. G., and Rice, D. L., 1991, ***The Ohio Breeding Bird Atlas***, The Ohio Department of Natural Resources.

APPENDIX C

APPLICATION OF ESSENTIAL NUTRIENTS IN ECOLOGICAL RISK ASSESSMENT

Appendix C

Application of Essential Nutrients In Ecological Risk Assessment

Introduction

All forms of living matter require inorganic elements, or minerals, for their normal life processes. All animal tissues and feeds contain inorganic or mineral elements in widely varying amounts and proportions. Minerals that are needed in relatively large amounts are referred to as major or macrominerals; those that are needed in very small amounts are referred to as trace minerals or microminerals. These terms represent quantity designations of the amounts required in an animal's diet and their generally low or trace concentrations in tissues. The major minerals are required in concentrations of greater than 100 parts per million (ppm) and are often reported as a percentage of diet, while trace elements are required at less than 100 ppm and are sometimes reported at the parts per billion level. Table C-1 presents 24 elements known to be required by at least some animal species (McDowell, 1992).

Table C-1
General Macro and Microminerals

Major or Macrominerals	Trace or Microminerals		
Calcium (Ca)	Arsenic (As)*	Iodine (I)	Nickel (Ni)*
Chlorine (Cl)	Boron (B)*	Iron (Fe)	Selenium (Se)
Magnesium (Mg)	Chromium (Cr)	Lead (Pb)*	Silicon (Si)*
Phosphorus (P)	Cobalt (Co)	Lithium (Li)*	Tin (Sn)*
Potassium(K)	Copper (Cu)	Manganese (Mn)	Vanadium (V)*
Sodium (Na)	Fluorine (F)	Zinc (Zn)	Molybdenum (Mo)
Sulfur (S)			

* These elements have not been shown to be essential for livestock or humans consuming typical diets.

The listing of some of the trace elements as essential is difficult and sometimes tentative, and rests on experiments with one or more species. In these experiments, diets adequate in all nutrients except the mineral in question produced clinical signs that were prevented or overcome by adding that mineral to the diets (McDowell, 1992).

Unlike other nutrients, mineral elements cannot be synthesized by living organisms. Minerals act as: (1) structural components of body organs and tissues, (2) constituents of body fluids and tissues as electrolytes, and (3) catalysts in enzyme and hormone systems. The most obvious function of mineral elements in the body is to provide structural support (skeleton) for the body. Calcium, phosphorus, magnesium, fluoride, and silicon in bones and teeth all contribute to mechanical stability. Birds use calcium to produce eggshells, phosphorus, sulfur, and silicon are found in muscle proteins. Minerals are interrelated and balanced against each other, and most often cannot be considered as single elements with independent and self-sufficient roles in the organized bodily processes. The definite relationship of cadmium and phosphorus in the formation of bones and teeth and the interrelationships of iron, copper, and cobalt (in vitamin B_{12}) in hemoglobin synthesis and red blood cell formation are examples. Sodium, potassium, calcium, phosphorus, and chlorine serve individually and collectively in the body fluids. A number of trace elements (i.e., copper, zinc, and selenium) in addition to certain vitamins (i.e., A, D, E, B_6, and folacin) and other nutrients, are strongly related to adequate immune response (McDowell, 1992).

Mineral Requirements

A series of "safe" dietary levels of potentially toxic elements has been established on the extent to which other elements that affect their absorption and retention are present (McDowell, 1992). Table C-2 presents some of these "safe" dietary levels or mineral requirements for selected species.

Table C-2
Mineral Requirements for Selected Species

Species	Mineral (mg/kg of feed)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Japanese Quail	25,000	500	4,000	1,500	6	100	70	5,000	0.2	50
Rat	5,000	400	3,600	500	5	35	50	4,000	0.10	0.25
Mouse	4,000	500	2,000	---	4.5	25	44	4,000	---	30
Cat	8,000	400	4,000	500	5	80	5	6,000	0.1	50
Mink	6,000	440	3,000	---	6	80	44	5,500	0.1	66

To determine whether concentrations of these minerals in the environment exceed safe dietary levels, the mineral requirements were converted to dietary doses using the following equation:

$$\text{Dose (mg/kg-day)} = \text{Diet (mg/kg)} \times \text{FI (kg/day)} \times 1 / \text{BW(kg)}$$

where:

Diet (mg/kg) = mineral requirement for each nutrient
FI (kg/day) = food ingestion rate
BW(kg/day) = body weight.

Variables for the species are shown in Table C-3.

Table C-3
Food Ingestion and Body Weights

Species	Food Ingestion (FI) (kg/day)	Body Weight (Kg)
Japanese Quail	0.017 derived from (FI(kg/day) = $0.0582*BW(kg)^{0.651}$[b]	0.15[a]
Rat	0.08[a]	0.35[a]
Mouse	0.0055[a]	0.03[a]
Cat	0.24 derived from (fi(kg/day) = $0.0687*BW(kg)^{0.822}$[b]	4.5 derived from 10 lbs*0.4535923 conversion factor.[c]
Mink	0.137[a]	1.0[a]

[a]Oak Ridge National Laboratory (ORNL), 1996.
[b]U.S. Environmental Protection Agency (EPA), 1993 .
[c]IT Corporation, 1999.

Table C-4 presents the mineral requirements calculated as dietary doses for selected species presented in Table C-3.

Table C-4
Mineral Requirements as a Dietary Dose for Selected Species

Species	Mineral (mg/kg of feed)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Japanese Quail	2,833	56.7	453	170	0.7	11.3	7.9	567	0.02	5.7
Rat	1,143	91.4	823	114	1.1	8	11.4	914	0.02	0.06
Mouse	733	92	367	---	0.8	4.6	8.1	733	---	5.5
Cat	427	21	213	26.7	0.3	4.3	0.3	320	0.01	2.7
Mink	822	60	411	---	0.8	11	6	753	0.01	9

Maximum Tolerance Levels

Information concerning the toxicity or tolerance of minerals is incomplete. According to available information, the toxic level of most major minerals is about 10 times the recommended level for young, growing livestock. The toxic levels of trace minerals appear to be highly variable, ranging between 10 and 1,500 times the recommended level. The National Research Council publishes maximum tolerance levels for domestic animals. The maximum tolerance level is defined as that dietary level that, when fed for a limited period, will not impair animal performance and should not produce unsafe residues in human food derived from animals. The levels listed in Table C-5 were derived from toxicity data on the designated species. Tolerance levels vary with the species, adaptation, duration of receiving the toxicants, age, physical condition of the animal, and many other factors (McDowell, 1992).

Table C-5
Maximum Tolerance Levels for Domestic Animals

Species	Mineral (mg/kg of feed)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Poultry	40,000[b] 12,000[c]	(3,000)	(20,000)	20,000	300	1,000	2,000	8,000	20,000	1,000
Rabbits	20,000	(3,000)	(30,000)	(30,000)	200	(500)	(400)	10,000	(20,000)	(500)

Source: McDowell, 1992.
The levels in parentheses were derived by interspecific species extrapolation.
[a]Ratio of calcium to phosphorus is important.
[b]Laying hen.
[c]Other poultry.

Using the same procedure described in Section H.2.0, the maximum tolerance levels were converted into dietary doses to determine whether concentrations of these minerals in the environment exceed safe dietary levels. Variables for the domestic animals are shown in Table C-6.

Table C-6
Food Ingestion and Body Weights for Domestic Animals

Species	Food Ingestion (FI)(kg/day)	Body Weight (kg)
Poultry	0.08 derived from (FI(kg/day) = 0.0582*BW(kg)$^{0.651a}$	1.6 (mean weight of male and femal chicken)[b]
Rabbits	0.2 derived from (FI(kg/day) = 0.0687*BW(kg)$^{0.822a}$	3.8[b]

a EPA, 1993.
b ORNL, 1996.

Table C-7 presents the calculated dietary doses for selected species presented in Table C-6.

Table C-7
Maximum Tolerance Level as a Dietary Dose for Domestic Animals

Species	Mineral (mg/kg of feed)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Poultry	600	150	1,000	1,000	15	50	100	400	1,000	50
Rabbits	1,053	158	1,579	1,579	11	26	21	526	1,053	26

Data Use

Mineral requirements or maximum tolerance levels will be used in ecological risk assessments, as appropriate.

References

IT, 1999. Best professional judgment for cat's (Felis domesticus) body weight being 10 lbs.

McDowell, L. R., 1992, Minerals in Animal and Human Nutrition, Academic Press, Inc. San Diego.

Oak Ridge National Laboratory (ORNL), 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, B. E. Sample, D. M. Opresko, G. W. Suter 11. ES/ER/TM-86/R3, June 1996.

U.S. Environmental Protection Agency (EPA), 1993, Wildlife Exposure Factors Handbook, EPA/600/R-93/187a, December.

APPENDIX D

RESPONSES TO COMMENTS ON THE FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

OhioEPA

Inter-Office Communication

To:	Paul Jayko, **NWDO-DERR**	Date: 29 May 2009
From:	Janusz Z. Byczkowski, DERR, CO	
Subject:	**Draft Baseline Human Health Risk Assessment, and Draft Screening Ecological Risk Assessment, Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works Sandusky, Ohio,** March 2009. Site: US NASA PLUM BROOK, TAYLOR & COLUMBUS Rds., SANDUSKY, OH 44870; ERIE Cnt.; OHID# 322-0552.	

The following memo is regarding the ***"Draft Baseline Human Health Risk Assessment" and "Draft Screening Ecological Risk Assessment", Reservoir No. 2 Burning Ground", Former Plum Brook Ordnance Works Sandusky, Ohio,*** dated March, 2009.

If you have any questions or need further technical support, please call me at: 614-644-3070 or e-mail at jbyczkowski@epa.state.oh.us.

DOCUMENT TITLE: ***Draft Baseline Human Health Risk Assessment, and Draft Screening Ecological Risk Assessment, Res. No. 2 Burning Ground***

SITE: US NASA PLUM BROOK, TAYLOR & COLUMBUS Rds., SANDUSKY, OH 44870; ERIE Cnt.; OHID# 322-0552.

DOCUMENT/DATE: Draft /March 2009

Ohio EPA – Division of Emergency and Remedial Response COMMENTS

REVIEWER: Dr. Janusz Z. Byczkowski, DERR, CO; Tel: 614-644-3070; e-mail: jbyczkowski@epa.state.oh.us.

Review/DATE: 05/29/2009

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
1.	P. 2-8 P. 2-9 Table 2-1 and SERA Table 2-2		**General Remark:** This Document contains some errors and misrepresentations, and thus, it should be revised. If you have any questions or need further technical support, please give me a call at: 614-644-3070 or e-mail at jbyczkowski@epa.state.oh.us. For example, this Document states: On pages 2-8 and 2-9: "…[…] *Table 2-1 provides the following information for each detected chemical for each medium at 2BG: […] • Range of detected concentrations • Range of detection limits • Arithmetic mean of site concentrations • 95 percent UCL on arithmetic mean…"* but then, in the heading of Table 2-1: "…| *Range of detection limits*	*Minimum Detected Concentration*	*Maximum Detected Concentration*	*Average* | Comment: Description in the text apparently misrepresents the data listed in the tables.	I suggest a **revision** of both Documents, followed by the quality reading. Also, the specific issues listed below should be addressed. Please **reconcile text with tables** throughout the Document.	Consistency between text and tables in the documents will be reviewed.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			Specifically, "*Average*" does not mean the same as an "*arithmetic mean*". If it indeed was an arithmetic mean, all values in the "*Average*" column, listed as greater than the corresponding "*Maximum Detected Concentrations*" would be implausible and thus, in error. Also, "*95 percent UCL on arithmetic mean*" is not the same as "*Average*". The data and other variables in tables should be defined precisely and labeled exactly what they are, e.g., "The *95% UCL on arithmetic mean*" (instead of "Average"), all units for numerical data should be listed (best in the heading or a footnote) and all the tables should be followed by an adequate description in the text.		
2.	HHRA Table 4-1		**Specific Issues:** In Table 4-1, both "*Reference Doses*" and "*Cancer Slope Factors*" are listed without units. Comment: It looks unprofessional and may be confusing for the reader when numerical values are listed without their units. Especially for the inhalation pathway, it is unclear whether the "Reference Doses" expressed concentrations (e.g., mg/m^3), or converted equivalent external dose rates (e.g., mg/kg per day). Similarly, it is unclear whether "Cancer Slope Factors" for inhalation indeed listed slope factors (SF), or may be, the inhalation unit risks (IUR).	Please revise this table and check all others, providing respective **units for all numerical values** listed.	Tables will be revised to include units for all numerical values.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
3.	HHRA S. 2.1.3 P. 2-3, L.# 40 and S. 5.1 P. 5-2 L.# 22 also S. 5.3 P. 5-5 Eq. 5.7		This Document states on P. 2-3: "…*Acceptable exposure levels are generally concentration levels that represent an increased upper bound lifetime risk cancer risk to an individual of 1E-6 to 1E-4 (EPA, 1990), referred to as "risk management range…*" and on page 5-2: "…*ILCR estimates above 1E-4 are considered to be unacceptable. The OEPA (2004b) policy is consistent with the EPA (1990) policy of risk management…*" then, on page 6-1: "…*risk exceeds generally acceptable limits (cancer risk greater than 1E-4…*" <u>Comment</u>: Baseline risk assessment should objectively evaluate risk, without deciding what level is or is not "*acceptable*". Even at this early stage of risk assessment (which is not yet an FS or risk management step), whenever the NCP "range" of risk has been invoked, there should be also a reference to the current OEPA - DERR (2004) risk goal guidance. For consistency, also the target risk level (TR) used in RBRL calculations, e.g., in equation 5.7 (and elsewhere), should be presented as a point value = 1E-5. Listing a couple of values can be misleading, giving an impression that for some chemicals of concern, the target levels may be an order of magnitude higher than for the others. The OEPA guidance is very clear about cancer risk goal for any potential carcinogen (it's 1E-5): "…*The DERR Remedial Response program has*	i) Please delete any reference to "*acceptable risk*" from baseline human health risk assessment, and ii) when referring to 40 CFR Part 300 "risk management range", please refer also to OEPA-DERR (2004); also iii) use **point risk goal of 1E-5**, particularly, in Conclusions and Summaries (e.g. S. 7.3 on pages 7-4 and 7-5).	The text will be revised accordingly per the comment.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			adopted a human health cumulative excess lifetime carcinogenic risk goal of 1E-5 and a cumulative non-cancer hazard goal equal to a hazard index (HI) of 1, for all receptors and land uses. These goals are to be used as both the level of acceptable excess cancer risk or non-cancer hazard and for the development of remediation goals for a site…" **Reference:** **OEPA – DERR (2004)** Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response and Office of Federal Facility Oversight. Technical Decision Compendium, 28 April 2004. Available on-line: http://www.epa.state.oh.us/derr/rules/riskgoal.pdf		
4.	HHRA S. 2.1.5, L.# 18		This Document states in Section 2.1.5: *"…Each groundwater BSC is either the MDC or the calculated 95 percent upper tolerance limit of the background groundwater data set.* […] *BSCs for soil were reported as the 95 percent upper tolerance limit for lognormal data sets or the 95th percentile for datasets with nonparametric distribution…"* and then: *"…Background screening was not used to eliminate COPCs…"* Comment: The described methodology does not follow the screening process recommended either by U.S. EPA (1989), or OEPA-DERR (2004). OEPA – DERR does not recommend the usage of the Upper Tolerance Limit (*UTL*) as the background screening criterion. Instead, the upper cutoff value should be used to estimate the background	Please follow methodology described by U.S. EPA (1989) in RAGS part A. For each chemical that may be screened out based on background, please calculate the background level equal to the **upper cutoff value**, according to OEPA – DERR (2004a). In the BHHRA document, please list a single, unadjusted, representative background level for each chemical, in each medium, within the same geological formation as the on-site area of concern.	It is true, there is no recent background data taken specifically for 2BG. However, there is a metals background data set from 2001, from background locations as agreed upon by the PBOW Team, including USACE and OEPA, that would suffice as the background data set for all PBOW FUDS AOCs to be investigated, including Acid Area 1. During the development of the appropriate background statistic to compare to for PBOW FUDS AOCs, the PBOW Team reviewed many statistics, including arithmetic mean, median, UCLs and UTLs. The OEPA risk assessors Bonnie Buthker, Laurie Moore with the rest of the PBOW team deemed the 95% UTL or the maximum detected background metal

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			concentration level and to compare it to the samples, taken from the area of concern within the same geological formation, on a point by point basis. For guidance on acceptable background calculation methodology, please see the OEPA – DERR (2004 and 2004a). **References:** **U.S. EPA (1989)** Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989; page 5-21. On-line: http://www.epa.gov/oswer/riskassessment/ragsa/index.htm **OEPA - DERR (2004)**: TECHNICAL DECISION COMPENDIUM Remedial Response Program: Methodology for Evaluating Site-specific Background Concentrations of Chemicals. On-line: http://www.epa.state.oh.us/derr/rules/Methodology.pdf **OEPA - DERR (2004a)**: Background Calculation Methodology. DERR-00-RR-039P, 30 June 2004, Final. On-line: http://www.epa.state.oh.us/derr/rules/RR-039_public.pdf		concentration, which ever is less, as the appropriate statistic to use during background screening of AOCs' metals, and as documented in the May 2000 PBOW Team Meeting Minutes as consensus for using this method.
5.	HHRA S. 2.3 P. 2-9 and P.2-10 L.# 13 L.# 25 L.# 35 and		In several paragraphs, this Document states: "...*Specific compounds exceeding the USEPA Region 9 Residential PRGs (EPA, 2004a) are identified in Table 2-1*..." Comment: Actually, in the table 2-1 the values listed (RBCs) are equal to 1/10 of PRGs for non-carcinogens	Please explain in the text derivation of the RBCs used, and please **provide in Table 2-1 the missing information** according to U.S. EPA (2001) RAGS part D.	During the 26 June 2008 PBOW Team Meeting, USACE presented to the team the discussion of and recommendation to use the Regional Screening Levels (RSLs) adopted all three EPA regions which had screening levels previously, and being EPA Region 3, Region 6 and Region 9. The PBOW Team decision was to

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
	L# 6 L.# 11 L.# 14 Table 2-1		(including lead) and 100% PRGs for potential carcinogens. Please note that in the Table 2-1, some reporting limits (or range of detection limits) are missing. Also, the rational for COPC selection or rejection has not been included. This information could be displayed in the appropriately indexed "*Standard Table*" for occurrence, distribution and selection of chemicals of potential concern (see: Table 2.1) according to U.S. EPA (2001) RAGS part D. **Reference:** **U.S. EPA (2001)** Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments), Final, December 2001. On-line: http://www.epa.gov/oswer/riskassessment/ragsd/index.htm		discuss RSLs with Bonnie Buthker, DOD Program Manager at OEPA and use RSLs for any new starts after being given the "go ahead" by Bonnie Buthker. On 18 March 2009, Bonnie Buthker stated that Brian Tucker of OEPA has directed her to direct USACE FUDs risk assessors to use the RSLs, and no longer the obsolete Region 9 PRGs. According to the 26 June 2008 PBOW Team agreement, when Bonnie Buthker gave the "go ahead" to use RSLs, any new starts there after should use the RSLs. The Acid Area 1 Risk Assessment Work Plans are dated April 2009 which is after 18 March 2009, and will incorporate the RSLs, not the obsolete EPA Region 9 PRGs from 2004. The rationale and process for selection or rejection of a COPC is specifically addressed in the Work Plan for 2BG.
6.	S. 3.2.2 P. 3-13 L.# 25 and S. 8.0 P. 8-2 to 8-5		This Document states: "*...Evaluation Manual (HHEM) (EPA, 1991b) was used in the BHHRA. This model was selected based on correspondence between OEPA (2004c) and the USACE...*" Comment: The *OEPA (2004c)* is not listed in the References section 8.0. The references are not well organized alphabetically.	Please **revise and organize References, section 8.0** and perform quality reading to reconcile text with the section 8.0.	The text and references will be revisited for completeness per the comment.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			While the U.S. Army Core of Engineers is referred to in this Document as the "USACE", the U.S. Environmental Protection Agency is only referred to as "EPA" and in the text it may be confused with the Ohio EPA.		
7.	S. 5.4 P. 5-7 L.# 1		This Document states: "*…COCs are defined as the chemicals that contribute significantly to an ILCR exceeding 1E-4…*" but then, e.g., on page 5-8: "*…COCs* […as] *exceeding the PRGs…*" Comment: This definition of COC is contradicting some other statements in this Document and is in disagreement with the OEPA (2004) [see above, comment # 3].	Please use **1E-5** in defining both human health cumulative excess lifetime carcinogenic risk goal and a level of concern from aggregate exposures.	See response to comment no. 3
Draft Screening Level Ecological Risk Assessment					
8.	SLERA S.7 P. 7-4		This Document states: "*U.S. Environmental Protection Agency (EPA)…*" and then: "*EPA…*" Comment: See above, comment # 6.	Please **revise and organize References, section 7.0** and perform quality reading to reconcile text with the section 7.0.	See response to comment no. 6
9.	SLERA Figure 2-2		This document states: "*…Injestion…*" Comment: It should be "Ingestion".	Please correct **typos** (and perform quality reading).	Change will be made as noted.
10.	SLERA S. 2.1.1 P. 2-3 L# 7		This document states: "*…Jacobs personnel completed a checklist similar to EPA's checklist for ecologicalaAssessment/ sampling (EPA, 1997)…*"	Please complete a checklist recommended by **OEPA-DERR (2008)**.	The text will be removed indicating the completion of the ecological checklist. The checklists were reviewed prior to completion of the ecological site surveys to ensure the

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			Comment: The ecological risk assessment guidance by OEPA-DERR, updated in 2008, provides the recommended generic ecological scoping checklist list in the Appendix B. **Reference:** **OEPA-DERR (2008)** Ecological Risk Assessment Guidance Document. Available on-line at: http://www.epa.state.oh.us/derr/rules/RR-031.pdf		surveys were adequate. The results of the ecological surveys are presented in the Appendices.
11	SERA S. 2.2.5 P. 2-12 L# 13		This document states: "*...BSCs for soil were reported as 95 percent upper tolerance limit (UTL) for lognormal data sets or the 95th percentile for datasets with nonparametric distribution...*" Comment: According to OEPA – DERR (2004), background concentration levels are to be calculated as the upper cutoff value of the data set defined as the upper quartile + 1.5 X (interquartile range). **Reference:** **OEPA - DERR (2004):** TECHNICAL DECISION COMPENDIUM Remedial Response Program: Background Calculation. On-line: http://www.epa.state.oh.us/derr/rules/RR-039_public.pdf	Please use **background definition** as described in OEPA – DERR (2004).	See response to comment no. 4
12	SERA S. 2.2.6 P. 2-12 L# 31 and P. 2-13		This document states: "*The following RBSEVs or RBSEV hierarchy, as noted, were used for the ecological evaluation...*" Comment: The hierarchy listed does not follow the OEPA-DERR recommendations.	Please use **screening hierarchy** for soil and sediment in accordance with OEPA (2008).	The hierarchy used is consistent with the approach specified in the Work Plan. The Ohio EPA sediment values were reviewed and used as part of this process.

Comment Number	Sect. Page/ Line#	Cross Ref.	Comment	Recommendation	PRP Response
			For soil, please add at the top of the list "U.S. EPA ECO-SSLs". For sediment risk-based screening, please use the following hierarchy, after comparing to OEPA Ohio-specific SRVs (Attachment H, p. 3-28. On-line: http://www.epa.state.oh.us/derr/rules/RR-031.pdf): 1) Consensus-based TEC values; The TEC values are located in: Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems, D.D. MacDonald, C.G. Ingersoll, and T.A. Berger, Arch. Environ. Contam. Toxicol. 39, 20-31 (2000). 2) Ecological Screening Levels, U.S. EPA, Region 5, 2003. http://www.epa.gov/reg5rcra/ca/edql.htm . **References:** **U.S. EPA ECO-SSLs**) U.S. EPA Ecological Screening Levels (Eco-SSL). On-line: http://www.epa.gov/ecotox/ecossl/ **OEPA-DERR (2008)** ECOLOGICAL RISK ASSESSMENT Guidance Document. On-line: http://www.epa.state.oh.us/derr/rules/RR-031.pdf		
13	SERA S. 3.1 P. 3-4 L# 38		This document states: "...*the drainage ditches associated with 2BG are ephemeral and were dry at the time of sampling...*" Comment: In the case of ephemeral runoff/surface water, the sampling should be performed during the wet season.	Please do additional **sampling,** or at least perform a predictive **modeling** of surface water.	The drainage ditches were dry at the time of sampling and sediment samples do not indicate the presence of contaminants at levels of concern.