2002 Groundwater Data Summary and Evaluation Report Former Plum Brook Ordnance Works Sandusky, Ohio

Volume 1 – Text, Tables, and Figures

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List of Acronyms

AA1	Acid Area 1
AA2	Acid Area 2
AA3	Acid Area 3
ABG	Additional Burning Ground
AOC	area of concern
BERA	baseline ecological risk assessment
bgs	below ground surface
BHHRA	baseline human health risk assessment
BNA	base neutral/acid extractable compound
BSC	background screening concentrations
BTEX	benzene, toluene, ethyl benzene, and total xylene
COC	chemicals of concern
D&D	decontamination and decommissioning
D&M	Dames and Moore, Inc.
DNB	dinitrobenzene
DNT	dinitrotoluene
DO	dissolved oxygen
DOD	U.S. Department of Defense
DQO	data quality objective
DRO	diesel range organics
Eh	oxidation-reduction potential
EPA	U.S. Environmental Protection Agency
FFS	focused feasibility study
ft/day	feet per day
ft/ft	foot per foot
FS	feasibility study
gpm	gallons per minute
GRO	gasoline range organics
GSA	General Services Administration
GWI	groundwater investigation
H_2S	hydrogen sulfide
HQ	hazard quotient

List of Acronyms *(Continued)*

HTRW	hazardous, toxic, and radiological waste
ICI	International Consultants, Inc.
ID	inside diameter
IDW	investigation-derived waste
ILCR	incremental lifetime cancer risk
IT	IT Corporation
MCL	maximum contaminant level
MDC	maximum detected concentrations
MK	Morrison Knudsen Corporation
MNTA	Maintenance Shop Area
msl	mean sea level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
OD	outer diameter
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PAH	polynuclear aromatic hydrocarbons
PBOW	Plum Brook Ordnance Works
PBS	Plum Brook Station
PCB	polychlorinated biphenyl
PETN	pentolite
pH	hydrogen ion concentration
PRRWP	Pentolite Road Red Water Ponds
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RAO	remedial action objective
RBSC	risk-based screening concentrations
RDX	Research and Development Explosive (cyclotrimethylenetrinitramine)

List of Acronyms *(Continued)*

RGO	remedial goal option
RI	remedial investigation
SAIC	Science Applications International Corporation
SAP	sampling and analysis plan
SCS	Soil Conservation Service
Shaw	Shaw Environmental, Inc.
SLERA	screening level ecological risk assessment
SSAP	site-specific sampling and analysis plan
SSHP	site-specific safety and health plan
SVOC	semivolatile organic compound
TNB	trinitrobenzene
TNT	trinitrotoluene
TNTA	TNT Area A
TNTB	TNT Area B
TNTC	TNT Area C
TSDF	treatment, storage, and disposal facility
UTL	Upper tolerance limit
USGS	U.S. Geological Survey
VOC	volatile organic compound
USACE	U.S. Army Corps of Engineers
WARWP	West Area Red Water Ponds

Executive Summary

The U.S. Army is conducting studies of the environmental impact of suspected hazardous waste sites at properties previously owned by the U.S. Department of Defense (DOD). The former Plum Brook Ordnance Works (PBOW), located in Sandusky, Erie County, Ohio, is currently being investigated under the Defense Environmental Restoration Program for Formerly Used Defense Sites. This 9,000-acre facility was used for the manufacture of explosives during World War II. 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.

The investigation is being managed and technically overseen by the Nashville, Tennessee and Huntington, West Virginia District Offices of the U.S. Army Corps of Engineers (USACE). Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) was contracted by the USACE, Nashville District to conduct a groundwater remedial investigation (RI) at two red water pond areas and three former trinitrotoluene (TNT) manufacturing areas. The two red water pond areas are the West Area Red Water Ponds (WARWP) and the Pentolite Road Red Water Ponds (PRRWP). The three former TNT manufacturing areas are TNT Area A (TNTA), TNT Area B (TNTB), and TNT Area C (TNTC).

This report assimilates data generated during three phases of 2001 field activities, data generated from the second, third, and fourth rounds of quarterly background sampling in 2002, and data from 2002 non-background groundwater sampling. It also presents data gathered from the TNTB RI and Red Water Ponds RI. Field activities that took place in 2001 included: direct-push screening investigation of soil and groundwater; installation of ten bedrock monitoring wells; development, groundwater sampling and aquifer testing of the newly installed wells; and, four rounds of quarterly background groundwater sampling and two rounds of non-background groundwater sampling. The field activities were conducted pursuant to the following documents: Site-Specific Sampling and Analysis Plan (SSAP) (IT, 2001a) and Site-Specific Safety and Health Plan (SSHP) (IT, 2001b), the Site-Wide Sampling and Analysis Plan (SAP) (IT, 1996a), Quality Assurance Project Plan (QAPP) (IT, 1996b), and Site-Wide Safety and Health Plan (IT, 1996c).

Groundwater flow in the shallow water-bearing zone is predominantly to the north. Based on historical and present data, the water table surface largely mirrors the surface topography and corresponds to the top of the bedrock. Groundwater within the overburden and underlying shale bedrock is considered to be connected. This interpretation is primarily based on the similarity of shale and overburden groundwater elevations at well pairs and by the bedrock groundwater contours (along the shale outcrops and the shale/limestone contact) merging with the overburdenshale groundwater contours.

Groundwater flow direction in the bedrock is predominantly to the northeast in the western half of PBOW and to the northwest in the eastern half. Groundwater merges in an area northeast of the reactor facility and exits PBOW to the northeast. Groundwater flow on the western side of PBOW is thought to be influenced by sump pumps at the reactor facility and structure of the Delaware Limestone. A groundwater low present on the eastern side of the facility is thought to be controlled by both structure and bedrock fractures.

Wells monitoring the Delaware Limestone showed significant variability in hydraulic conductivity. Hydraulic conductivity from slug tests completed in wells screened in the Delaware Limestone range from 0.002 (PB-BED-MW27) to 1.84 feet per day (ft/day) (PB-BED-MW24). A downward vertical gradient is present between the shallow water-bearing zone and the bedrock.

Quarries mining the Delaware Limestone in the vicinity north of PBOW are reported to have encountered naturally occurring petroleum hydrocarbons and hydrogen sulfide (H_2S) gas. Free-phase hydrocarbons and benzene, toluene, ethyl benzene, and total xylene (BTEX) analytical compounds detected in the groundwater of PBOW bedrock monitoring wells are interpreted to have the same origin based on the following observations:

- The majority of wells with hydrocarbons detections are screened in the Delaware Limestone
- Hydrocarbon-contaminated monitoring wells are widespread throughout PBOW, rather than being limited to only specific site areas
- Drilling borelog notes indicate that hydrocarbons were encountered while drilling in the Delaware Limestone bedrock
- Photographs of petroleum hydrocarbon on Delaware Limestone rock cores

- The detection of H_2S associated with the hydrocarbon that is found in the Delaware Limestone.

Discussions with the Ohio Department of Natural Resources, Division of Geological Survey, indicated that there are producing oil wells in Erie County. These oil wells reportedly are pumping from the Delaware Limestone and the Columbus Limestone.

Twenty-one groundwater samples were collected over a five-year period from five bedrock wells in background locations. The analytical results from these samples will be used to establish site-specific background concentrations for naturally occurring BTEX, polynuclear aromatic hydrocarbons (PAH), and for inorganic constituents when additional background groundwater data has been evaluated. The background groundwater samples were also analyzed for nitroaromatic explosives to confirm that PBOW activities had not impacted sites selected for determining background groundwater quality. Additional background sampling is scheduled to be conducted in October 2002 and April 2003. Major and trace elements were concluded to be naturally occurring in groundwater; they are present at varying concentrations depending on local geochemical and hydrogeological conditions. Detectable BTEX and PAHs are also present in background bedrock groundwater at the PBOW facility and are believed to have a natural source, such as from the natural petroleum in the Delaware Limestone (PB-BED-MW24) and from the petroliferous shale (PB-BED-MW20, PB-BED-MW25, and BG8-BEDGW-001).

The sporadic, seasonally dependant shallow water-bearing zone at PBOW has been impacted by inorganic and nitroaromatic contaminants. Toluene contamination is also present in overburden monitoring well MK-MW20 located downgradient of the upper toluene tanks.

The bedrock water-bearing zone at PBOW has also been impacted by organic and/or nitroaromatic contaminants to different extents by past site activities, although to a lesser degree than the overburden. Since the November 1997 sampling event with which current analytical results are being compared, nitroaromatic compounds above the risk-based screening concentration (RBSC) values have been found in the bedrock groundwater at five areas investigated plus in one downgradient monitoring well and one background monitoring well. Significant volatile organic compound (VOC) concentrations (most commonly BTEX) are also found in the bedrock groundwater at ten areas investigated. Semivolatile organic compounds (SVOC) have also exhibited impacts on water quality at all twelve areas but only two areas (WARWP and Maintenance Shop Area [MNTA]) exhibited SVOCs that may be site-related. Three PAHs that exceeded RBSC limits at one area (Additional Burning Ground [ABG]) may be

attributable to site contamination are benzo(a)pyrene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Common organic compounds detected above the RBSCs at PBOW included arsenic, iron, manganese, and thallium.

The following preliminary agreements between the USACE and OPEA were reached September 11, 2002 and are made based upon the results of this investigation:

- Background data determinations:
  - Groundwater sampling of potential background wells will be conducted for two additional events to verify the reality of nitroaromatic detections, to justify background well localities, and to obtain additional background analytical data. The sampling events should be conducted in October 2002 (dry season) and April 2003 (wet season).
  - Existing analytical results from monitoring well PB-BED-MW26 will not be used in the background summary statistics calculations because data was determined to be "outlier" data.
  - Only unfiltered groundwater data (both on-site and background) will be used for screening and risk assessment purposes.
  - Background groundwater data values will be limited to include only data from 2001 through 2003 obtained by low-flow sample collection. Data collected by means of a bailer can be used in qualitative discussions of risk uncertainty or to provide further evidence in a risk assessment as needed.
  - If sufficient low-flow data is present for each area of concern (AOC), then only that data will be used for statistical analysis. Bailer obtained data can be used in the absence of low-flow data but should be discussed in a risk uncertainty section.
  - The lesser value of the "upper tolerance limit (UTL)" and the "Maximum Detected Concentration (MDC)" will be used as the background screening concentration (BSC), once a background data set is finalized.
  - Statistical population testing will be used to determine whether detected concentrations of inorganics are associated with background conditions.
- Abandon monitoring well PB-BED-MW27 due to potential hazardous gas emissions and public concerns. Prior to abandonment, an additional groundwater

sample will be collected and analyzed for nitroaromatic compounds, metals, and water quality parameters.

- Determine extent of nitroaromatics in groundwater off site (downgradient of north fence line) by:

  - Installing downgradient bedrock monitoring wells for contaminant assessment, if necessary.

The following additional recommendations are made based upon conclusions from analytical results during this investigation:

- Toluene contamination is present in the shallow water-bearing zone at the Upper Toluene Tanks Area. Additional overburden soil and groundwater investigation activities should be conducted in the area to identify the extent of the toluene plume and prevent possible plume migration into Plum Brook.

- Monitoring wells have not been installed at the Middle Toluene Tanks Area. Based upon the results from the Upper Toluene Tank Area, consideration should be given to the installation of overburden water-bearing zone wells at the Middle Toluene Tank Area (assessment of possible toluene contamination in overburden groundwater) and bedrock wells at the Middle and Lower Toluene Tank Areas (assessment of possible toluene contamination in bedrock groundwater), if deemed necessary.

- Installation of one additional bedrock monitoring well in the PRRWP Area to monitor bedrock contamination.

- Collect additional data on the Garage/Maintenance Area pumping rates and the reactor sump well pumping rate/cycles to support groundwater modeling.

- Conduct a local off-site private wells survey to determine the number of private wells, construction information, and availability for sampling.

- Evaluate off-site nitroaromatic migration through private well sampling (if possible).

Planned Activities

- Complete site-wide groundwater model (2003).

- Complete site-wide groundwater risk assessment (2003).

1.0 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected hazardous waste sites at properties previously owned by the U.S. Department of Defense (DOD). The former Plum Brook Ordnance Works (PBOW), located in Sandusky, Erie County, Ohio, is currently being investigated under the Defense Environmental Restoration Program for Formerly Used Defense Sites. Figure 1-1 shows the geographical location of the former PBOW site. This 9,000-acre facility was used for the manufacture of explosives during World War II. 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.

The investigation is being managed and technically overseen by the Nashville, Tennessee and Huntington, West Virginia District Offices of the U.S. Army Corps of Engineers (USACE). Shaw Environmental Inc. (Shaw), (formerly IT Corporation [IT]) was contracted by the USACE, Nashville District to conduct a groundwater remedial investigation (RI) at two red water pond areas and three former trinitrotoluene (TNT) manufacturing areas. The two red water pond areas are the West Area Red Water Ponds (WARWP) and the Pentolite Road Red Water Ponds (PRRWP). The three former TNT manufacturing areas are TNT Area A (TNTA), TNT Area B (TNTB), and TNT Area C (TNTC). This work was performed under Delivery Order 0010 of Contract Number DACA62-00-D-0002 and the report was prepared under Delivery Order 0014 of the same contract number.

This report represents an interim document in the RI/feasibility study (FS) process. The purpose of this report is to provide a comprehensive summary of all data collected through October 2002, document key decisions made by the USACE in conjunction with the Ohio Environmental Protection Agency (OEPA) and to the extent practical, provide an evaluation of the data.

This data evaluation and subsequent recommendations define the data needs to complete the RI. As such, this document represents the basis, both in format and content, of the RI report. The Report of Findings (Volume 1 of the RI/FS) is anticipated to be issued in 2004. This report also presents data gathered from the TNTB RI and Red Water Ponds RI. Note that the quarterly groundwater sampling was designed to monitor seasonal changes in groundwater quality. As discussed in Chapter 6.0 in this report, two general seasons exist in reference to groundwater

recharge, a wet season (April) and a dry season (October). Field activities completed in 2001 and 2002 are listed below:

- Direct-push screening investigation conducted during the PBOW dry season from July 24 through August 7, 2001.
- Bedrock monitoring well installation, confirmation soil sampling, well development, and groundwater sampling conducted during the wet season from August 23 through October 10, 2001.
- Hydraulic conductivity testing field investigation conducted from November 13 to 15, 2001.
- Second round of background groundwater sampling conducted during the wet season, January 15 to 17, 2002.
- Third round of background and non-background groundwater sampling conducted in the wet season from April 2 to 15, 2002.
- Fourth round of background groundwater sampling conducted in the dry season July 9 to 11, 2002.

In addition, quarterly groundwater elevation measurements were also conducted by International Consultants, Inc. (ICI) to support ongoing investigation and remediation activities at PBOW. This information is critical in the evaluation of groundwater flow and contaminant transport, and is incorporated into this report.

The field activities completed by Shaw were conducted pursuant to the following documents: Site-Specific Sampling and Analysis Plan (SSAP) (IT, 2001a) and Site-Specific Safety and Health Plan (SSHP) (IT, 2001b), the Site-Wide Sampling and Analysis Plan (SAP) (IT, 1996a), Quality Assurance Project Plan (QAPP) (IT, 1996b), and the Site-Wide Safety and Health Plan (IT, 1996c).

1.1 Objectives and Scope of Work

The objectives of this investigation included the following:

- Determine if hazardous substances are present at the site at concentrations that may exceed risk-based screening values.
- Define site physical features and characteristics (aquifer background conditions).

- Support the evaluation of the fate and transport pathways through sitewide groundwater modeling (anticipated to be completed in 2004).
- Determine the nature and extent of source areas.
- Define current and future routes of exposure.
- Determine whether contaminant distribution is consistent with former DOD activities.
- Establish naturally occurring levels of inorganics in PBOW groundwater to use in screening site data in risk assessments.

The scope of the groundwater RI included the preparation of a quality control plan and site-specific addenda to the site-wide SAP and safety and health plan, monitoring well installation, monitoring well development, in-situ permeability determination, groundwater sampling, soil sampling, analytical work, investigation-derived waste (IDW) management and disposal, and preparation and submittal of a report of findings. Based on the findings of previous investigations, this report presents both historical groundwater data (pre-2001) and new groundwater data obtained as part of this groundwater RI. Groundwater information was collected during these investigations to support groundwater modeling activities (USACE, 2001). Figure 1-2 identifies the areas investigated in relation to other areas of concern and site features.

1.2 Report Organization

Chapter 2.0 of this report describes the PBOW site, its physical setting, geology, and hydrogeology features. Previous investigations of TNTA, TNTB, TNTC, WARWP and the PRRWP are found in Chapter 3.0. Sampling strategy and field procedures are described in Chapter 4.0. The analytical program and results are presented in Chapter 5.0 and 6.0, respectively. Conclusions are provided in Chapter 7.0 and recommendations in Chapter 8.0. References that were used in preparing the report are listed in Chapter 9.0.

All appendices are contained in Volume 2. Direct push-drilling logs and temporary piezometer diagrams are provided in Appendix A. Sample collection logs generated during the investigation are included in Appendix B. Monitoring well construction diagrams, site photographs, and well development logs are provided in Appendices C, D, and E, respectively. Appendix F contains hydraulic conductivity data while Appendix G contains land survey data. Appendices H through K contain analytical data pertinent only to the fourth quarter background sampling event (July 2002) and the April 2002 non-background sampling event. Background groundwater summary

statistics are tabulated and described in Appendix L. Appendix M presents a teleconference note on local BTEX and an e-mail message on active oil/gas field. Appendix N presents recharge calculations for PBOW. Chromatograms are provided in Appendix O while Appendix P contains comments and responses.

1.3 Facility Location and Description

The former PBOW site is currently owned by NASA and is operated as the PBS of the NASA John Glenn Research Center, which is located at Lewis Field in Cleveland, Ohio. Most of the aerospace testing facilities built at the site in the 1960s are in standby or inactive status. The site 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 the site 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 County Road 43, and on the east by U.S Highway 250. The areas surrounding PBOW are mostly agricultural and residential. Public access is restricted at PBOW except during the annual deer hunting season.

1.4 Site History and Potential for Contamination

The PBOW site was built in early 1941 as a manufacturing plant for 2,4,6-TNT, dinitrotoluene (DNT), and pentolite (PETN). Production of explosives began on December 16, 1941 and continued until 1945. It is estimated that more than one billion pounds of explosives were manufactured during the 4-year operating period.

The United States Army began decontamination and decommissioning (D&D) all TNT, DNT, and PETN lines in September 1945. Three areas manufactured TNT and DNT (TNTA, TNTB, and TNTC) and one area manufactured PETN (Figure 1-2). TNTA consisted of manufacturing lines 1 through 4, TNTB lines 5 through 7, and TNTC lines 8 through 12. TNTA is located on the northeast side of PBOW, TNTB at the southern central part, and TNTC at the southwestern side of PBOW. The PETN manufacturing area is located in the north-central portion of PBOW and lies within the boundaries of Ransom Road on the west, Pentolite Road on the south, and Patrol Road on the north and east. The PETN Area contained three pentolite lines with a designated capacity of 7,000 pounds per 24 hours (Morrison-Knudsen Ferguson Corporation [MK], 1994 and Science Applications International Corporation [SAIC], 1995).

Typical D&D methods of all the manufacturing lines involved removing and relocating any explosive waste from the buildings or structures to a burning ground for open burning. Above-

ground portions of buildings and structures were demolished and burned where possible. Based on soil investigations completed at the TNT areas, at least portions of the concrete foundations remain in place. Steam lines used for facility heating and associated building drain lines were flushed and dismantled, but no record was found indicating the wash-out location. By December 1945, it was estimated that 65 percent of the necessary decontamination was complete (MK, 1994).

From January 1 to June 30, 1946, the USACE assumed responsibility for maintenance and custodial activities. Further decontamination activities were conducted, and the extent of contamination was certified (MK, 1994).

In the summer of 1955, a significant effort was made by the USACE through Ravenna Arsenal to decontaminate the surface and subsurface soil at the TNT Areas (Dames and Moore, Inc. [D&M], 1997a). Decontamination was performed first at TNTA. At TNTA, the decontamination process included the removal of contaminated surface and subsurface soil around the wash houses, bi-tri houses, fortifier buildings, DNT sweating and graining building, DNT nitrating building and nail houses. They also removed wooden and ceramic waste disposal lines containing from 1.0 to 2.5 inches of TNT. In addition, concrete catch basins containing thousands of pounds of TNT were discovered overlain by wood and scrap lumber. This lumber and TNT was removed and transported to the Burning Grounds where it was burned. Decontamination of TNTB and TNTC was supposed to be modified to address only surface contamination detected by visual inspection leaving underground flumes in place. It is unknown whether this modification in the procedure took place as part of the 1955 decontamination of TNTB and TNTC (D&M, 1997a).

NASA acquired PBOW on March 15, 1963 and currently utilizes the site. The General Services Administration (GSA) decontaminated the TNT Manufacturing Areas to facilitate transfer. The decontamination is believed to have occurred in 1963 (D&M, 1997a) and work was accomplished in five steps:

1. Inspecting then removing contaminated surface soil above the drain tiles, flumes, etc.

2. Spot checking of subsurface soil in the vicinity of drain tiles, flumes, etc. to determine where the contaminated tiles and flumes were located. Where contamination was found, the flumes, tiles, etc. were removed in sections.

3. Removal of some items previously decontaminated to three X (XXX) condition to a storage facility and additional decontamination of the remainder of the items to a five X (XXXXX) condition in order to be sold ("X" indicates unknown information).

4. Destruction of all buildings by fire then removal of all debris and concrete foundations. All the materials including the earth in those areas was flashed and the area was then rough graded. As previously noted, recent soil investigations at the TNT areas suggest that at least portions of the concrete building foundations remain in place.

5. Decontamination of all sump basins and removal of the concrete.

The decontamination process also included the burning of nitroaromatic-filled flumes that were excavated. As shown in the records review (D&M, 1997b) this was performed on July 10, 1963, near the intersection of Fox Road and Snake Road.

On April 18, 1978, NASA declared approximately 2,152 acres of land as excess. The Perkins Township Board of Education acquired 46 acres of the excess for use as a bus transportation center. The GSA retains the remaining acreage and currently has a use agreement with the Ohio National Guard for 604 acres of the land. NASA presently controls about 6,400 acres and is using the site to conduct space research as a satellite operation of the John Glenn Research Center. The details of these land transactions are listed in the site management plan and can be found at NASA PBS.

Based on review of historical use of the site and soil and groundwater findings from previous investigations, contaminants related to the manufacture of nitroaromatic explosives are present at PBOW. These potential contaminants include: nitroaromatic compounds, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), cyanide, and inorganics.

2.0 Physical Setting

2.1 Geography, Topography, and Surface Drainage

PBOW is located within the Eastern Lake Region of the Central Lowland Province (Soil Conservation Service [SCS], 1971). Erie County is overlain by lacustrine sediment, glacial outwash, and glacial till. The surface is a plain with a slight slope to the north-northeast toward Lake Erie at approximately 25 feet per mile. Elevations at the site range from 680 feet above mean sea level (msl) at the intersection of Taylor Road and Patrol Road on the south western side of the site to 625 feet above msl at the northern portion of the installation (Figure 2-1). In general, the topography of PBOW is characterized by a flat ground surface with occasional low hummocks influenced primarily by glacial scouring and deposition. A low escarpment trends from the western to the northeastern portion of the site.

PBOW lies in the eastern region of the Pickeral Creek-Pipe Creek Basin, which is part of the St. Lawrence River drainage basin (D&M, 1997a). Eleven streams exist within the site and flow north-northeast toward Lake Erie, which is located approximately 3.5 miles north of the site. The site is 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 (north central PBOW), all of which flow into Sandusky Bay (D&M, 1997b). Surface water for TNTA specifically drains into ditches that are tributaries to Lindsley Ditch, which eventually drains (off-site) into Plum Brook. Surface water on the northern side of TNTB drains to ditches that are tributaries to Ranson Brook while surface water on the southern side of TNTB drains to tributaries flowing into Plum Brook. Surface water at TNTC flows into tributaries which flow into Pipe Creek. Surface water drainage at the WARWPs flows into tributaries for Pipe Creek while surface water at the PRRWPs is drained by tributaries for Plum Brook. The drainage pattern is dendritic where streams are incised into bedrock and is poorly developed where they have not yet downcut to the bedrock. Two drainages at the site, Kuebler Ditch and Plum Brook are being monitored by NASA PBS for National Pollutant Discharge Elimination System (NPDES) outfall permits. In addition to the streams, 17 isolated ponds and reservoirs and former red water ponds are located at PBOW (U.S. Geological Survey [USGS], 1992; D&M, 1997b).

2.2 Geology and Soils

2.2.1 Regional Geology

The bedrock in northern Ohio consists of Devonian and Silurian carbonates (limestone and dolomite) and clastics (shale, siltstone, and sandstone). These units unconformably overlie older sedimentary sequences of Ordovician and Cambrian Age rocks, which in turn unconformably overlie pre-Cambrian basement rocks (D&M, 1997a). The local bedrock is situated on the eastern flank of the Findlay Arch. Beds in the vicinity of PBOW dip to the southeast at a rate of approximately 10 to 30 feet per mile. In the Devonian and Silurian of northern and western Erie County, weathering of the carbonates has produced cavernous porosity and karst topography.

2.2.2 Local Geology

Three formations, all of Devonian Age, outcrop across PBOW (Figure 2-1). Each of the units discussed below was encountered in the upper 100 feet of bedrock at PBOW along the lines of section presented in Figure 2-2 and on cross-sections shown on Figures 2-3 through 2-7. A top-of-bedrock elevation contour map is presented on Figure 2-8, and an updated overburden thickness contour map is presented in Figure 2-9. These figures were previously presented in the June 1999 Site-Wide Groundwater Monitoring Report (IT, 1999), but have been updated according to lithologic data obtained during the installation of 10 bedrock monitoring wells in August and September 2001.

The Delaware Limestone is the lowermost formation screened by site wells. It is characterized as a hard, dense, finely crystalline limestone and dolomite. The unit is typically buff colored and usually is described as fossiliferous. In the vicinity of PBOW, quarries mine limestone from the Delaware. Traces of natural petroleum-derived hydrocarbons and hydrogen sulfide (H_2S) are common in area quarries. Overlying the Delaware Limestone is the Olentangy Shale. Two members of the Olentangy Shale have been characterized at the site, the Plum Brook Shale and the overlying Prout Limestone. The Plum Brook Shale is interpreted to consist of approximately 35 feet of bluish-gray, soft, fossiliferous shale containing thin layers of dark, hard, fossiliferous limestone. The Prout Limestone has been described as a 15 foot thick unit which occasionally outcrops in a 1,000-to-2,000-foot-wide, northeast-striking band across the middle portion of PBOW. It is described as a dark-gray to blue, very hard, siliceous, fossiliferous limestone or dolomitic mudstone. The uppermost formation at the site is the Ohio Shale. Only one member of the Ohio Shale is present in the PBOW area, the Huron Shale. This unit has been described as black, thinly bedded, with abundant carbonaceous matter. Some large pyrite/carbonate

concretions are also present in the Huron Shale, some as large as 6 feet in diameter (D&M, 1997).

2.2.3 Local Soils

The bedrock overburden in Erie County is predominantly glacial till, glacial outwash, or glacial lacustrine (lake) deposits. In the vicinity of PBOW, the soil has been interpreted to be lacustrine. In many areas, the overburden also consists of highly weathered bedrock. The thickness of the overburden ranges from 1 foot to greater than 25 feet. As shown on Figure 2-9, overburden is thickest on the northern portion of the site in the vicinity of the Reactor Facility Area, where it has filled in a bedrock low.

The 1971 *SCS Soil Survey for Erie County* mapped four soil associations on PBOW (in order of areal percentage) as the Prout, Arkport-Galen, Del Rey-Lenawee, and Lewisburg (SCS, 1971). More recently, the Ohio Department of Natural Resources (ODNR) revised the soil associations in the county, which also changed the soil associations at PBOW. As shown in the 1994 report (ODNR, 1994), the soil in the northwest portion of the PBOW site is now placed within the Kibbie-Elnora-Tuscola-Colwood Association that is described as nearly level to gently sloping. The soil is described as somewhat poorly drained, moderately well drained, and very poorly drained soils formed in outwash, lacustrine, and deltaic sediments. Along a strip from west to northeast across the site is the Castalia-Millsdale-Milton-Ritchey Association. This association is described as shallow to moderately deep, nearly level to moderately steep, well drained and very poorly drained soils formed in glacial till, lacustrine sediments, and limestone residuum. Across much of the central portion of the site is the Hornell-Fries-Colwood Association, described as moderately deep to deep, nearly level to gently sloping, somewhat poorly drained to very poorly drained soils formed in glacial till and lacustrine sediments over shale bedrock. At the extreme southeast portion of PBOW is the Pewamo-Bennington Association, described as nearly level to gently sloping, very poorly drained and somewhat poorly drained soils formed from glacial till and lacustrine sediments.

2.2.4 Hydrogeology

2.2.4.1 Current Groundwater Usage

The majority of residents in Erie County receive water from public utilities that obtain most of their water from surface water sources. Residences to the north and east of PBOW are connected to city, county, or rural services. Erie County's primary groundwater source is from the limestone and dolomite aquifer found in the western end of the county. Groundwater wells in

the central and eastern portions of the county tap lower-yielding shale and sandy zones in the overburden (D&M, 1997a). Some wells surrounding PBOW are used for agricultural purposes, including irrigation, which could have an effect on drawdown near the site (ICI, 1995). A few wells in the vicinity of PBOW were determined to be used for private and public consumption (SAIC, 1991); however, none within the facility boundary are used. The distance between the private wells and site wells is not known.

2.2.4.2 Regional Hydrogeology

Regional groundwater flow is to the north-northeast towards Lake Erie, although local flow may vary due to local topography. Water in the limestone typically occurs in joints and along bedding planes or in solutionally enlarged openings. Although some limestones in the middle of the county provide well yields of up to 500 gallons per minute (gpm), the overburden and the majority of the other formations can sustain groundwater pumping of only 10 gpm or less (D&M, 1997b). A hydrogeological study by the USGS conducted on the glacial deposits in Sandusky in 1990 reported a horizontal hydraulic conductivity of 0.046 feet per day (ft/day) and a vertical hydraulic conductivity of 1.2 ft/day (USGS, 1992).

2.2.4.3 General Site Hydrogeology

At PBOW, the groundwater has been divided into three zones based on location and yield. Zone one occurs in the north and northwestern portion of PBOW. It has been characterized as yielding from 100 to 500 gpm from karstic limestone approximately 100 feet below grade. Zone two is in the northern portion of PBOW and has yields of 15 gpm or less from limestone approximately 300 feet below grade. Zone three is located in the eastern and southern portion of the site in predominantly shale bedrock. In addition to being found in the shale, groundwater is located in thin sand and gravel horizons interbedded with silt and clay deposits. Most zone three wells are poor yielding, many of them providing less than 3 gpm (D&M, 1997a).

The two main water-bearing zones at PBOW are the overburden and the bedrock. Data from recent investigations (TNT Areas A and C Remedial Investigation [IT, 2000c], Summary Report, Site-Wide Groundwater Monitoring [IT, 1997-1998] [IT, 1999], and the Site-Wide Groundwater Investigation Report [IT, 1997]) have found that groundwater in the overburden is in discontinuous pockets during dry time periods. During these periods of low precipitation, only limited migration of contaminants would occur due to less infiltration. During a wet period, the general flow direction in the overburden water-bearing zone is to the north-northeast largely mirroring surface topography. The flow also corresponds somewhat to the topography of the top of the bedrock. In contrast, the bedrock water-bearing zone is saturated year-round. The

conceptual model of the site is that groundwater flow in the bedrock water-bearing zone migrates and is influenced by the frequency, orientation, density, and connectivity of the fractures. Similar to the overburden flow direction, groundwater in the bedrock flows to the north-northeast. A more detailed discussion of hydrogeological information is presented in Section 6.0.

2.3 Climatological Setting

The climate of Erie County is continental, with cold and cloudy winters and warm, humid summers. The county's first freezing temperature is typically in October, and its last freezing temperature is typically in April. Average annual precipitation for Sandusky from 1961 to 1990 was 34.05 inches. Within that time period, February had the lowest monthly precipitation average with 1.65 inches, whereas July had the high of 3.70 inches. The weather changes every few days as cold fronts move through the region. Wind is from the southwest 55 percent of the time (MK, 1994; D&M, 1997a). A discussion of more recent precipitation data obtained as part of this investigation is presented in Section 6.2.4.

2.4 Site-Conceptual Model

Figure 2-10 presents a "generalized" cross-section of PBOW showing the possible contaminant migration transport routes, the overburden/shale and bedrock water-bearing units, the geologic units, and the interrelationship between the water-bearing zones. Groundwater sampling investigations and groundwater monitoring well measurement events have found that groundwater in the overburden may be limited to discrete areas during dry time periods of little rainfall. During these periods of low precipitation, only limited migration of contaminants would occur due to less infiltration of rainwater. The site conceptual model illustrates this seasonal, discontinuous nature of the overburden/shale groundwater. As noted in section 2.2.4.3, during a wet period, the general flow direction in the overburden water-bearing zone is to the north-northeast and mirrors the surface topography. The groundwater flow also corresponds somewhat to the topography of the top of the bedrock.

The site conceptual model also illustrates groundwater flow in the bedrock water-bearing zone through fractures. Groundwater flow paths and velocity are dictated by the frequency, orientation, density, fracture size, and connectivity of these bedrock fractures. In addition to fractures, some solutional cavities may be present in the limestone bedrock. Similar to the overburden flow direction, groundwater in the bedrock flows to the north-northeast. A more detailed discussion of hydrogeological information is presented in Section 6.0.

3.0 Summary of Previous Environmental Studies

Previous investigations of site hydrogeology and groundwater contamination were documented in the *Engineering Report of the Contamination Evaluation* (IT, 1991), the *Site Inspection Report* (MK, 1994), the *Site Management Plan* (ICI, 1995), the *Sitewide Groundwater Investigation Draft Report* (D&M, 1997b), the *Site-Wide Groundwater Investigation Report* (IT, 1997), and the *Site-Wide Groundwater Monitoring Report (1997-1998)* (IT, 1999).

3.1 Summary of Existing Site Data

The discussion of existing site data will focus on the primary areas to be investigated under this RI, which include the three TNT Manufacturing Areas (TNTA, TNTB, and TNTC), the WARWP, and the PRRWP. During field efforts conducted for the current groundwater investigation, it was reported by ICI that a free-phase substance was suspected in one well at the Upper Toluene Storage Tank Area. The existing well at the Upper Toluene Tanks Area was sampled to confirm or deny this presence. Therefore, although not a part of the original scope for this investigation, background information and analytical results are included in this report.

Although groundwater data are not subjected to risk assessment screening in this document, risk-based screening concentrations (RBSC) are included on the tables in Chapter 6.0 as points of reference. The groundwater RBSCs are derived from U.S. Environmental Protection Agency (EPA) (2002) tap water criteria. The RBSCs are based on a generalized residential drinking water scenario, assumed to be the most restrictive use of groundwater. Concentrations of analytes that exceed the RBSCs are highlighted in the tables. It is emphasized that RBSCs do not infer a regulatory limit or mandated cleanup level.

3.1.1 TNT Areas

TNT was manufactured in three areas, designated TNTA, TNTB, and TNTC (Figure 1-2). Each area had production lines consisting of a mono house, a bi-tri house, a fortifier house, and a wash house used in the manufacture of TNT. In addition, other buildings (e.g., nailing houses, wastewater settling tanks, and DNT sweating and graining houses) were present at each site. Each TNT area is discussed in the following paragraphs.

3.1.1.1 TNT Area A

The former TNTA occupies approximately 114 acres of land in the northeastern part of PBOW. Columbus Avenue bisects the site, as shown in Figures 1-2 and 3-1. NASA constructed its administration building on the east side of Columbus Avenue in the central portion of former TNT process buildings at TNTA (Buildings 121 and 122). TNTA was used during World War II as a manufacturing facility for TNT and DNT. During PBOW operations, TNTA had four TNT lines consisting of five buildings each, and two DNT lines, each consisting of one building (Figure 3-1). Wastewater from TNTA was routed through the wastewater setting tanks and pump house to the PRRWP through underground flumes and sewer lines. Aboveground evidence of the former TNTA structures and features include abandoned railroad tracks, portions of foundations, soil mounds (indicative of former building foundations), roadways, ditches, manholes, drains, and water valves.

Significant previous remediation activities have been performed in TNTA. According to the records review report (D&M, 1995), TNTA was decontaminated along with two other TNT areas in 1955 and again in 1966. The decontamination at TNTA was reportedly very thorough. Significant subsurface contamination was removed, including underground flumes and sewer lines. Approximately 16,000 pounds of TNT were removed from TNTA.

Previous environmental investigations in this area include a 1993 site inspection by MK (MK, 1994), a 1994 TNT Areas site investigation by D&M (D&M, 1997a), groundwater investigations by Shaw in 1996, 1997, and 1998, and a soil, surface water/sediment investigation by Shaw in 2000. Historical surface water, sediment, soil, and groundwater analytical results are shown on Tables 3-1, 3-2, 3-3, and 3-4, respectively. As noted in Section 3.1 historical groundwater analytical results are compared to RBSCs.

The MK inspection of the TNTA site included one soil sample, one collocated sample each of surface water and sediment, and three groundwater samples. No nitroaromatic residues were detected in any of these samples.

During the 1994 D&M investigation, a total of 36 soil samples were collected from 28 borings in TNTA. Borings were placed in and around former buildings that were associated with the TNT production lines. In addition, one soil boring was installed in a ditch north of Maintenance Road. A wide range of nitroaromatic compounds were detected, including concentrations of TNT up to 580 milligrams per kilogram (mg/kg) near the Wastewater Settling Tanks and 53 mg/kg near the

Fortifier House, Building 143. One boring located near the Mono House, Building 141, exhibited 2,4-DNT and 2,6-DNT concentrations of 45 mg/kg and 47 mg/kg, respectively.

D&M also collected groundwater samples. There were seven existing monitoring wells in TNTA. Five are overburden wells (MK-MW22, -MW23, -MW24, and TNTA-MW10, and -MW11) and two are bedrock wells (BED-MW17 and -MW18). Ten nitroaromatics were detected, nine above RBSCs in the overburden wells. Five nitroaromatics were detected above RBSCs in the bedrock wells.

Shaw conducted a site-wide groundwater investigation at PBOW in 1996 (IT, 1997) and again in November 1997 (IT, 1998). Both investigations included the collection of groundwater samples from wells in TNTA.

Eight nitroaromatics above RBSCs were detected in groundwater in overburden well MK-MW-22 in 1996 and 3 in 1997. Only 1 other nitroaromatic (2,6-DNT) above RBSCs in the overburden wells was detected during both years and it was from well MK-MW23 in 1996. Nitrobenzene was detected above the RBSC in 1996 in bedrock well PB-BED-MW17 while 4-A2,6-DNT, was detected above the RBSC in well PB-BED-MW18. The only nitroaromatics detected above RBSCs in 1997 were 1,3-dinitrobenzene (DNB) and nitrobenzene from well PB-BED-MW18. Filtered inorganics from overburden wells above RBSCs in 1996 included arsenic (MK-MW23), manganese (MK-MW23, TNTA-MW10, and TNTA-MW11), vanadium (MK-MW24), and iron (MK-MW10). Filtered inorganics above RBSCs in 1997 included arsenic (MK-MW23), manganese (MK-MW22, MK-MW23, MK-MW24, TNTA-MW10, and TNTA-MW11), chromium, iron, vanadium (MK-MW24) and barium and iron (TNTA-MW10). Filtered inorganics from bedrock wells above RBSCs in 1996 included only arsenic (PB-BED-MW17) while in 1997, barium was detected above RBSCs in both wells.

Benzene, toluene, total xylenes, and methyl chloride were common SVOCs detected above RBSCs in both bedrock wells during both years. Total cyanide was also detected above the RBSC in bedrock well PB-BED-MW17 in 1997.

In May 1998, Shaw again conducted a site-wide sampling event. Nitroaromatic compounds (4-amino 2,6-DNT [4-A2,6-DNT] 2,4-DNT and 2,6-DNT) were detected above RBSCs in overburden well MK-MW22. Overburden well MK-MW23 showed bis(2-ethylhexyl)phthalate above RBSC values. Eleven metals were found to be above RBSC screening values in overburden wells in the unfiltered samples. Three metals were above RBSCs with manganese

common to each overburden well. Two nitroaromatics (2,4-DNT and 2,6-DNT) were detected in bedrock wells above RBSCs, both concentrations from well PB-BED-18. Of the bedrock wells, naphthalene, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, methylene chloride, and total xylenes were detected above screening values in well PB-BED-MW17, and benzene, total xylenes, naphthalene, and bis(2-ethylhexyl)phthalate were above limits in well PB-BED-MW18. In well PB-BED-MW17, arsenic (filtered) and barium (filtered and unfiltered) were the only metals detected above screening values.

The last week of June through October 2000, Shaw conducted an RI of TNTA to determine the nature and extent of contamination in surface soil, subsurface soil, surface water, sediment and shallow groundwater. Four hundred twenty-seven soil samples were collected for field screening analysis of nitroaromatics, 39 confirmation soil samples, 10 (9 on-site, 1 off-site) surface water, 15 (10 on-site, 5 off-site) sediment samples and 10 shallow groundwater samples. It was determined that most of the nitroaromatic-impacted soil was encountered within 1 to 5 feet of the former building foundations. The largest nitroaromatic concentration of 2,4,6-TNT was located at Wash House, Building 146 (530 mg/kg) in a sample collected at 4 to 6 feet below ground surface (bgs).

Nine on-site surface water samples were collected, 8 from drainage areas and 1 from a suspect "red water" puddle at Wash House, Building 146. Three nitroaromatic compounds were detected in 2 samples from the drainage ditches with the highest concentration being 2.34 micrograms per liter (µg/L) of 4-2,6-DNT. Three VOC compounds (acetone [2.95 µg/L], carbon disulfide [11.5 µg/L], and methylene chloride [3.75 µg/L]) and 1 SVOC (di-n-butyl phthalate [1.3 µg/L]) were detected. Analytical results listed were the highest of each sample. Twenty metals were also detected. The surface sample from Wash House, Building 146 was analyzed only for nitroaromatics. TNT concentrations were 11,000 µg/L.

As part of the June through October 2000 RI, Shaw collected 9 shallow groundwater samples from confirmation soil sample locations which displayed the highest detections for PBOW related contaminants. Groundwater samples were collected from temporary piezometers and analyzed for VOCs, SVOCs, nitroaromatics, and metals. Three of the 9 groundwater samples (GW-02, GW-06, and GW-10) for metals were filtered. Figure 3-1 shows groundwater sample locations.

Nitroaromatics were detected in all groundwater samples above RBSCs. TNT analytical concentrations ranged from non-detect (GW-01, GW-03, and GW-08) to 32,400 µg/L (GW-06).

Total DNT was detected in 6 of the 9 samples with the highest analytical result of 13,800 µg/L in groundwater from GW-10. 4-A2,6-DNT and 2-A4,6-DNT were detected above RBSCs in 5 of the sampling locations. Benzene and toluene were the only VOCs above RBSCs in groundwater from temporary piezometer GW-01. Nitroaromatics 2,4-DNT and 2,6-DNT (detected as SVOCs) were the only SVOCs above the RBSC. 2,4-DNT was found at all temporary piezometers except GW-04 and GW-07 at concentrations as great as 5,750 µg/L (GW-10). 2,6-DNT was found in the groundwater at GW-01, GW-03, GW-08, and GW-10 at concentrations as great as 5,610 µg/L GW-10. Polychlorinated biphenyls (PCB) Aroclor 1260 was detected above its RBSC in the groundwater at GW-03. Fourteen unfiltered metals above RBSCs were detected at the temporary piezometers. Filtered manganese was the only inorganic detected above its RBSC. Unfiltered manganese was found above the RBSC at all of the sampling points. Unfiltered iron was above the RBSC in all piezometers except GW-10 while unfiltered aluminum, arsenic, chromium and lead was found at all except GW-07 and GW-10.

A baseline ecological risk assessment (BERA) was performed by Shaw for TNTA (IT, 2001c). The BERA estimated that ecological hazards associated with TNTA surface and total soils were elevated. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTA soils be remediated to human health-based remedial goal options (RGO), and that ecological risk be re-evaluated in the FFS based on cleanup of areas previously exceeding these RGOs. Because of uncertainties of estimating chemical concentrations in aquatic insects, the limited amount and low quantity of aquatic habitat, and the low hazard estimates, neither remedial action nor further study was recommended for surface water and sediment.

A baseline human health risk assessment (BHHRA) was also performed for exposure to TNTA soil, surface water, and sediment (IT, 2001d). Results of the BHHRA indicate that cumulative human health risks associated with TNTA total soil for the potential future resident and construction worker exceed the respective risk management ranges for cancer risk (i.e., incremental lifetime cancer risk [ILCR]>1E-5) and noncancer hazard (i.e., hazard quotient>1). Exposure to surface water and sediment were found to contribute insignificantly to human health risks. Exposure to surface soil (as evaluated for the groundskeeper, indoor worker, and hunter/venison eater) resulted in noncancer and cancer risk estimates within or less than the risk management ranges. The chemicals of concern (COC) for TNTA total soil are lead, Aroclor 1260, and several nitroaromatics. Human health risk-based RGOs for TNTA soil are being developed as cleanup criteria in the TNTA&C focused feasibility study (FFS) (IT, 2002a).

In 2003, Shaw prepared a Draft FFS for TNTA. The study recommended excavation, windrow composting, on-site disposal of treated material, and off-site disposal of soil with lead contamination greater than 200 mg/kg (approximately 708 yd^3) and PCB contamination greater than 50 mg/kg (approximately 119 yd^3) at a Subtitle C hazardous waste treatment, storage, and disposal facility (TSDF). The total cost of the alternative is estimated to be $7,459,000 (combined remediation cost of TNTA and TNTC) (IT, 2003).

3.1.1.2 TNT Area B

TNTB comprises an area of approximately 55 acres in the south-central portion of PBOW, immediately north of West Sheid Road, as shown on Figures 1-2 and 3-2. TNTB was used during World War II as a manufacturing facility for TNT and DNT. During PBOW operations, TNTB had three TNT lines consisting of 5 buildings each, and one DNT line consisting of one building. All of the buildings that were present during the TNT manufacturing period have been demolished but most foundations have been located during environmental investigations. Figure 3-2 presents a site map showing the locations of all former buildings. Aboveground evidence of former PBOW facilities exist at TNTB in the form of roads, hydrants, and ditches. In addition, aboveground water valves indicate the presence of underground utilities.

Two NASA facilities present at the site are currently active, the Hypersonic Testing Facility and the Nitrogen Dewar Tanks (Figure 3-2). The Hypersonic Testing Facility is located on the site of the former Wash House, Building 476 in the northwest portion of TNTB. The facility consists of a single building, aboveground and underground piping and utilities, and paved parking areas. The Nitrogen Dewar Tanks are located in the center of TNTB, with aboveground piping and underground utilities leading to the northwest and to the northeast off site (D&M, 1997a).

Historical surface water, sediment, soil and groundwater analytical results from previous investigations are shown on Tables 3-5, 3-6, 3-7, and 3-8, respectively for TNTB. As noted in Section 3.1, historical groundwater analytical results are compared to RBSCs. Soil analytical results are compared to site-specific RGOs developed by the FS (IT, 2001e).

In 1993, MK collected two surface water, two sediment, and two surface soil samples in the vicinity of TNTB. The samples were analyzed for VOCs, SVOCs, nitroaromatics, and dissolved metals. The surface water and sediment locations were SW07/SD07 and SW08/SD08. SW07 and SD07 were collected near the beginning of Ransom Brook, approximately 250 feet north of Magazine Road near the former red water settling tanks. SW08 and SD08 were collected north

of TNTB, approximately 200 feet south of Fox Road and approximately 3,000 feet downgradient of SW07 and SD07 (ICI, 1995).

The surface water samples exhibited no detections of VOCs or SVOCs. No metals were detected in the surface water at concentrations above their maximum contaminant level (MCL) or secondary MCL. The sediment sample collected at SD07 had detections of five VOCs and fourteen SVOCs. Using the 10X rule (10 times the soil RGO to account for less exposure), all were below RGO screening levels. The only nitroaromatic detection in SD07 was TNT at a concentration of 25 mg/kg, below the 10X rule of the soil site-specific cleanup level of 3.36 mg/kg (IT, 2001e). Eleven organic compounds were detected in sediment sample SD08, all at concentrations of 0.1 mg/kg. Detected organic compounds included two VOCs and nine SVOCs, eight of which were polynuclear aromatic hydrocarbons (PAH). All were less than the site-specific RGO.

The two surface soil sample locations were designated SB09 and SS13. SB09 was collected from the borehole for monitoring well MK-MW17. Sample SS13 was collected in the vicinity of the railroad tracks southwest of the Fortifier House, Building 463 (ICI, 1995). VOCs (toluene and xylenes), SVOC (bis[2-ethylhexyl]phthalate), and nitroaromatics (TNT and 2,6-DNT) were detected in the surface soil. Nitroaromatics were present at SB09, with TNT detected at a concentration of 12 mg/kg.

Two overburden monitoring wells were installed at TNTB in July 1993 by MK. Well MK-MW16 is located upgradient and well MK-MW17 is located downgradient of TNTB (Figure 3-2). Groundwater samples collected from both wells were analyzed for VOCs, SVOCs, nitroaromatics, and dissolved metals. No VOCs or nitroaromatics were detected in either of the wells. Twelve unfiltered metals were detected at levels that exceeded RBSCs. One SVOC, bis(2-ethylhexyl)phthalate, was detected at a concentration of 12 μg/L in MK-MW17.

In October 1994, as part of the TNT Areas site investigation, D&M sampled soil at 26 locations at TNTB. All samples were collected between 0.5 and 3.5 feet bgs. Eighteen of the 26 locations were sampled at one depth, and 8 locations were sampled at two depths. The samples were analyzed for nitroaromatics and metals. Nitroaromatics were detected in 18 of the 26 locations, and most locations had at least one sample with a concentration greater than 1.0 mg/kg. Concentrations of nitroaromatics detected in excess of 10,000 mg/kg were present in soils at the Bi-Tri House for Line 5 (Building 452) and the DNT Sweating and Graining House (Building 412).

In December 1994, D&M sampled both MK-MW16 and MK-MW17 as part of the TNT Areas site investigation. Samples from the wells were analyzed for nitroaromatics, nitrates, and unfiltered and filtered concentrations of 14 metals, the 13 priority pollutant metals plus manganese. MK-MW16 did not exhibit any detection of nitroaromatics. The downgradient well MK-MW17 contained 6 nitroaromatics (4-A2,6-DNT, 2-A4,6-DNT, 2,4-DNT, 2,6-DNT, 3,4-DNT, and 2,4,6-TNT) that exceed RBSCs. Nitrates were detected, but at concentrations below RBSCs. Five metals were detected above RSBCs in unfiltered overburden groundwater: arsenic, cadmium, manganese, nickel, and thallium. Three of the metals (manganese, nickel, and thallium) were detected in both wells. Four metals (antimony, manganese, nickel, and thallium) were detected above RBSCs in filtered groundwater samples. Manganese and nickel were common to both wells.

In September and October 1996, Shaw collected groundwater samples from MK-MW16 and MK-MW17 as part of the site-wide groundwater investigation. Both groundwater samples were analyzed for VOCs, SVOCs, metals, pesticides, PCBs, cyanide, and nitroaromatics. SVOCs, pesticides, and cyanide were not detected, and VOCs were not detected above RBSC levels. Seven metals were detected above screening levels; aluminum, arsenic, cobalt, iron, lead, manganese, and nickel. Seven nitroaromatics were detected above levels in MK-MW17. The maximum concentration of any nitroaromatic detected in MK-MW17 was 11 μg/L of 2,6-DNT.

In 1997, Shaw installed two bedrock wells near TNTB. TNTB-BEDGW-001 was installed northwest of the site to monitor bedrock groundwater downgradient of TNTB, and TNTB-BEDGW-002 was installed southeast of TNTB to monitor bedrock groundwater upgradient of the site.

In November 1997 and May 1998, as part of the semiannual monitoring portion of the groundwater investigation, overburden wells MK-MW16 and MK-MW17 were sampled by Shaw. Overburden groundwater samples were analyzed for VOCs, SVOCs, nitroaromatics, metals (unfiltered and filtered), cyanide, and water quality parameters (alkalinity, chloride, hardness, sulfate, nitrate, total dissolved solids, total organic carbon, and total suspended solids) (IT, 1999).

During 1997, no VOCs, SVOCs, cyanide, or water quality parameters exceeded RBSCs. Overburden groundwater samples analyzed for dissolved metals exceeded screening levels for arsenic, cobalt, iron, manganese, and nickel in MK-MW17 and aluminum, iron and manganese

in upgradient well MK-MW16. Only one nitroaromatic compound, 4-A2,6-DNT, was detected above its RBSC. This exceedance occurred only in downgradient well MK-MW17. No SVOCs, cyanide, or water quality parameters exceeded screening levels in bedrock wells TNTB-BEDGW-001 and -002. Two VOCs, benzene and methylene chloride, were detected at concentrations above their RBSCs in well TNTB-BEDGW-002. No nitroaromatics were detected in either well. Filtered and unfiltered bedrock groundwater samples in TNTB-BEDGW-001, analyzed for metals, exhibited RBSC exceedances for iron and manganese. Bedrock well TNTB-BEDGW-002 exhibited RBSC exceedances for barium in the filtered and unfiltered phases.

In May 1998, Shaw again sampled groundwater from site-wide monitoring wells. Overburden well MK-MW17 exhibited nitroaromatic compounds 4-A2,6-DNT and 2-4 DNT above the RBSC. No VOCs were above screening levels. Nitroaromatic 2,4-DNT (detected as a SVOC) was above its RBSC. Metals above screening levels in the overburden wells were limited to iron, manganese, and nickel in MK-MW16 and aluminum, arsenic, iron, manganese, and nickel in MK-MW17, all in the filtered and unfiltered groundwater samples. Bis(2-ethylhexyl)phthalate was the only SVOC found above its screening level in the bedrock well TNTB-BEDGW-001. Detected metals above RBSCs in the bedrock wells were arsenic, barium, iron, and manganese in TNTB-BEDGW-001 in the unfiltered phase and barium and manganese in the filtered phase. Bedrock well TNTB-BEDGW-002 exhibited only barium (filtered and unfiltered) above its RBSC.

In October and November 1998, Shaw conducted an RI of TNTB to determine the nature and extent of contamination in surface soil, subsurface soil, surface water, and sediment. Three hundred ninety-one soil samples were collected for field-screening analysis of nitroaromatics, and 40 confirmation samples, two surface water, and five sediment samples were collected. It was determined that most of the nitroaromatic-impacted soil above site-specific RGOs was encountered within 1 to 5 feet of the former building foundations. A total of 23 soil samples with nitroaromatic compounds above site-specific RGOs were recorded, with the highest detected 2,4,6-TNT concentration (6,900 mg/kg) being located at the Bi-Tri House, Building 452, in a 0 to 1 foot bgs sample. Wash House, Building 456, exhibited 6 soil sample concentrations of 2,4,6-TNT, 4-A2,6-DNT and 2-A4,6-DNT nitroaromatics above RGOs. Surface water results indicated that only VOCs and metals were present, while sediment analytical results showed VOCs, SVOCs, and metals (IT, 2000b).

A BHHRA and screening level ecological risk assessment (SLERA) were performed for TNTB (IT, 2000d). Total soil was found to exceed the cancer (1E-5) and noncancer cumulative risk management ranges for both receptors evaluated (potential future resident and construction worker). Likewise, surface soil was found to exceed the respective risk management ranges for both receptors evaluated (groundskeeper and indoor worker). Thirteen human health risk COCs were identified in TNTB surface and total soils. Site-related human health risks associated with surface water and sediment were found to be within or less than the risk management ranges (i.e., ILCR$\leq$1E-5 and HI$\leq$1).

The SLERA estimated that ecological hazards associated with TNTB surface and total soils were elevated. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTB soils be remediated to human health-based cleanup levels. The resulting residual ecological risks to terrestrial receptors were re-evaluated in the FFS based on cleanup of areas previously exceeding the cleanup levels. The resulting ecological risks were estimated to be reduced an average of approximately 750-fold. The SLERA concluded that remediating the site to human health cleanup levels would result in residual concentrations that are protective of terrestrial receptors. Additionally, the SLERA found that due to the limited aquatic habitat and the lack of rare, threatened, or endangered species, that the development of remedial action objectives (RAO) based on aquatic receptors was unwarranted.

Shaw generated a FS for TNTB in July 2001. Site-specific cleanup levels for TNTB surface and subsurface soil for each of the COCs are as follows (IT, 2001e):

Chemical of Concern	TNTB Cleanup Level (mg/kg)
Nitroaromatics	
2-amino-4,6-DNT	0.40
4-amino-2,6-DNT	0.40
2,4-DNT	7.50
2,6-DNT	2.75
2-Nitrotoluene	74
2,4,6-TNT	3.36
Polychlorinated Biphenyls	
Aroclor 1254	0.16
Aroclor 1260	2.87
Polynuclear Aromatic Hydrocarbons	
Benzo(a)anthracene	5.43
Benzo(a)pyrene	0.54
Benzo(b)fluoranthene	5.43
Dibenz(a,h)anthracene	0.65
Indeno(1,2,3-cd)pyrene	5.43

The removal action of contaminated soil at TNTB began in September 2002. Soil above the site-specific clean-up level will be excavated, stabilized, and transported off-site for disposal.

3.1.1.3 TNT Area C

The former TNTC occupies approximately 119 acres of land in the southwestern portion of PBOW, as shown in Figures 1-2 and 3-3. TNTC was used during World War II as a manufacturing facility for TNT and DNT. During PBOW operations, TNTC contained five TNT lines consisting of five buildings each (Figure 3-3). Wastewater from TNTC was routed to the WARWP through underground flumes and sewer lines.

Presently, the area is largely overgrown with trees and brush; however, some of the roads, building foundations, manholes, drains, and remnants of utilities from former TNT operations are still recognizable. According to the records review report, TNTC was decontaminated along with the two other TNT areas in 1955 and again in 1966 (D&M, 1995). However, the decontamination at TNTC was reportedly not as thorough as that at TNTA, and significant subsurface contamination associated with underground flumes and sewer lines is probably still present.

Previous environmental investigations in this area include a 1993 site inspection by MK (MK, 1994) a 1994 TNT Areas site investigation by D&M (D&M, 1997a) groundwater investigations by Shaw in 1996, 1997, and 1998, and a soil, surface water/sediment investigation by Shaw in 2000. Historical surface water, sediment, soil, and groundwater analytical results are shown on Tables 3-9, 3-10, 3-11, and 3-12, respectively. As noted in Section 3.1, historical groundwater analytical results are compared to RBSCs.

The MK inspection of the TNTC site included two surface soil samples and one collocated pair of surface water and sediment samples. Organic compounds were not detected in the surface water sample nor in the collocated sediment sample. Toluene was detected in both surface soil samples at concentrations below the quantitation limit.

A total of 30 soil samples were collected from 26 borings within the TNTC site during the 1994 D&M investigation. Boring locations were placed in and around former buildings that were associated with the TNT production lines (Line 12 - Buildings 626, 612, and 604). A wide range of nitroaromatic compounds were detected, including TNT at concentrations up to 2.7 mg/kg (near Building 626) and 2,4-DNT up to 8.7 mg/kg (near Building 626).

D&M also collected groundwater samples from wells in TNTC. There were 4 overburden wells present (TNTC-MW03, TNTC-MW04, TNTC-MW05, and TNTC-MW06) and one bedrock well (PB-BED-MW13). Overburden wells TNTC-MW03 and TNTC-MW04 were not sampled due to insufficient water present during sampling activities (D&M, 1997a). One nitroaromatic (2,4-DNT) was detected slightly (0.1 μg/L) above its RBSC in overburden well TNTC-MW05. No VOCs, SVOCs, nitrates, or water quality parameters were detected above RBSCs. Inorganics above RBSCs included aluminum (filtered) and manganese (filtered and unfiltered) in well TNTC-MW05 and chromium (filtered and unfiltered), iron (unfiltered), and manganese (filtered and unfiltered).

Four nitroaromtatic compounds (4-A2,6-DNT, 2,4-DNT, 2,6-DNT, and 3-nitrotoluene) were detected above RBSCs in the bedrock well PB-BED-MW13. VOCs and SVOCs above RBSCs included benzene, toluene, total xylenes, 2-methylnaphthalene, and naphthalene. Antimony (filtered) was the only inorganic detected above its RBSC.

Shaw conducted a site-wide groundwater investigation at PBOW in 1996 (IT, 1997) and again in 1997 (IT, 1998). The investigations included collection of groundwater samples from four overburden monitoring wells (TNTC-MW03, TNTC-MW04, TNTC-MW05, and TNTC-MW06) in 1996 and five wells (the previously sampled four wells and IT-MW09) in 1997. One bedrock monitoring well, PB-BED-MW13, was also sampled during both events.

No VOCs above RBSCs were detected in the overburden groundwater in 1996 or 1997. The SVOC bis(2-ethylhexyl)phthalate was detected above its RBSC in TNTC-MW06 in 1997. Nitroaromatics were not detected during either sampling event. Filtered and unfiltered manganese was detected above its RBSC in all overburden wells during both sampling events. Unfiltered iron was detected above its RBSC in all overburden wells in 1996 and in wells TNTC-MW04, TNTC-MW05, and TNTC-MW06 in 1997. Other filtered and unfiltered metals above RBSCs in 1996 included chromium, cobalt, lead, nickel, and vanadium in groundwater in TNTC-MW03, lead and vanadium in well TNTC-MW04, and chromium in well TNTC-MW06. Nitrate was detected above its RBSC in well TNTC-MW04 during the 1997 sampling event.

Several constituents were detected in bedrock well PB-BED-MW13 in 1996 and 1997. Three nitroaromatics, 4-A-2,6-DNT, 2,6-DNT and nitrobenzene were detected above their RBSCs in 1996. VOCs detected above their RBSCs were benzene, toluene and total xylenes in 1996 and 1997. SVOCs, naphthalene, and 2-methylnaphthalene had detected concentrations exceeding

their RBSCs in 1996 and 1997, bis(2-ethylhexyl)phthalate exceeded its RBSC limit. Barium was above the RBSC in both the filtered and unfiltered samples during the 1996 and 1997 samples events and chromium was above its RBSC in 1996 in only the filtered sample.

In May 1998 site-wide groundwater sampling, no nitroaromatics were detected in the overburden or bedrock monitoring wells. No VOCs or SVOCs were detected above RBSC levels in the overburden wells. Filtered and unfiltered manganese was detected above its RBSC in all overburden wells in 1998. Unfiltered metals aluminum, arsenic, chromium, and iron were detected above RBSC values in well TNTC-MW03; aluminum and iron in TNTC-MW04; aluminum, arsenic, chromium, iron, and lead in TNTC-MW05; and only iron in well TNTC-MW06. VOC contaminants benzene, methylene chloride, toluene, and total xylenes were above RBSCs in bedrock well PB-BED-MW13. SVOCs above RBSCs included bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and napthalene. No metals exceeded RBSC values in filtered or unfiltered samples in 1998.

During the last week of June through October 2000, Shaw conducted an RI of TNTC to determine the nature and extent of contamination in surface soil, subsurface soil, surface water, sediment, and shallow groundwater. Three hundred eighty-three soil samples were collected for field-screening analysis of nitroaromatics, and 40 confirmation samples, 10 surface water samples, and 15 sediment samples were collected for a confirmatory analysis. During excavation for soil sample placement, most of the former building foundations were located. As at TNTB, it was determined that most of the nitroaromatic-impacted soil was encountered within 1 to 5 feet of the former building foundations. The highest detection was 54,969 mg/kg of 2,4,6-TNT in a sample collected from 0.25 to 1.25 feet bgs at the former Bi-Tri House (Building 692). It should be noted that this sample was of a suspected waste product from a clay line that was encountered during excavation at the former building. Surface water results indicated that only VOCs and metals were present, while sediment analytical results showed VOCs, SVOCs, and metals. Based on the low concentrations of the contaminants in the soil, surface water, and sediment, concentrations were believed not to be attributable to former site activities (IT, 2001f).

As part of the June through October 2000 RI, Shaw collected 9 shallow groundwater samples from confirmation soil sample locations that displayed the highest detections of PBOW-related contaminants. Groundwater samples were collected from temporary piezometers and analyzed for VOCs, SVOCs, nitroaromatics, and metals. Three of the 9 groundwater samples (GW-04, GW-06, and GW-10) for metals were filtered. Figure 3-3 shows groundwater sample locations.

Nitroaromatics were detected in all groundwater samples above the RBSCs. TNT analytical concentrations ranged from 0.208 µg/L (GW-07) to 20,100 µg/L (GW-08). Total DNT was detected in all but one sampling point (GW-03) with concentrations as great as 21,100 µg/L in GW-08. 4-A2,6-DNT was detected above its RBSC at all sampling piezometers. Benzene was the only VOC above its RBSC; it was found in temporary piezometers GW-03 and GW-09. Nitroaromatic 2,4-DNT (detected as an SVOC) was found above its RBSC at all sampling points except at GW-03 and GW-06. 2,6-DNT (detected as an SVOC) was also found above its RBSC at all the temporary piezometers except GW-03, GW-05, GW-06, and GW-07. Sixteen unfiltered metals above RBSCs were found in groundwater at the temporary piezometers. Unfiltered manganese was found to be above its RBSC at all of the sampling points. Unfiltered aluminum, arsenic, iron, and lead were above RBSCs at all temporary piezometers except GW-10.

A BERA was performed for TNTC (IT, 2001c), which estimated that ecological hazards associated with exposure to TNTC surface and total soils were elevated for terrestrial receptors. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTC soils be remediated to human health-based RGOs, and that ecological risk be re-evaluated in the FFS based on cleanup of areas previously exceeding the human health RGOs for TNTC. Also, neither remedial action nor further study are recommended for aquatic receptors exposed to TNTC surface water based on the following: uncertainties associated with estimating chemical concentrations in aquatic insects, limited area and low quality of aquatic habitat, and relatively low hazard estimates especially when using the lowest-observable-adverse-effects-level approach.

A BHHRA was also performed for exposure to TNTC soil, surface water and sediment (IT, 2001d). Results of the BHHRA indicate that cumulative human health risks associated with total soil for the potential future resident and construction worker exceed the respective risk management ranges for cancer risk (i.e., ILCR >1E-5) and noncancer hazard (i.e., hazard quotient [HQ] >1). Similarly associated with exposure to surface soil for the groundskeeper, indoor worker, and adult hunter exceeded the respective risk management ranges. Noncancer risks associated with exposure to sediment for the potential future resident and construction worker also exceeded the risk management range (i.e., ILCR>1E-5), and cancer risks associated with exposure to sediment contributed significantly (ILCR>1E-6) to the overall ILCR of the construction worker and potential future resident. Human health risk-based RGOs for TNTC soil and sediment are being developed as cleanup criteria in the TNTA&C FFS.

In 2003, Shaw prepared a Draft FFS for TNTC. The study recommended excavation, windrow composting, on-site disposal of treated material, and off-site disposal of soil with lead contamination greater than 200 mg/kg (approximately 400 yd^3) at a Subtitle C hazardous waste treatment, storage, and disposal facility (TSDF). The total cost of the alternative is estimated to be $7,459,000 (combined remediation cost of TNTA and TNTC) (IT, 2003).

3.1.2 Red Water Pond Areas

3.1.2.1 West Area Red Water Ponds

The WARWP is located on the western edge of PBOW, near the intersection of Campbell Street and Fox Road and to the north and west of Pipe Creek, as shown in Figures 1-2 and 3-4. Two former red water ponds in the WARWP have been identified through the use of aerial photographs, site reconnaissance, and the presence of nitroaromatic compounds in soil and groundwater. Available historical surface water, sediment, soil, and groundwater analytical results are shown on Tables 3-13, 3-14, 3-15, and 3-16, respectively. As noted in Section 3.1, historical groundwater analytical results are compared to RBSCs.

Prior to 1985, numerous studies were conducted of the surface water and sediment from the red water pond areas. The Ohio National Guard conducted surface sediment screening for TNT and DNT. The highest values found in the screened sediments were less than 1 mg/kg (IT, 2000b). Shaw was contracted in 1989 to conduct near-surface sediment sampling to determine the presence or absence of residual chemical contamination from PBOW operations. Soil sample analysis showed that DNB, trinitrobenzene (TNB), DNT, and TNT were present in the soils at the WARWP. In 1991, SAIC confirmed that hazardous substances had been released into the environment at the WARWP (USACE, 1997).

A site inspection by MK from June through July 1993 to determine the potential risk to human health and the environment indicated low levels of VOCs and SVOCs in the sediments around Pipe Creek near the WARWP area but found no contaminant concentrations of VOCs, SVOCs, or nitroaromatics in the surface water. MK also installed four overburden groundwater monitoring wells (MK-MW09, MK-MW10, MK-MW11, MK-MW12) near WARWP and had the groundwater analyzed for the above contaminants. Laboratory analysis did not indicate the presence of VOCs, SVOCs, or nitroaromatics in the groundwater samples near Pipe Creek (MK, 1994).

In 1994, D&M conducted a Focused Remedial Investigation to evaluate groundwater occurrence and flow conditions in the overburden and bedrock water-bearing zones; assess groundwater quality in the overburden water-bearing zone; and investigate the baseline groundwater quality of the bedrock water-bearing zone to evaluate the necessity of additional work at PBOW. Two bedrock wells (BED-MW14 and BED-MW19) and two overburden wells (WA-MW01 and WA-MW02) were installed in the vicinity of the WARWP area. Hydrogeologic data indicated that groundwater flow in the overburden exhibited a strong downward vertical component and the presence of groundwater was strongly seasonally dependent. The general groundwater flow in both water-bearing zones was determined to be to the north toward Lake Erie. Groundwater samples were analyzed for VOCs, base neutral/acid extractable compounds (BNA), nitroaromatics, and metals. Significant concentrations of nitroaromatics were determined to be present adjacent to the ponds in both the overburden and the bedrock water-bearing zones. VOCs and BNAs were also present in the bedrock wells. Some metals (antimony, manganese, and nickel) were also detected at concentrations exceeding their RBSCs (D&M, 1997a).

As part of the 1994 Focused RI, to identify and evaluate the source, nature, and extent of contamination of former DOD activities, surface and subsurface soil at the Red Water Ponds was investigated by D&M. Soil samples were collected from the WARWP and analyzed for nitroaromatics and metals. Nitroaromatics 1,3,5-TNB and 2,4-DNT were most commonly detected (D&M, 1997a).

Shaw conducted groundwater investigations in 1996 and 1997. Both investigations indicated that the overburden had been impacted by nitroaromatic compounds in the central portion of the WARWP and that inorganic compounds were present at concentrations exceeding screening values throughout the area. Shaw determined that the bedrock water-bearing zone was impacted by nitroaromatics and other organic and inorganic compounds north of the WARWP, but not in the central portion of the area. Shaw recommended additional subsurface investigations to determine the nature and extent of contamination in these areas. Additional investigation should be conducted after background levels are established for metals in groundwater due to the possibility of inorganic screening levels being greater than calculated background values (IT, 1997). Groundwater sampling of the WARWP groundwater wells in November 1997 and May 1998 indicated continued elevated levels of nitroaromatics (IT, 1999).

Shaw conducted a soil and groundwater risk assessment and direct-push investigation in June and November 1998 at the WARWP. A total of 19 surface soil, 37 subsurface soil, and 15 groundwater samples were collected. Four nitroaromatic compounds were detected in soil

samples in direct-push borings DP09, DP10, DP11, and DP18. Groundwater samples collected from direct-push borings with detected nitroaromatics exceeding RBSC levels included DP08, DP09, DP11, DP12, DP13, DP15, and DP17. A maximum nitroaromatic concentration of 680 µg/L 1,3,5-TNB, 270 µg/L 1,3-DNB, and 950 µg/L 2,4-DNT was detected in DP13, 7.1 µg/L 2,4,6-TNT was detected in DP11 and 2.7 µg/L 2,6-DNT was detected in DP09 (IT, 2000b).

A baseline ecological risk assessment was performed by Shaw in 2001 for the WARWP (IT, 2001f). Preliminary screening suggested that elevated PAH concentrations in soil and iron concentrations in sediment would pose an ecological concern. However, the areas of concern appeared to be very localized and a refined food-chain model demonstrated no adverse affects. Based on these findings, the ecological risk assessment concluded that remedial actions to address the ecological concerns for soil or sediment were not warranted.

A BHHRA was also performed for exposure to WARWP soil, surface water and sediment (IT, 2000b). Results of the BHHRA indicate that site-related cumulative human health risks do not exceed the respective risk management levels for cancer risk (i.e., incremental lifetime cancer risk>1E-5) and noncancer hazard (i.e., hazard quotient>1) when summed across all media for any of the receptors evaluated. An FFS was performed for the two Red Water Pond Areas (IT, 2002a). Because no WARWP COCs were identified in the BHHRA, the FFS did not identify or evaluate any remedial alternatives for the WARWP.

3.1.2.2 Pentolite Road Red Water Ponds

The PRRWP are located in the north-central portion of the PBOW facility, north of Maintenance Road and south-southeast of the Reactor Facility Area across Pentolite Road, as shown in Figures 1-2 and 3-5. Available historical surface water, sediment, soil, and groundwater analytical results are shown on Tables 3-17, 3-18, 3-19, and 3-20, respectively.

In April 1977, Plum Brook Station personnel reported pockets of reddish brown water in the small surface ditch east of and adjacent to the PRRWP. The source of the reddish brown water was discovered to be a broken drain tile that was formerly used to drain the ponds. As a corrective action, retention dikes and sump pits were excavated to prevent further leakage of the material to the stream. Approximately 60,000 gallons of the "red" water were removed by a private contractor and grading and drainage improvements were made to the area. The action also included backfilling of the former ponds and excavation of a new drainage ditch approximately 300 feet east of the ponds to reduce standing surface water (D&M, 1997a).

In 1984, Battelle Laboratories collected a surface soil sample from the spoils area at WARWP. Concentrations of nitroaromatics were detected in the low-parts per million range (IT, 2000b).

In 1989, Shaw conducted an evaluation to determine whether residual chemical contamination was present from former Department of Defense activities at the red water pond areas. Soil samples from borings IT-SB13 through IT-SB18 were collected at the PRRWP area. Overburden monitoring well IT-MW05 was also installed on the northern edge of the PPRWP, in a suspected downgradient location. 2,4-DNT and 2,6-DNT were detected in soils at concentrations of at least 0.740 part per million and sodium concentrations in samples from six of the borings exhibited concentrations above the background levels (IT, 2000b).

In 1993, MK conducted a site inspection to assess the threat posed to human health and the environment and to determine the need for additional investigations. Surface soil and sediment samples were collected and analyzed from a drainage ditch along Pentolite Road, north of the PRRWP area. No samples from the Pentolite Road ditch showed detectable levels of VOCs, SVOCs, or nitroaromatics (MK, 1994).

As part of the 1994 Focused RI, to identify and evaluate the source, nature, and extent of contamination of former DOD activities, surface and subsurface soil at the Red Water Ponds was investigated by D&M. Soil samples were collected and analyzed for nitroaromatics and metals. Nitroaromatics 1,3,5-TNB and 2,4-DNT were most commonly detected (D&M, 1997a).

From May to June of 1994, D&M conducted a groundwater investigation (GWI) to evaluate groundwater conditions in several areas at PBOW. One scope of work included the assessment of groundwater quality in the overburden and bedrock water-bearing zones at the PRRWP area. Overburden monitoring wells PR-MW7, PR-MW8, and PR-MW9 and bedrock monitoring well BED-MW15 were installed. The investigation found that the groundwater flow in the overburden exhibited a strong downward vertical component and the presence of groundwater in the overburden was seasonally dependent. Groundwater sample results indicated that nitroaromatics were present in the overburden water-bearing zone, while lower levels of nitroaromatics were present in the bedrock water-bearing zone (D&M, 1997b).

A site-wide GWI performed by Shaw in 1996 determined that the overburden water-bearing zone had been impacted by nitroaromatic compounds and that the bedrock water-bearing zone had been impacted by benzene, toluene, ehtylbenzene, and total xylene (BTEX), SVOCs, and

nitroaromatics (IT, 1997). Groundwater sampling events in November 1997 and May 1998 indicated continued elevated concentrations of nitroaromatic compounds (IT, 1999).

Shaw conducted a soil and groundwater risk assessment and direct-push investigation in June and November 1998 at the PPRWP. A total of 20 surface soil, 39 subsurface soil, and 20 groundwater samples were collected. Nitroaromatic compounds were detected in soil samples in direct-push borings DP01, DP02, DP03, DP06, DP09, DP10, DP11, and DP16. Maximum concentrations included 9.3 mg/kg 1,3-DNB and 25 mg/kg 2,4-DNT in DP03 (4 to 5 feet), 1.7 mg/kg 2,6-DNT in DP10 (9 to 10 feet), and 2.7 mg/kg 4A-2,6-DNT in boring DP11 (0 to 2 feet). Groundwater samples with detected nitroaromatics exceeding RBSCs included DP01, DP03, DP04, DP06, DP07, DP08, DP10, DP11, DP12, DP13, DP17 and DP18. A maximum nitroaromatic concentration of 600 μg/L 1,3,5-TNB was detected in DP11, 4,800 μg/L 1,3-DNB, 6,800 μg/L 2,4-DNT in DP03, and 400 μg/L 2,6-DNT was detected in DP10 (IT, 2000b).

A BERA was performed by Shaw for the PRRWP in 2001 (IT, 2001f). Results of the risk assessment showed that environmental media at the PRRWP do not appear to pose significant or unacceptable risks to ecological receptors.

A BHHRA was also performed for exposure PRRWP surface soil and total soil (IT, 2000b). Results of the BHHRA indicate that cumulative human health risks associated with total soil exceed the respective risk management ranges for cancer risk (i.e., ILCR >1E-5) and noncancer hazard (i.e., HQ >1) in the potential future resident. Also, the noncancer hazards for the construction worker also exceed the risk management range for exposure to total soil. Six nitroaromatics and benzo(a)pyrene COCs were identified in the BHHRA.

An FFS was conducted for the two Red Water Pond areas (IT, 2002a). The FFS evaluation of the PRRWP was initially based on the BHHRA and the COCs identified therein. During the FFS, a single location with elevated nitroaromatics concentrations, particularly TNT, was identified. It was determined that if this small "hot spot" was remediated, then the remaining soil would not pose a cancer risk nor noncancer hazard for any PRRWP receptor at levels exceeding the respective risk management ranges.

3.1.3 Upper Toluene Tanks Area

The Upper Toluene Tanks served as bulk storage for toluene used in the production of TNT (ICI, 1995). The Upper Toluene Tanks are located west of TNTA (Figure 1-2). Two tanks were used at this site, each with a capacity of 200,000 gallons. The tanks are encircled by earthen dikes

approximately 6 feet high. After TNT manufacturing processes were complete, the tanks were decommissioned by the DOD in 1945 by pumping out their remaining contents, draining the transfer lines, and opening top and bottom flanges for ventilation.

Sometime thereafter, NASA renumbered the toluene storage tanks and used them for heating fuel storage. In January 1989, there was a leak reported from one of the Upper Toluene Tanks, which originally (in 1976) contained approximately 185,000 gallons of heating oil. The area around the tank was discolored, a fuel oil odor was noticed, and fuel oil seepage was observed on the eastern side of the tank. Six to eight inches of affected soil and vegetation were removed from the contaminated area and taken to a burn ground for incineration. Approximately 230 gallons of fuel oil and sludge were removed from the bottom of the drain valve and absorbent matting was used to soak up oil that seeped from underneath the tank. It was believed that the seepage was contained within the berm (ICI, 1995).

4.0 Field Activities

4.1 Introduction

The original statement of work from the groundwater RI included direct-push groundwater screening to characterize the overburden groundwater at each TNT area, assessment of background groundwater quality conditions, and installation of permanent monitoring wells.. The direct-push screening investigation was initiated in July 2001. Direct-push groundwater screening sample locations at TNTA, TNTB, and TNTC were placed at historical "hot spot" soil sample locations. If analytical groundwater screening data showed nitroaromatic contamination, further direct-push groundwater delineation would be performed. Upon completion of the groundwater characterization using direct-push sampling, residuum (overburden) monitoring wells were to be installed to confirm direct-push screening data. Bedrock monitoring wells would be installed to determine impact to the bedrock groundwater (IT, 2002d).

During the initial phase of direct-push investigation at the TNT Areas, 32 of the 135 proposed temporary piezometers were installed. Of these 32 piezometers, 26 lacked sufficient groundwater for sample collection. Based on the lack of groundwater, the USACE and the Ohio Environmental Protection Agency (OEPA) agreed that further installation of temporary piezometers to monitor the overburden groundwater would not be required. This would include all efforts for the overburden groundwater RI, including installation of the remaining temporary piezometers and installation of the planned 15 overburden monitoring wells.

Because of the limited and sporadic nature of the residuum groundwater encountered during the direct-push field investigation, placement of seven of the ten bedrock monitoring wells was based upon historical soil and groundwater data. Three of the bedrock wells were installed as directed in the RI as potential background wells to collect upgradient groundwater analytical data.

Based on these changes, field activities in 2001 associated with the groundwater RI (completed during the dry season at PBOW) included: screening analysis for nitroaromatics in 6 groundwater samples collected from direct-push temporary piezometers, installation and development of 10 bedrock wells, groundwater sampling from 4 (existing) overburden monitoring wells and 24 (new and existing) bedrock wells, permeability testing, land surveying, and IDW management.

Field activities conducted in 2002 included a second round of background groundwater sampling (January 15 to 17, 2002 during the PBOW wet season), a third round of background and non-background groundwater sampling (April 2 to 15, 2002 during the PBOW wet season) and a fourth round of background groundwater sampling (July 9 to 11, 2002 during the PBOW dry season).

4.2 Direct-Push Groundwater Sampling

As mentioned above, due to lack of groundwater in August 2001, the direct-push groundwater sampling field effort was discontinued prior to installation of all of the planned 135 temporary piezometer groundwater sampling points. Direct-push drilling occurred at 32 locations (13 borings at TNTA, 5 at TNTB, and 14 at TNTC) and groundwater samples were collected from 6 locations (2 samples from each TNT area). Figures 4-1, 4-2, and 4-3 show planned and actual sample locations. Note that only the initial phase of sampling locations are shown on Figures 4-1, 4-2, and 4-3. Locations of remaining samples were to be based on screening results. Appendix A shows hazardous, toxic, and radiologic waste (HTRW) drilling logs and temporary piezometer construction diagrams.

Direct-push drilling locations were selected from known soil "hot spots" identified during previous investigations at TNTA, TNTB, and TNTC in an attempt to determine if the overburden groundwater was contaminated at these locations. A Prosonic Geoprobe DT66 all-terrain, track-mounted geoprobe rig, consisting of a hydraulic drive unit, stainless-steel sampling point, and sampling rods, was positioned at the selected boring location, and a hydraulically powered percussion hammer drove a 3.25-inch outer-diameter (OD) solid steel probe to refusal. A temporary piezometer was installed and time allowed for groundwater to migrate into the borehole.

The water level, if available, was measured the following day. The groundwater sample was collected using either a peristaltic pump or a disposable bailer. As specified in the SSAP, all groundwater samples were analyzed for VOCs and nitroaromatics using the screening-level 8330 analytical method (IT, 2001d). Due to limited groundwater volume, water quality field measurements were recorded for only 5 of the 6 samples. Appendix B provides sample collection logs. Table 4-2 presents water quality readings for groundwater collected during the direct-push field event.

After either the groundwater sample was collected or the temporary piezometer was determined to be dry, the piezometer was removed and the borehole was filled to the surface with granulated bentonite. All piezometer material was decontaminated and disposed of into a sanitary trash bin.

It should be noted that this investigative technique was previously used at PBOW to collect groundwater samples. During the 2000 source area investigations, groundwater samples were collected at approximately 90 percent of all attempted sampling locations. This supports the validity of both the sampling method employed and the interpretation of the discontinuous nature of overburden groundwater.

4.3 Monitoring Well Installation

Because groundwater was only sporadically encountered during direct-push drilling, no overburden monitoring wells were installed. Ten 2-inch diameter bedrock monitoring wells were installed as part of the 2001 groundwater RI. Figure 2-2 (site map with wells and lines of cross-section) shows the site-wide locations of the newly installed wells along with the pre-existing monitoring wells. Three of the bedrock wells, PB-BED-MW24, PB-BED-MW25, and PB-BED-MW26, monitor groundwater entering PBOW on the south and west perimeter and are designated as potential background wells. Two bedrock wells, PB-BED-MW22 and PB-BED-MW27, monitor groundwater leaving PBS at the northern property boundary area; one bedrock well, TNTB-BEDGW-004, monitors groundwater leaving TNTB; one bedrock well, PB-BED-MW23, monitors groundwater leaving the PRRWP area and entering the Reactor Facility Area; and three bedrock wells, TNTA-BEDGW-001, TNTB-BEDGW-003, and TNTC-BEDGW-001, were located at previous soil investigation "hot spots".

Monitoring wells were installed in accordance with guidelines specified in the USACE Engineering Manual EM-1110-1-4000 (USACE, 1998) and following the procedures in the site-wide SAP (IT, 1996a). With the exception of monitoring well PB-BED-MW27, which was completed as an open borehole, monitoring wells were completed as described below.

Bedrock monitoring well installation began in August 2001. Bedrock wells were installed as either double-cased or open-hole monitoring wells. A Boart Longyear BK81 truck-mounted rotary drill rig was used to drill a pilot borehole in the overburden soil. The boring was advanced using 4.25-inch inside diameter (ID) and 8-inch OD hollow-stem augers to the depth of auger refusal. Soil core samples were continuously collected from the ground surface to the terminating depth using a 1.4-inch ID stainless steel split-spoon. Soil cores were visually examined by Shaw field geologist and documented on HTRW drilling logs (Appendix C). No

soil overburden samples were collected for laboratory analysis because bedrock monitoring wells were installed in either an upgradient background location; in source areas identified by previous soil sampling; or in downgradient suspected "clean" soil areas. During this phase of work, overburden soil was not analyzed for chemical parameters, except for disposal characterization as described in Section 6.0.

After determining depth to bedrock, the borehole was reamed with 8.25-inch ID and 12-inch OD hollow-stem augers to bedrock or auger refusal. The augers were left in the borehole to hold back overburden materials while the borehole was advance into bedrock. An 8-inch tri-cone roller bit was used with water to drill several feet into competent bedrock to provide a stable base for the outer casing. Black steel casing (6-inch ID by 6 5/8-inch OD) was installed, pressure grouted into the bedrock and allowed to cure for a minimum of 48 hours.

Bedrock was then cored using a BK81 or Cantera C2-250 truck-mounted drill rig. Coring was conducted through the center of the black steel casing using a 3-inch OD PQ bit attached to a 5-foot long core barrel. Cutting bedrock with the PQ bit left a 6-inch nominal OD borehole. Rock cores were visually examined and a lithology description prepared. Photographs of the rock cores were taken and are presented in Appendix D.

Bedrock well completion in most boreholes was accomplished using a 2-inch diameter Schedule 40 polyvinyl chloride (PVC) riser pipe and 10 to 20 foot sections of 0.010-inch factory-slotted screen. No monitoring well completion material was installed into well PB-BED-MW27 because a depth where groundwater was encountered during coring could not be determined. Filter packs in screened wells were constructed with sand (tremied) beginning at a depth approximately 1-foot below the screen to approximately 2 feet above the screen. Three to six feet of pellet bentonite was then placed above the sand. The remaining annular space between the PVC/borehole and PVC/black steel casing, from the top of the bentonite to approximately 2 feet bgs, was filled (tremied) with bentonite-cement grout. Approximately 1 to 2 feet of bentonite pellets were added above the cement-bentonite grout within the black steel casing to ground surface. The black steel casing was also used as the protective casing. Sand was then added above the bentonite (within the steel casing) to approximately 5-inches below the top of the PVC.

A 4-foot square, 4-inch thick, concrete pad with sides sloping away was constructed around all wells. Four steel posts, filled with concrete, were radially set around the concrete pad as protective barriers. An internal drainage hole (weep hole) was drilled in the protective casing

immediately above the top of the concrete pad. The protective casing and guard posts were painted yellow. An identification plate was then riveted to the lid of each monitoring well that verified the well name, total depth, depth to screen, and survey information.

The construction details for the new monitoring wells at the site are summarized in Table 4-4. Drilling logs and well construction diagrams are included in Appendix C.

4.4 Monitoring Well Development

All newly constructed monitoring wells were developed no sooner than 48 hours and no later than 7 days after completion of well construction. Well development was performed by surging and bailing with a polyethelyene disposable bailer or surging and pumping using a Grundfos™ submersible pump. The method of development chosen depended upon groundwater yield in the well. A well development log was completed for each well to document well development progress, field parameters, and other pertinent information. Photographs of development water and well development logs are included in Appendices D and E, respectively. One monitoring well, PB-BED-MW26, could not be properly developed due to a limited water column and poor recharge. The impact of the limited development is that any groundwater samples would be expected to have higher turbidity and not be representative of bedrock aquifer conditions.

4.5 Groundwater Sampling

PBOW dry season groundwater sampling was conducted from September 1 through October 10, 2001 from a total of 28 monitoring wells and 6 temporary piezometers. Groundwater samples were collected from 6 piezometers (TNTA-DP14, -DP21, TNTB-DP02, -DP03, TNTC-DP13, and -DP19), 4 pre-existing overburden wells (MK-MW17, TNTA-MW11, TNTC-MW04, and TNTC-MW05), 9 new bedrock wells (PB-BED-MW22 through MW25, PB-BED-MW27, TNTA-BEDGW-001, TNTB-BEDGW-003, TNTB-BEDGW-004, and TNTC-BEDGW-001), and 15 existing bedrock monitoring wells (Acid Area 2 [AA2]-BEDGW-001, Acid Area 3 [AA3]-BEDGW-001, Additional Burning Ground [ABG]-BEDGW-001, BG8-BEDGW-001, MNTA-BEDGW-001, PB-BEDGW-MW13 through MW20, TNTB-BEDGW-001, and TNTB-BEDGW-002). Three of the newly installed bedrock wells were placed in background locations (PB-BED-MW24, PB-BED-MW25, and PB-BED-MW26).

The pre-existing bedrock and overburden monitoring wells sampled were selected by the USACE based on the groundwater investigation conducted in 1997. Groundwater monitoring well locations are shown on Figure 2-2 and Figures 3-1 through 3-5.

A total of 49 permanent monitoring wells were scheduled to be sampled, but a sample could not be collected from bedrock monitoring well PB-BED-MW26 due to the low yield of the well, and bedrock well Acid Area 1 [AA1]-BEDGW-001 was not sampled due to extremely high H_2S vapors encountered at the well. Overburden wells MK-MW16, TNTA-MW10, and TNTC-MW03 could not be sampled because they were dry and overburden well IT-MW01 was not sampled because a dent in the riser prohibited either a bailer or a pump from entering the well. In addition, 15 new overburden monitoring wells were not installed because of the dry conditions. Because the OEPA considers the residuum groundwater to be intermittent and therefore not an exposure pathway, the 15 wells planned for installation will not be installed at any future date. Groundwater samples were analyzed for nitroaromatics, metals (filtered and unfiltered), VOCs, SVOCs, and water quality parameters (alkalinity, chloride, cyanide, hardness, nitrate, sulfate, total dissolved solids, total organic carbon, total suspended solids, and turbidity).

In addition, two free-phase samples were collected from monitoring wells TNTA-BEDGW-001 (sample number FP7001) and PB-BED-MW16 (sample number FP7002). The free-phase samples were analyzed for VOCs, diesel range organics (DRO), and gasoline range organics (GRO).

Monitoring well PB-BED-MW16 is located north of the Upper Toluene Tanks. The Upper Toluene Tanks stored toluene for TNT manufacturing but were also used for storage of fuel by NASA. Therefore, the free-phase product could be toluene, fuel stored by NASA, or naturally occurring free product. To determine the composition of the product found in monitoring well PB-BED-MW16, a free-phase sample was collected. For comparison purposes and or to confirm or deny the absence of toluene, a second free-phase product sample believed to be naturally occurring product, was collected from well TNTA-BEDGW-001.

Sampling of newly installed monitoring wells took place no sooner than 14 days after well development was completed. Two procedures were used for purging and sampling monitoring wells. Low-flow (minimal drawdown) was the preferred purging and sampling method in wells where adequate recharge was present. If a well did not recharge adequately to use the low-flow sampling method (i.e., water level dropped 6 inches or more), removal of 3 to 5 volumes of groundwater was performed either by continued pumping or bailing followed by sampling.

Groundwater recharge rates permitted 17 of the 28 wells to be sampled with the low-flow sampling methodology. A bladder pump was used to complete the sampling. The pump was inserted into the screened portion of the monitoring well and the well was pumped at a rate that

minimized drawdown. Typically, purging rates were on the order of 200 to 500 milliliters per minute. The purge rate was set such that drawdown in the well was never greater than 0.5 foot. Water chemistry parameters (hydrogen ion concentration [pH], oxidation-reduction potential [Eh], conductivity, temperature, dissolved oxygen, and turbidity) were monitored for stability.

If pre-pumping (static) water level was above the top of the well screen and drawdown exceeded 0.5 foot even at the lowest setting of the pump, low-flow sampling could not be conducted. In this situation, an attempt was made to remove 3 to 5 volumes of groundwater without allowing the water level to drop below the top of the well screen. If the water level dropped to the screened level, purging activities were stopped. If the recharge rate was adequate, 3 to 5 volumes of groundwater were removed. If the recharge rate was slow, purging was considered complete after the stagnant water column above the well screen was purged, and the monitoring well was sampled.

Another instance when low-flow sampling could not be conducted was if the static water level was below the top of the well screen during the initial measurement and drawdown exceeded 0.5 foot even at the lowest setting of the pump. In this situation, recharge was so low that adequate purging of the well could not be achieved even over a period of days. In this case, the well was sampled without purging.

Samples collected for metals analysis were filtered in the field through a 0.45-micrometer high-capacity filter attached to the discharge line of the bladder pump. If the well was not sampled using the bladder pump (i.e., with a disposable bailer), a hand-operated 0.45-micrometer filter was used. Sample filtration, preservation, packing, and shipment were performed in accordance with Section 5.4 of the site-wide QAPP (IT, 1996a).

Background groundwater samples collected during the PBOW wet season, January 15-17, 2002, for the second quarter followed the same sampling procedures as identified above and were analyzed for the same parameters. Background samples were collected from monitoring wells PB-BED-MW24, PB-BED-MW25, PB-BED-MW26 (unfiltered metals only), PB-BED-MW20, and IT-BG8-BEDGW-001. Unfiltered metals were only collected from well PB-BED-MW26 due to insufficient recharge during sampling activities. As previously noted in Section 4.5, this well could not properly be developed, and sample results particularly for inorganic analyses may not be representative of site conditions. Groundwater sampling field information and results were presented in the Second Quarterly Background Report (IT, 2002b).

Background groundwater samples collected for the third quarter (PBOW wet season), April 2-15, 2002 along with groundwater samples collected from non-background wells, also followed the same sampling procedures as previously identified. The same potential background monitoring wells as sampled during the first and second quarters were sampled during the third, excluding well PB-BED-MW26. Monitoring well PB-BED-MW26 was not sampled due to an insufficient water column. Groundwater sampling field information and analytical results were presented in the Third Quarterly Background Report (IT, 2002c). Non-background monitoring wells sampled during the wet season were the same wells as scheduled to be sampled during the September-October, 2001 field event excluding monitoring well AA1-BEDGW-001 (excessive H_2S vapors).

Table 4-1 shows a list of the primary groundwater samples collected during the April 2002 wet season non-background sampling and groundwater samples collected during the fourth quarter background groundwater sampling. Final field measurements of groundwater samples collected during 2001 background and non-background sampling are presented in Table 4-2.

4.6 Hydraulic Conductivity Testing

A rising and/or falling head slug test was performed at the newly installed monitoring wells on November 13 to 15, 2001, to acquire information on the hydraulic conductivity of each water-bearing zone. A slug test was not conducted in monitoring well PB-BED-MW26 due to lack of groundwater, nor in TNTA-BEDGW-001 due to an erratic water-level reading. Equipment used in the test included:

- Ten-pounds-per-square-inch pressure transducer equipped with an atmospheric pressure compensation tube
- HERMIT 1000C Environmental Data Logger
- Five-foot-long or two five-foot-long, 1.5-inch-diameter PVC slugs.

Rising and/or falling head tests were completed by performing the following steps:

- Measure the static water level from the top of casing.
- Place a pressure transducer at least ½ foot above the bottom of the well and initiate the reference information on the data logger.
- Allow the water level to re-equilibrate, then initiate the data logging sequence on the recording device and insert the slug to start the falling head test.

After the falling head test was complete and the water level returned to the pre-testing condition, the data logger was reset. The rising head test was begun by removing the slug from the well.

The slug test results were analyzed using AQTESOLV for Windows Pro 3.0 (Geraghty and Miller Environmental Services, 1989), which assumes that the aquifer being tested is homogenous and isotropic. Since the aquifer is rarely a homogenous and isotropic media, the hydraulic conductivity calculation based on commonly accepted assumption and the Bouwer and Rice method will have uncertainties associated with it. The degree of uncertainty is directly proportional to the deviation of the homogenous and isotropic model from the reality. Such uncertainty can only be reduced but not eliminated through specifically designed pumping tests with sufficient monitoring coverage and duration. Pumping tests are not practical for this phase of the investigation. Furthermore, an accurate estimation of hydraulic conductivity in a fractured bedrock medium poses more challenge than in porous medium. Therefore, the calculated hydraulic conductivity value using the best available data at the site represents an approximation of the aquifer's "true" hydraulic conductivity. It is recommended that the slug test data be used with caution, knowing the limitations and uncertainties associated with these results. The hydraulic conductivity testing data are included in Appendix F, along with a description of the method used in the data analysis.

Based upon the current hydrology understanding, where fractured bedrock is encountered, slug test results would most likely be biased low. Results would probably be low since vertical anisotropy is not considered but results are associated with a higher degree of uncertainty with using the Bouwer and Rice method. However, the extent of the uncertainty or the bias is highly dependent on the well development, skin effect, and fracture distribution. Opposite results or tendency (biased high) may occur if the fractures are very well developed just in the immediate proximity of the well and no skin effect is present which is a very unlikely situation. This is because any slug test only affects the immediate proximity of the well and not the formation farther away. Unlike the slug test, a pumping test covers a much larger area around the well and therefore the hydraulic conductivity result is more representative of the site than slug test.

4.7 Decontamination Procedures

Decontamination of drill rigs, downhole tools, and sampling equipment was performed in accordance with Section 4.4.3 of the SAP (IT, 1996a). Specifically, drill rigs, rods, drill bits, and augers were cleaned at the decontamination pad using high pressure hot water from a steam-cleaner before entering the drilling site, between sites, and after completion of the last borehole. Other equipment, including water level indicators, slugs, and transducers, was decontaminated

by rinsing in sequence with phosphate-free soapy water, deionized water, isopropyl alcohol, and a final rinse with deionized water. Equipment was then air dried before use. The bladder pump was decontaminated by running the decontamination fluids through the pump head. Tubing was not decontaminated because new tubing was used for each well.

4.8 Land Survey

All temporary piezometer, soil boring, and new bedrock monitoring well locations were surveyed in August and September 2001 by an Ohio-registered professional land surveyor. Horizontal coordinates were surveyed to the closest 0.1 foot and referenced to the Ohio State Plane Coordinate System. Vertical coordinates (land surface elevation and top-of-casing elevation) were surveyed to the nearest 0.01 foot and referenced to the 1929 National Geodetic Vertical Datum. Complete land survey data are included in Appendix G.

4.9 IDW Management

IDW generated during the 2001 groundwater remedial RI included soil, groundwater, rock cores, decontamination water, and personnel protective equipment. All IDW was managed and handled in accordance with procedures described in the SAP (IT, 1996a).

Soiled personal protective equipment generated during the project was double-bagged and placed in the on-site industrial dumpster. Decontamination, development, and purge water generated during field activities was initially stored in 55-gallon drums and transferred to the central staging area located north of Pentolite Road. At the staging area, groundwater was pumped from the storage drums into two 1,500-gallon poly tanks and sampled. Soil generated during soil boring sampling and monitoring well installation was collected in 55-gallon drums, labeled with contained material, content volume, date of generation, and source of origin as applicable. Rock cores generated during installation of bedrock monitoring wells were also placed in storage drums and labeled appropriately.

U.S. Liquids of Detroit, Inc. removed the IDW from PBOW on November 19, 2001. Groundwater was transported to the U.S. Liquids facility in Detroit, Michigan, treated, and disposed of at their facility. A total of 107 drums containing soil and rock cores were also taken to the U.S. Liquids facility. The solids were treated and disposed of at the Woodland Meadows landfill in Detroit.

IDW generated during the second, third, and fourth rounds of groundwater sampling included groundwater, decontamination water, and personal protective equipment. All IDW water from

each sampling event was stored in labeled 55-gallon drums. Water from the January 2002 sampling event was stored in an igloo to prevent freezing and rupture of the drum. Water from the April and July sampling events were stored at the staging area. U.S. Liquids of Detroit removed the IDW from the second (January 2002) sampling effort April 2, 2002, the third (April 2002) sampling effort on June 5, 2002 and the fourth (July 2002) sampling effort September 12, 2002. All personal protective equipment generated during the sampling events was double-bagged and placed in the onsite disposal dumpster.

5.0 Analytical Program

Primary and field duplicate project samples were analyzed by Severn Trent Laboratories, Inc. of Knoxville, Tennessee. Analyses for water quality parameters were provided by Severn Trent's Canton, Ohio, laboratory. Quality assurance samples and field splits were analyzed by Paragon Analytics, Inc., Fort Collins, Colorado for the September-October 2001 sampling and Accutest Laboratory of Orlando, Florida for the subsequent events. Complete analytical data for the September-October 2001 sampling event, second quarter (January 2002), and third quarter (April 2002) sampling events are not shown in this report because data has been presented in previous reports. Shaw performed the data validation. The validation summary for the April 2002 non-background and July 2002 background groundwater samples is provided in Appendix H. The analytical results for the April and July samples are summarized in Appendix I. Tables of detected hits that exclude "B" qualified data are included in Appendix J. A data quality evaluation is located in Appendix K. The groundwater analytical data were compared to EPA Region 9 RBSCs, defined in Section 5.4. The analytical summary tables, beginning in Section 6.4.2.2, includes only compounds detected above detection limits.

5.1 Analytical Program and Methodologies

Chemical analyses for the investigation were performed in accordance with guidelines detailed in the EPA's *Test Methods for Evaluating Solid Waste (SW-846), Physical/Chemical Methods,* Third Edition, September 1986 (EPA, 1986) and subsequent revisions. The groundwater samples and associated quality assurance/quality control (QA/QC) samples were analyzed for VOCs, SVOCs, metals, nitroaromatics, and several water quality parameters. Methods used for analysis for all four events are summarized in Table 5-1.

All data analyzed were reviewed for accuracy and completeness. One hundred percent of the data analyzed were subjected to data validation following guidelines in the *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, October 1999 (EPA, 1999) and *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, February 1994 (EPA, 1994a). 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 III Modifications to National Functional Guidelines for Organic Data Review,* September 1994 (EPA, 1994b) and *Region III*

Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA, 1993). The procedure is outlined in Section 5.3.

5.2 Data Quality Evaluation

The reliability of the sampling and analytical procedures used during the investigation was demonstrated by implementing the project-specific quality assurance procedures specified in the site-wide SAP (IT, 1996c) and QAPP (IT, 1996a) and its site-specific attachments. Successful execution of these procedures provides strong supporting evidence that the data are representative of the areas under investigation.

The DQOs for this project were to produce scientifically valid data of known accuracy and precision that were complete with respect to identified critical samples, comparable with similar data types, and representative of the media sampled so as to be useful for the cited purposes. Evaluation of the data using the DQOs and the data validation process resulted in the determination that most of the data set is valid and of sufficient quality to meet the objectives of the investigation. Some VOCs were rejected in samples because of headspace and calibration problems. Only non-detects were rejected. Detects were qualified "J," estimated. Nitroaromatic results in the field-split samples BD3045 (PB-BED-MW19) and BD3047 (TNTC-BEDGW-001) were rejected for poor surrogate and matrix spike recoveries. Calibration recoveries were poor also. A complete evaluation of the analytical results is given in the data quality evaluation found in Appendix K.

5.3 Blank Evaluation

The purpose of blank analysis is to detect contamination resulting from laboratory and field activities. Blank evaluation involves qualification of data based on the results of associated field blanks, trip blanks, equipment rinsates, and laboratory method blanks. The criteria for blank evaluation are as follows:

- If a parameter is found in a blank but not detected in the sample, no action is taken.
- For organics, if the sample result is greater than the contract-required quantitation limit, but is less than 5 times or 10 times that of the blank result, the sample result is qualified "B."
- For organics, if the sample result is less than the contract-required quantitation limit and less than 5X or 10X of the blank result, the sample result is qualified "B." The "J" qualifier is not used.

- For inorganics, if the sample result is greater than the instrument detection limit but less than 5X of the blank result, the sample result is qualified "B."
- If the sample result is greater than 5X or 10X of the blank result, the sample result is not qualified.

In instances where more than one blank is associated with a given sample, qualification is based upon a comparison with the associated blank having the highest concentration of a contaminant. Blank results are not subtracted from sample concentrations.

5.4 Comparison to Screening Criteria

Although groundwater data are not subjected to risk assessment screening in this document, RBSCs are included on the tables (except Table 6-21 for background analytical data), in Chapter 6.0 as points of reference. Groundwater samples collected from background monitoring wells are not compared to RBSCs. The groundwater RBSCs are derived from EPA (2002) tap water criteria. The RBSCs are based on a generalized residential drinking water scenario, assumed to be the most restrictive use of groundwater. Concentrations of analytes that exceed the RBSCs are highlighted in the tables. It is emphasized that RBSCs do not infer a regulatory limit or mandated cleanup level.

Tables in Chapter 6.0 also include a column for maximum detected concentrations (MDC) and a column for PBOW background screening concentrations (BSC). The MDC column represents the maximum detected concentration of a particular analyte found at the area of concern (AOC). Although "B" qualified data is identified on the tables, "B" qualified results are not included in the MDC as all "B" qualified data will be removed during the BHHRA evaluation. MDC results for the AOC may change as additional groundwater samples are collected. Values of the BSC column have not been established and values for inorganics are denoted by "TBD" for "to be determined." Additional background groundwater wells will be installed and additional groundwater samples collected prior to the completion of the RI; the BSC for inorganics will be based on the resulting data set. These BSC results will be included in the RI and the BHHRA.

A true screening will be performed in the BHHRA to compare site groundwater analytical results to the RBSC; site inorganics results will be additionally compared to BSC. The RBSCs and their eventual use in the BHHRA for screening are discussed in Subsection 5.4.1. PBOW BSC and their use in the risk assessment are discussed in Subsection 5.4.2. Although it does not directly

apply to this interim report, the BHHRA protocol for screening and evaluating analytes detected in groundwater is depicted on Figure 5-1 and briefly discussed in Section 5.4.2.

5.4.1 Risk-Based Screening

As previously mentioned groundwater RBSCs are included in the tables for Chapter 6.0 for comparison purposes. In the BHHRA, RBSCs will be used to screen chemicals detected in site groundwater. RBSCs correspond to a one-in-a-million (1E-6) ILCR or a HQ of 0.1, whichever would result in a lower concentration value. It is again emphasized that RBSCs do not infer a regulatory limit or mandated cleanup level.

In the BHHRA, each chemical with a MDC less than the RBSC will not be considered further in the BHHRA. Those chemicals whose MDCs exceed RBSCs will be subject to further evaluation. Risk-based screening is the initial step of the risk screening and evaluation process, depicted on Figure 5-1, which will be used in the BHHRA. For inorganics, this protocol includes the background screening protocol described in Section 5.4.2 below. Based on the findings of the BHHRA, a chemical exceeding its RBSC may or may not be subject to cleanup.

5.4.2 Background Screening

BSC values can be finalized only after additional background wells are installed, additional background groundwater samples are collected, and a subsequent evaluation of flow direction is performed to determine which wells are truly representative of background conditions. Therefore, the BSC column on the tables in Chapter 6.0 are left as "to be determined." The finalized BSC will be included in analogous tables in the RI as points of reference, but screening on the basis of background is performed in the BHHRA.

Background screening in the BHHRA will apply only to inorganic constituents that exceed RBSC. Although certain organic compounds (BTEX and PAHs) in site groundwater may be attributable to background conditions, these will not be summarily screened out, but rather will be carried through the risk assessment process (i.e., exposure assessment, toxicity assessment, risk characterization) unless screened out on the basis of comparison to RBSCs as described in Section 5.4.1. Final PBOW BSCs will be based on either the 95th upper tolerance limit (UTL) or the MDC of the background data set (refer to Appendix L), whichever is less.

5.4.3 Screening and Risk Evaluation Protocol

In the BHHRA, the on-site groundwater MDC for a given inorganic analyte that exceeds its RBSC will be screened against its BSC. Figure 5-1 depicts how risk-based and background

screening support the risk assessment decision process. This approach is consistent with the BHHRA work plan (IT, 2001d) and previous BHHRAs performed at the site (IT, 2000a; 2001b). The "further evaluation" box shown on Figure 5-1, just before the "risk management decision", may include a spatial analysis of the data to determine whether the elevated concentrations are found in a small isolated plume or are more evenly distributed throughout the site. This analysis would also examine the potential effect of the distribution on remediation decisions. A geochemical evaluation may be performed for inorganics, as described in Appendix L, to further determine whether apparent exceedances in groundwater may be associated with background groundwater conditions.

6.0 Investigation Results

6.1 Quarterly Groundwater Level Measurements

A total of six site-wide quarterly groundwater level measurement events have taken place since the last groundwater summary report was presented in June 1999 (IT, 1999). These site-wide measuring events were conducted by ICI for the USACE. Groundwater levels were measured in September 2000, January, August, November 2001, and February and May 2002. Shaw received the water-level data and used it to assist in better defining the groundwater hydrology. Table 6-1 lists a summary of the groundwater elevation measurements. Note that elevations were corrected for those wells with free product.

6.2 Geologic and Hydrogeologic Investigation Results

This section presents updated information and revisions of interpretations made of geologic and hydrogeologic data presented in the last site-wide groundwater summary investigation report (IT, 1999). During 2001 bedrock monitoring well installation and groundwater sampling, free-phase hydrocarbons were encountered in several of the wells (PB-BED-MW23, PB-BED-MW24, PB-BED-MW27, PB-BED-MW16, and TNTA-BEDGW-001). As noted on the teleconference log generated on November 18, 1998 regarding BTEX (Appendix M) and in Section 2.2.2, traces of natural petroleum are common in the local quarries mining the Delaware Limestone. An e-mail message was also received in August 2002 from the OEPA stating that an actively producing oil and gas field was present in the Delaware Limestone in Florence and Berlin Townships in Erie County (Appendix M). Further discussion of the free-phase product is contained in Section 6.5. Table 6-2 shows the hydrocarbons detected in each of the new bedrock monitoring wells. Hydraulic conductivity results from the new bedrock monitoring wells are shown on Table 6-3 with results from the other bedrock wells.

Contour maps of water level elevations in the shallow and bedrock water-bearing zones have been generated from November 2001 and May 2002 data to show seasonal variations in the groundwater flow. Contours of water level elevations in the shallow overburdenshale and bedrock water-bearing zones are presented in Figures 6-1 through 6-4. Figures 6-1 and 6-2 show data from overburden/shale wells for November 2001 and May 2002, respectively. Figures 6-3 and 6-4 show data from bedrock wells screened in limestone for November 2001 and May 2002, respectively. Groundwater levels from bedrock wells PB-BED-MW22, -23, 24, 25, 26, 27; TNTA-BEDGW-001; TNTB-BEDGW-003; TNTB-BEDGW-004, and TNTC-BEDGW-001 are not included on the November 2001 Figures 6-1 and 6-3 because water levels were not recorded

site-wide until February 2002. A generalized cross-section of PBOW depicting the relationship of the overburden/shale groundwater-bearing zone with the bedrock water-bearing zone is shown on Figure 2-10.

6.2.1 Hydrogeology of Shallow Water-Bearing Zone

The shallow water-bearing zone at the former PBOW is encountered within the unconsolidated glacial, lacustrine, alluvial deposits, and severely to moderately weathered shale. The water table extends into the upper severely to moderately weathered shale from the central portion of the facility to the south-central and southwestern areas. Groundwater elevations in the shallow water table fluctuated less than 4 feet in the six water level measurements used as part of this investigation.

Groundwater flow in the shallow water-bearing zone is predominantly to the north. The water table surface largely mirrors the surface topography and corresponds to the topography of the top of the bedrock. This is demonstrated by comparing the top-of-bedrock map (Figure 2-8) with the water table elevation contour maps (Figures 6-1 and 6-2). In the southeastern portion of the site, groundwater flow appears to have a relatively uniform horizontal hydraulic gradient to the east-northeast. Groundwater in the central portion of the facility generally flows to the north and discharges to both Ransom Brook and Plum Brook. On the north side of the site, the flow is toward Ransom Brook and a wetland area located southwest of the Reactor Facility Area. Groundwater in the western portion of the site flows to the north-northwest and discharges to Pipe Creek. Connectivity between groundwater in the shallow water-bearing zone and surface water is particularly evident during the spring wet season (Figure 6-2).

Figures 6-5 and 6-6 show groundwater flow in both the overburden and bedrock (Delaware Limestone) water-bearing zones in the vicinity of the Reactor Facility Area for August and November 2001, respectively. More recent water levels were not measured for the wells located at the Reactor Facility Area after November 2001 due to their location in a secured area. There is a distinct southwestern flow toward the reactor buildings in the overburden in that area, possibly as a result of active sump pumps believed to be pumping within and at the base of the overburden at that location. Both maps show very similar groundwater flow direction as previously presented by the November 1997 and May 1998 maps in the June 1999 *Groundwater Summary Report* (IT, 1999).

Based on information obtained with the installation of new bedrock wells in Fall 2001, the shallow water-bearing zone has been reinterpreted to include the upper portions of the Ohio and

Olentangy Shale. This interpretation is based on 1) the similarity of shale and overburden groundwater elevations at well pairs, 2)depth similarity of groundwater encountered in soil (overburden) and shale wells site-wide, and 3) the merging of overburden and bedrock groundwater contours along the shale outcrops and the shale/limestone contact. The former "Bedrock Groundwater Elevation Maps" are now specifically the Delaware Limestone Groundwater Elevation Contour Maps (Figure 6-3 and 6-4).

Overburden hydraulic gradients were calculated for three transects across the site from the August and November 1997, February and May 1998, and November 2001 and May 2002 water level surveys. Flow along the western side of the site is toward the north-northwest to Pipe Creek at a gradient of approximately 0.012 feet per foot (ft/ft). Flow in the center of the site was to the north at a consistent gradient over time of approximately 0.0053 ft/ft. Groundwater from the east-central portion of the site flowed to the northeast at a gradient ranging from 0.0054 to 0.0059 ft/ft. Hydraulic conductivity of wells completed within the surficial deposits measured by slug tests ranged from 0.74 ft/day (AA1-GW-002) to 212 ft/day (ABG-GW-002), as shown in Table 6-3. The calculated geometric mean for the five wells tested was 8.75 ft/day. The hydraulic conductivity of wells completed in the upper portions of the shale units ranged from 0.002 (TNTB-BEDGW-003) to 22.2 ft/day (ABG-BEDGW-001). The geometric mean for the shale portion of the water table was calculated to be 1.2 ft/day. All slug test data is presented in Appendix F.

Groundwater elevations in the overburden fluctuate seasonally, irrespective of the area of the site. Figure 6-7 shows the similarity among four select overburden wells. Consistent fluctuations in other overburden wells may imply a significant horizontal connectivity across the overburden water-bearing zone and/or that water levels are controlled by regional fluctuations in the bedrock groundwater elevations.

6.2.2 Geology and Hydrogeology of Bedrock Water-Bearing Zone

In previous reports, bedrock at the site has largely been discussed as one unit. In this report, formations within the bedrock have been differentiated to explain enigmatic groundwater levels and fluctuations over time in many of the site wells. After comparing the geologic plan view map (by the ODNR) (Figure 2-1) with the five cross-sections (discussed in Section 2.0), the bedrock will be discussed both as a whole and as three separate units (the Ohio Shale, the Olentangy Shale, and the Delaware Limestone), where appropriate.

A preliminary fracture trace analysis to identify optimal locations for installation of bedrock monitoring wells was performed by D&M in 1997 (D&M, 1997b). Results of the analysis indicated 70 fractures on and near the PBOW facility. Several large fractures also coincide with the western (southwest-northeast trending) and eastern (southeast-northwest trending) groundwater troughs of the bedrock contour map.

Based on boring logs from the bedrock wells, there are currently 15 wells completed in the Delaware Limestone, 4 wells in the Ohio Shale, and 5 wells screened in the Olentangy Shale. Of the wells completed within the shale units, all but 3 (PB-BED-MW20, PB-BED-MW26, and TNTB-BEDGW-003) are considered to be monitoring the lower portions of the overburden water table. Wells PB-BED-MW20 and PB-BED-MW26 monitor the Ohio Shale and TNTB-BEDGW-003 monitors the deeper zone in the Olentangy. These three wells are not included in the contouring of the May 2002 groundwater elevations maps (Figure 6-2 and 6-4). The occurrence of water within the deeper zones of the shale is limited with variable conductivity. TNTB-BEDGW-003 is the only well of the three to be slug tested. The hydraulic conductivity at the well was calculated to be 2.41 x 10-3 ft/day. PB-BED-MW26 has been essentially dry since installation, while PB-BED-MW20 has shown slow to moderate recharge with a groundwater purge rate of 200 ml/min during groundwater sampling.

Because bedrock groundwater level interpretations for those wells measured in November 2001 (Figure 6-3) were very similar to May 2002 (Figure 6-4); contour lines on both figures were dashed to indicate the uncertainty. The potentiometric surface of the Delaware Limestone aquifer shows two linear depressions, one extending southwest through the western portion of PBOW and a second extending southeast into the northeastern area of the facility. These depressions merge just northeast of the reactor facility into one trough and exit the PBOW facility at the northeast corner. A small groundwater high is located in the western panhandle of the facility. The southwest trending trough is thought to be caused by the pumping wells in the reactor facility and is structurally or fracture controlled based on the geologic map (Figure 2-1) while the southeast trending low appears to be fracture controlled. This is based on its orientation perpendicular to the strike of the bedrock.

Horizontal hydraulic gradients (groundwater slopes) in the bedrock were calculated for the two preferential pathways (troughs) in the Delaware Limestone for May 2002. Bedrock groundwater flow into the western trough is toward the northwest and southeast with gradients of 0.017 and 0.021 ft/ft, respectively. Groundwater flow through the trough is to the northeast with a gradient of approximately 0.004 ft/ft. Bedrock groundwater flow into the eastern trough is to the

northeast with a gradient of approximately 0.022 ft/ft, and the southwest with a gradient of approximately 0.020 ft/ft.

Groundwater elevation in the bedrock water-bearing zone typically had little fluctuation in wells monitoring the Ohio Shale and the Olentangy Shale (Figures 6-8 and 6-9, respectively); however, wells monitoring the Delaware Limestone showed significant elevation fluctuations over time (Figure 6-10). Wells constructed in the Delaware Limestone in the Reactor Facility Area (wells REACTOR 1, 2, and 3) showed the greatest variation over time, with water levels fluctuating as much as 25 feet (Figure 6-11). Well PB-BED-MW16 showed a one-time rise of more than 60 ft between December 1994 and March 1995. Water levels in PB-BED-MW16 remained relatively steady over the course of several years until it displayed a 25-foot drop in water level between August and November 2002.

Hydraulic conductivity in the Delaware measured by slug tests performed in the site wells range from 0.002 (PB-BED-MW27) to 1.84 ft/day (PB-BED-MW24) (Table 6-3). This range also demonstrates the variability in hydraulic conductivity of the bedrock across the site. The geometric mean conductivity for Delaware bedrock wells is 0.13 ft/day.

Weathered petroleum and H_2S, a byproduct of anaerobic petroleum degradation, have been present in monitoring wells screened within the Delaware Limestone at the site (Table 6-2) indicating that the Delaware Limestone may be a natural source for this product. To further this thought, an e-mail was received from the OEPA in August 2002 stating that an active oil and gas field is present in the Delaware Limestone in Florence and Berlin Townships in Erie County. After evaluating the boring logs that had noted petroleum during drilling, the wells in which monitoring equipment had detected H_2S, and the widespread, sporadic location of those monitoring wells, it is apparent that petroleum and H_2S may be naturally occurring at the site.

6.2.3 Hydraulic Connection Between Zones

Vertical hydraulic gradients, calculated for five well pairs, revealed two general trends across the site (Table 6-4). Well pairs on the western and northern portions of the site showed higher groundwater elevations in the overburden zone than in the bedrock aquifer. This difference suggests that there may be relatively limited connectivity between the overburden and bedrock water bearing zones in these areas. In addition, any vertical groundwater migration that occurs will be downward from the overburden into the bedrock. The greatest difference in water levels occurred in the overburden/Delaware Limestone well pair IT-AA1-GW002/IT-AA1-BED-GW001, with approximately 25 feet of difference in the water levels and an average vertical

gradient over time of 0.6 ft/ft downward from the overburden to the bedrock. In contrast, the central and southern portions of the site showed very similar groundwater elevations in the overburden and the bedrock, particularly in well pair ABG-GW002/ABG-BED-GW001. This indicates that the groundwater in the overburden and the Ohio Shale located on that portion of the site have a high degree of connectivity.

6.2.4 Influence of Precipitation on Water Levels

Although previous investigations have indicated that there is a strong connection between precipitation and groundwater elevations, no clear correlation exists between monthly precipitation rates and water level elevations in site wells. The lack of observed correlation is probably influenced by the amount of precipitation and the runoff rate. For example, summer thunderstorms that produce short periods of heavy precipitation may result in more surface runoff and less infiltration. Conversely, constant periods of precipitation at a lower rate over a period of days may result in more infiltration. Freezing rain or snow will also not result in an immediate recharge to groundwater. These factors are not discernable from total monthly precipitation data shown on Figure 6-12. When comparing the number of seasonal groundwater elevation measurements collected from the site, shown in Table 6-1 with aquifer recharge (Figure 6-13), a seasonal correlation appears to be present. January through June is determined to be a "wet" time period at PBOW and is therefore an optimal time for sampling the overburden wells while July through December is determined to be a "dry" time period. Recharge at PBOW was obtained by subtracting potential evapotranspiration rates (from Cleveland, Ohio data) and calculated runoff rates from rainfall. Appendix N shows previous calculations and reference information along with newly acquired rainfall data required for this calculation.

Figure 6-13 demonstrates that there is a strong correlation between seasons of the year and calculated monthly aquifer recharge rates at PBOW. Recharge to the overburden is calculated to be highest in the winter months (December, January, or February) for 8 of the 9 years shown. A lag time should, however, occur from the time the rain infiltrates the soil to the time it reaches the water table. At PBOW, this lag time should be weeks from the time of precipitation. The lag time depends largely upon the infiltration capacity of the soil, the thickness of the overburden in the areas of recharge, and, in the winter, frozen ground. Thus, the groundwater elevations should typically be highest in February or March. Although Figure 6-12 shows that the greatest rainfall occurs in summer months, Figure 6-13 shows that recharge rates are actually lower during that season. This is because evapotranspiration is highest in the mid to late summer in north-central Ohio. Similar to the lag time for the groundwater high, a lag time in the groundwater low should also occur. Thus, groundwater elevations should be lowest in early fall. Correspondingly,

groundwater sample collection events were scheduled to take place during two "dry" and two "wet" season time periods.

Figures 6-12 and 6-13 show that both precipitation and recharge rates were similar for most of the years measured. However, in 1994 the annual precipitation was approximately 25 percent lower than the average annual rate in Sandusky. Correspondingly, the lowest water levels measured in site wells occurred in December 1994. This reveals that significant fluctuation in groundwater elevation can occur during drought conditions such as in 1994.

6.3 Groundwater Sampling Events

In September through October 2001, groundwater samples representative of low groundwater levels, or dry season conditions were collected. Groundwater samples representative of high groundwater levels, or wet season conditions were collected in April 2002. The samples were collected from the same bedrock monitoring wells sampled in November 1997 and May 1998, except Reactor 1, as well as from the new wells installed in 2001 (PB-BED-MW22, PB-BED-MW23, PB-BED-MW24, PB-BED-MW25, PB-BED-MW26, PB-BED-MW27, TNTA-BEDGW-001, TNTB-BEDGW-003, TNTB-BEDGW-004, and TNTC-BEDGW-001). Eight pre-existing and 15 newly installed overburden monitoring wells were scheduled to be sampled during the 2001 dry season event; but, because of the lack of overburden groundwater, the residuum monitoring wells were not installed and only 4 overburden wells contained sufficient water for sampling. Fifteen pre-existing bedrock wells and 9 newly installed bedrock wells were sampled during the 2001 dry season groundwater investigation. Groundwater samples in April 2002 were collected from the same wells as scheduled to be sampled during September-October 2001 except newly installed bedrock well PB-BED-MW26 (insufficient groundwater) and bedrock well AA1-BEDGW-001 (high H_2S levels).

The first quarterly sampling event of background bedrock monitoring wells also began during the September and October 2001 groundwater investigation and were followed by three additional quarterly sampling events (January 2002 [wet season], April 2002 [wet season], and July 2002 [dry season]). A quarterly sampling schedule was chosen for these wells based upon precipitation data (Figure 6-12), which indicates a "wet" and "dry" time period for PBOW. Quarterly sampling also obtains background bedrock groundwater data to determine if similar patterns or trends of chemical constituents are present throughout the wet and dry time periods to characterize background (Section L.2.0).

6.4 Analytical Results

The following sections present the validated analytical results of the dry and wet season non-background sampling events by monitored water-bearing zone and geographic location within the site. Quarterly background validated results representative of the wet and dry seasons are also presented. As discussed in Section 5.4, RBSCs are provided for comparison purposes for the detected constituents in the bedrock groundwater. November 1997 and May 1998 analytical results are also shown on the figures with the data. November 1997 and May 1998 analytical results are discussed with 2001 and 2002 data in the Summary of Sampling Events at the end of each section. Analytes detected below RBSCs are not discussed in detail but are presented in the referenced data tables. Analytical data for the April 2002 non-background groundwater sampling and the fourth quarter of background groundwater sampling are presented in Appendices I and J. Data from the September-October 2001 sampling event (first quarter background and first round non-background) were presented in the March 2001 Groundwater Remedial Investigation report (IT, 2002d) and analytical results of the second and third quarterly background sampling, were presented in the Second (IT, 2002b) and Third Quarterly Background Report (IT, 2002c), respectively.

6.4.1 West Area Red Water Ponds Area

No pre-existing overburden monitoring wells were sampled. Bedrock monitoring well PB-BED-MW14 is located downgradient (northeast) of the WARWP shown on Figure 6-14. Groundwater was analyzed for VOCs, SVOCs, nitroaromatics, metals (unfiltered and filtered), cyanide, and water quality parameters (Table 6-5).

6.4.1.1 Overburden

No pre-existing overburden monitoring wells were sampled during the 2001 dry season or 2002 wet season events.

6.4.1.2 Bedrock

2001 Dry Season Sampling Event (September-October). Arsenic, cobalt, nickel, and thallium were the only constituents detected in PB-BED-MW14 above the RBSCs. Concentrations exceeded the screening levels in both the filtered and unfiltered samples. Two VOCs (acetone and methylene chloride) and nine other metals were detected in both the unfiltered and filtered-phase samples but were below screening levels. Groundwater quality parameter nitrate exceeded the RBSCs at a concentration of 24,000 μg/L.

2002 Wet Season Sampling Event (April). Nitroaromatic compound 2,4-DNT, detected as a SVOC, was above the screening level at a concentration of 19 µg/L. 3-nitroanaline, was also detected as a SVOC. Arsenic, cobalt, manganese, and nickel were above the screening level in both the filtered and unfiltered samples. VOC (methylene chloride) and nine metals were detected in both the unfiltered and filtered-phase samples but were below RBSCs. Groundwater quality parameter nitrate exceeded the RBSC at a concentration of 79,300 µg/L.

6.4.1.3 Summary of Sampling Events, West Area Red Water Ponds

Four nitroaromatic compounds (detected as SVOCs) were found to be above screening levels during the wet season of May 1998 and nitrobenzene (as a SVOC) was also present above levels during the wet season in April 2002. At least fourteen metals were detected in bedrock monitoring well PB-BED-MW14 in both the unfiltered and filtered samples. Four filtered and unfiltered metals exceeded RBSCs during the dry season, while four metals exceeded limits during the wet season. Nitrate was found to be above screening levels on three different sampling events.

6.4.2 Pentolite Road Red Water Ponds Area

No overburden monitoring wells were sampled. One pre-existing monitoring well, PB-BED-MW15, and one newly installed well, PB-BED-MW23, are located at the PRRWP area. Both bedrock wells are located downgradient (north) of the area, as shown on Figure 6-15. Groundwater samples were analyzed for VOCs, SVOCs, nitroaromatics, metals (unfiltered and filtered), cyanide, and water quality parameters. Table 6-6 presents the detected analytes and water quality parameters.

6.4.2.1 Overburden

No pre-existing overburden monitoring wells were sampled during the 2001 dry season or 2002 wet season events.

6.4.2.2 Bedrock

2001 Dry Season Sampling Event (October). 2,4,6-TNT was detected in monitoring well PB-BED-MW15 but was below the RBSC. Six VOCs, acetone, benzene, ethylbenzene, methylene chloride, toluene, and total xylene were detected above screening levels in both PB-BED-MW15 and PB-BED-MW23. The SVOC compound naphthalene was detected in both wells above the RBSC, and bis(2-ethylhexyl)phthalate and 4-methylphenol was above its screening level in well PB-BED-MW23. Barium was detected above its RBSC in both the

filtered and unfiltered sample in monitoring well PB-BED-MW15. Arsenic, chromium, iron, and manganese in both the unfiltered and filtered samples exceeded screening levels while only chromium was above the limit in the unfiltered sample.

2002 Wet Season Sampling Event (April). Four nitroaromatics (4-A2,6-DNT, nitrobenzene, research and development explosive (RDX), and 2,4,6-TNT) were detected in well PB-BED-MW15 with 4-A2,6-DNT, and nitrobenzene above RBSC levels. VOCs acetone, benzene, ethylbenzene, toluene, methylene chloride, and total xylene were detected above screening levels in wells PB-BED-MW15 and PB-BED-MW23. Naphthalene was detected above screening levels in both wells while 4-methylphenol was detected above its RBSC in well PB-BED-MW23. Four total and 4 dissolved metals were detected in well PB-BED-MW15 (barium above its RBSC), while 7 total and 6 dissolved metals were detected in well PB-BED-MW23; iron and manganese above screening levels.

6.4.2.3 Summary of Sampling Events, Pentolite Road Red Water Ponds Area

Nitroaromatic compounds in the bedrock groundwater were only detected in well PB-BED-MW15 during the wet season sampling (May 1998 and April 2002) and were above the screening limits during both events. BTEX parameters were found in both wells with benzene consistently exceeding the screening limits. Methylene chloride, bis(2ethylhexyl)phthalate, 4-methylphenol, and naphthalene were also above screening levels in both bedrock wells during the wet and dry sampling seasons. A total of five unfiltered and 2 filtered metals were detected above RBSC values in well PB-BED-MW15 and a total of 4 unfiltered and 3 filtered metals were above RBSC values in PB-BED-MW23.

6.4.3 TNT Manufacturing Area A

Two groundwater samples were collected during the direct-push operations at TNTA during the 2001 field groundwater sampling efforts. One sample, DP14, was collected downgradient of the Bi-Tri House (Building 142), and the other sample, DP21, was collected downgradient of the Bi-Tri House (Building 132). Groundwater collected from the temporary piezometers was analyzed only for VOCs and nitroaromatics by the screening method, as previously discussed. Figure 4-1 shows groundwater analytical results above RBSCs from the 2001 direct-push groundwater sampling along with the 2000 groundwater sampling direct-push locations.

Two overburden wells were scheduled to be sampled. Overburden monitoring well TNTA-MW10 is located north of Maintenance Road, downgradient of the Wash House (Building 136). Well TNTA-MW11 is located south of Maintenance Road, downgradient of the Wash House

(Building 146). During the dry season sampling event, overburden monitoring well TNTA-MW10 was dry. Only a limited sample volume could be collected from TNTA-MW11 due to insufficient water. Groundwater from TNTA-MW11 was analyzed for VOCs, SVOCs, nitroaromatics, dissolved metals, and total organic carbon. Three bedrock wells (PB-BED-MW17, PB-BED-MW18, and TNTA-BEDGW-001) are present at TNTA. Bedrock well PB-BED-MW17 is located sidegradient of the TNTA area, PB-BED-MW18 is positioned upgradient (east) of TNTA, and well TNTA-BEDGW-001 is located at the northwest corner (downgradient) of the former Wash House (Building 146) (Figure 6-16). Groundwater was analyzed for VOCs, SVOCs, nitroaromatics, metals (unfiltered and filtered), cyanide, and water quality parameters.

6.4.3.1 Temporary Piezometers

No nitroaromatics or VOCs were detected in the screening groundwater sample from DP14. A total of 8 nitroaromatic compounds were detected in the screening groundwater sample from DP21, 6 of which exceeded RBSC levels. Detected nitroaromatics included 4-A2,6-DNT, 2-A4,6-DNT, 2,4-DNT, 2,6-DNT, 2-, 3-, 4-nitrotoluenes, and 2,4,6-TNT. Chloroform was also detected above the RBSC value in groundwater from temporary piezometer DP21 (Table 6-7).

6.4.3.2 Overburden

2001 Dry Season Sampling Event (October). Three nitroaromatic compounds (4-A2,6-DNT, 2-A4,6-DNT, and 2,4,6-TNT) were detected in well TNTA-MW11 and 4-A2,6-DNT and 2-A4,6-DNT were above RBSC screening levels. Thirteen metals were detected and 5 were above RBSC levels in the unfiltered metals. No filtered metals were detected (Table 6-8).

2002 Wet Season Sampling Event (April). Three nitroaromatic compounds (4-A2,6-DNT, 2-A4,6-DNT, and 2,4,6-TNT) were detected in well TNTA-MW11 above the screening levels. No nitroaromatics were detected in TNTA-MW10. Two VOCs (acetone and methylene chloride) were detected in both overburden wells but were below RBSCs. Several unfiltered and filtered metal compounds were detected in both monitoring wells. Screening levels were exceeded in well TNTA-MW10 in both the unfiltered and filtered samples by iron and manganese. In well TNTA-MW11, only iron in the unfiltered sample exceeded the RBSC limit (Table 6-8).

6.4.3.3 Bedrock

2001 Dry Season Sampling Event (October). 2,6-DNT was detected above its screening limit in downgradient bedrock monitoring well PB-BED-MW17. Both amino DNT isomers were detected above RBSC levels in TNTA-BEDGW-001. Methylene chloride and total xylenes exceeded RBSCs in all three bedrock wells. Acetone and toluene exceeded RBSCs in well PB-BED-MW17; acetone and chloromethane exceeded RBSCs in well PB-BED-MW18;and benzene, ethylbenzene, and total xylene concentrations were above RBSCs in monitoring well TNTA-BEDGW-001. SVOC naphthalene was detected above the RBSC in wells PB-BED-MW17, PB-BED-MW18, and TNTA-BEDGW-001. Bis(2-ethylhexyl)phthalate, chrysene, dibenzofuran, 2-methylphenol, and phenanthrene were above their action levels in well TNTA-BEDGW-001. Arsenic and barium were the only metals above the RBSC in both the unfiltered and filtered phases in well PB-BED-MW17. Barium was the only metal above the RBSC in unfiltered and filtered samples from well PB-BED-MW18. Arsenic, barium, manganese, and nickel were above RBSCs in well TNTA-BEDGW-001, but only in the unfiltered metals sample while barium exceeded the limit in the filtered sample (Table 6-9).

2002 Wet Season Sampling Event (April). Nitroaromatic compound 2-nitrotoluene was detected in well PB-BED-MW17; 2-nitrotoluene and 3-nitrotoluene was detected in well PB-BED-MW18; and 2-A4,6-DNT and 4-A2,6-DNT was detected in well TNTA-BEDGW-001, but only 2-A4,6-DNT and 4-A2,6-DNT were above the RBSC. Benzene, toluene, and total xylenes were detected above RBSCs in all three wells. Methylene chloride was detected above limits in well PB-BED-MW17 and TNTA-BEDGW-001. Acetone and ethylbenzene were above limits in only well TNTA-BEDGW-001. SVOC naphthalene was also detected above the screening level in all three wells. In unfiltered samples, arsenic, barium, and thallium (PB-BED-MW17); barium and manganese (PB-BED-MW18); and arsenic, barium, iron, lead, manganese, and vanadium (TNTA-BEDGW-001) exceeded RBSCs. In the filtered samples, barium exceeded RBSCs in all three wells. Arsenic (PB-BED-MW17) and manganese (PB-BED-MW18) also exceeded the RBSCs (Table 6-9).

6.4.3.4 Summary of Sampling Events, TNT Manufacturing Area A

Nitroaromatics in the overburden groundwater are present only in monitoring well TNTA-MW11. VOCs and SVOCs have never been detected above RBSCs in either of the overburden monitoring wells. Arsenic, iron, and manganese above RBSCs have been encountered in the unfiltered metals samples in both wells since the dry season sampling event in November 1997.

In the filtered groundwater samples, barium, iron, and manganese detected above RBSCs in November 1997, have decreased in concentration values to be nondetect or below RBSC limits. Nine nitroaromatic compounds have been detected in the bedrock groundwater at TNTA. 2,6-DNT and nitrobenzene exceeded RBSCs in well PB-BED-MW17 during the dry season (November 1997 and October 2001). Nitroaromatic compounds 1,3-dinitrobenzene, nitrobenzene, 2,4-DNT, and 2,6-DNT exceeded limits in PB-BED-MW18 during the November 1997 dry season and May 1998 wet season. 2-A4,6-DNT and 4-A2,6-DNT exceeded RBSCs in well TNTA-BEDGW-001 during the October 2001 (dry season) and April 2002 (wet season). VOC compounds have consistently been detected in all site wells since 1997 with BTEX parameters and methylene chloride commonly above the limit. Naphthalene was commonly detected at concentrations exceeding the limit throughout the sampling episodes in all three wells. Bis(2-ethylhexyl)phthalate exceeded the RBSC value one time in each well. Total cyanide, detected as a water quality parameter, was above the RBSC during November 1997 in well PB-BED-MW17.

BTEX constituents and SVOCs (2-methylnaphthalene and naphthalene) in monitoring well TNTA-BEDGW-001 remain above RBSC levels during both sampling events. Sixteen unfiltered and 10 filtered metals were detected from the groundwater in TNTA bedrock wells with barium exceeding RBSC limits during all sampling events. Arsenic (filtered and unfiltered) exceeded RBSC limits during both the wet and dry season sampling events in well PB-BED-MW17.

6.4.4 TNT Manufacturing Area B

Two groundwater samples were collected during the direct-push investigation at TNTB in 2001. One sample, DP02, was collected downgradient of the Fortifier House (Building 453), and the other sample, DP03, was collected downgradient of the Bi-Tri House (Building 452) (Figure 4-2). Groundwater collected from the temporary piezometers was analyzed for VOCs and nitroaromatics by the screening method.

Two overburden wells were scheduled to be sampled. Overburden monitoring well MK-MW16, paired with TNTB-BEDGW-002, is located south of West Scheid Road and MK-MW17 is located downgradient of the TNTB area. Overburden well MK-MW16 was dry during the October 2001 sampling event, so no sample was collected. Four bedrock wells (TNTB-BEDGW-001, -002, -003, and -004) are present in TNTB. Bedrock well TNTB-BEDGW-001 is located downgradient of the TNTB area, TNTB-BEDGW-002 is positioned upgradient of the site, TNTB-BEDGW-003 is located downgradient of Bi-Tri House (Building 452), and TNTB-

Table 3-10

TNTC - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SD07		TNTC-SD08		TNTC-SD09		TNTC-SD10		TNTC-SD11		TNTC-SD12		TNTC-SD13	
		SAMPLE_NO		AB1007		AB1008		AB1009		AB1010		AB1011		AB1012		AB1013	
		SAMPLE_DATE		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	11.2				0.385		11.2									
Amino-4,6-dinitrotoluene, 2-	mg/kg	12.8				0.299		12.8									
Dinitrotoluene, total	mg/kg	0.414				0.246								0.104		0.102	
Nitrobenzene	mg/kg	0.051	J							0.051	J						
RDX	mg/kg	0.521															
Trinitrobenzene, 1,3,5-	mg/kg	0.832						0.832									
Trinitrotoluene, 2,4,6-	mg/kg	1496				0.706		1496		0.198				0.0918	J		
GENERAL CHEMISTRY																	
% Solids	Percent	86.5		79.2		79.4		77.7		76.6		74.2		77.8		79.4	
METALS																	
Aluminum	mg/kg	15600		7160		4610		9210		11300		1600		2900		6310	
Arsenic	mg/kg	25.3		10.3		4.13		12.6		12.2				2.41		9.37	
Barium	mg/kg	324		65.9		32.4		84.9		52.3		15.3		22.6		52.8	
Beryllium	mg/kg	0.941		0.613		0.21	J	0.498		0.657		0.128	J	0.165	J	0.413	
Cadmium	mg/kg	1.24		0.801		0.371	J	0.675	J	0.673	J	0.144	J	0.303	J	0.754	
Calcium	mg/kg	182000		83600		6480		14300		4090		1320		5430		3180	
Chromium	mg/kg	25.2		16.6		8.73		12.3		18.3		4.05		5.25		12.5	
Cobalt	mg/kg	18.5		11.4		4.7		14		9.83		3.44		2.65		8.64	
Copper	mg/kg	38.8		25.5		9.7		23.8		24		3.22		8.31		12	
Iron	mg/kg	64600		26000		12900		21200		27900		5320		7890		24400	
Lead	mg/kg	86.3		14.4		14		46.2		15		2.83		8.66		8.24	
Magnesium	mg/kg	8230		8230		1790		2660		3700		528		1060		1980	
Manganese	mg/kg	1230		516		239		1230		428		116		58.9		656	
Mercury	mg/kg	0.156				0.023	J	0.156								0.04	
Nickel	mg/kg	47.3		31.3		14.6		29.1		29.9		7.53		6.36		22.5	
Potassium	mg/kg	3310		2680		943		1240		2300		284		413		1010	
Selenium	mg/kg	2.47		0.945	J					2.2				1.46		0.953	J
Sodium	mg/kg	272		239	J	160	J	190	J	201	J	193	J	211	J	195	J
Vanadium	mg/kg	37.9		20.1		14.2		21.3		24.8		6.93		13.8		21.2	
Zinc	mg/kg	131		71.9		33		61.3		83.4		14.5		21.8		43.9	
PESTICIDES/PCBs																	
Aroclor 1260	mg/kg	0.769				0.0224	J	0.769						0.0807	J		

Table 3-10

TNTC - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SD07		TNTC-SD08		TNTC-SD09		TNTC-SD10		TNTC-SD11		TNTC-SD12		TNTC-SD13	
		SAMPLE_NO		AB1007		AB1008		AB1009		AB1010		AB1011		AB1012		AB1013	
		SAMPLE_DATE		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00		19-Sep-00	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																	
Benzo(a)anthracene	mg/kg	0.0947	J					0.0947	J								
Benzo(a)pyrene	mg/kg	0.0699	J					0.0699	J								
Benzo(b)fluoranthene	mg/kg	0.12	J					0.12	J								
Bis(2-ethylhexyl)phthalate	mg/kg	0.0553	J														
Chrysene	mg/kg	0.0737	J					0.0737	J								
Di-n-butyl phthalate	mg/kg	0.14															
Dinitrotoluene, 2,4-	mg/kg	0.276	J			0.101	J	0.276	J								
Dinitrotoluene, 2,6-	mg/kg	0.183	J					0.183	J								
Fluoranthene	mg/kg	0.18															
Phenanthrene	mg/kg	0.16															
Pyrene	mg/kg	0.12						0.11	J								
VOLATILES																	
Acetone	mg/kg	0.0379				0.00563	J			0.00475	J	0.00351	J				
Benzene	mg/kg	0.00341	J														
Butanone, 2-	mg/kg	0.00987	J														
Methylene chloride	mg/kg	0.074		0.00547	J	0.00476	J	0.00485	J	0.00414	J	0.00366	J	0.00379	J	0.00412	J
Toluene	mg/kg	0.00683															

Table 3-10

TNTC - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SD14		TNTC-SD15	
		SAMPLE_NO		AB1014		AB1015	
		SAMPLE_DATE		19-Sep-00		19-Sep-00	
		FK_DEPTH		0 - 0 FT		0 - 0 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual
EXPLOSIVES							
Amino-2,6-dinitrotoluene, 4-	mg/kg	11.2				2.79	
Amino-4,6-dinitrotoluene, 2-	mg/kg	12.8				3.25	
Dinitrotoluene, total	mg/kg	0.414		0.112		0.414	
Nitrobenzene	mg/kg	0.051	J				
RDX	mg/kg	0.521				0.521	
Trinitrobenzene, 1,3,5-	mg/kg	0.832					
Trinitrotoluene, 2,4,6-	mg/kg	1496		0.11		2.9	
GENERAL CHEMISTRY							
% Solids	Percent	86.5		79.2		86.5	
METALS							
Aluminum	mg/kg	15600		1200		2510	
Arsenic	mg/kg	25.3		1.14	J	2.39	
Barium	mg/kg	324		84.3		21	
Beryllium	mg/kg	0.941				0.101	J
Cadmium	mg/kg	1.24		0.297	J	0.254	J
Calcium	mg/kg	182000		1760		1610	
Chromium	mg/kg	25.2		5.24		5.15	
Cobalt	mg/kg	18.5		0.871	J	1.31	
Copper	mg/kg	38.8		2.49		6.35	
Iron	mg/kg	64600		9180		6240	
Lead	mg/kg	86.3		52.5		24.4	
Magnesium	mg/kg	8230		297		532	
Manganese	mg/kg	1230		53.4		37.3	
Mercury	mg/kg	0.156		0.146		0.034	J
Nickel	mg/kg	47.3		2.23		4.14	
Potassium	mg/kg	3310		155		341	
Selenium	mg/kg	2.47		0.904	J	1.16	
Sodium	mg/kg	272		187	J	180	J
Vanadium	mg/kg	37.9		18.1		9.86	
Zinc	mg/kg	131		11.1		17.8	
PESTICIDES/PCBs							
Aroclor 1260	mg/kg	0.769		0.506		0.287	

Table 3-10

TNTC - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	TNTC-SD14		TNTC-SD15	
			SAMPLE_NO	AB1014		AB1015	
			SAMPLE_DATE	19-Sep-00		19-Sep-00	
			FK_DEPTH	0 - 0 FT		0 - 0 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual
SEMIVOLATILES							
Benzo(a)anthracene	mg/kg	0.0947	J				
Benzo(a)pyrene	mg/kg	0.0699	J			0.0324	J
Benzo(b)fluoranthene	mg/kg	0.12	J				
Bis(2-ethylhexyl)phthalate	mg/kg	0.0553	J	0.0299	J		
Chrysene	mg/kg	0.0737	J				
Di-n-butyl phthalate	mg/kg	0.14					
Dinitrotoluene, 2,4-	mg/kg	0.276	J			0.134	J
Dinitrotoluene, 2,6-	mg/kg	0.183	J				
Fluoranthene	mg/kg	0.18					
Phenanthrene	mg/kg	0.16					
Pyrene	mg/kg	0.12					
VOLATILES							
Acetone	mg/kg	0.0379					
Benzene	mg/kg	0.00341	J				
Butanone, 2-	mg/kg	0.00987	J				
Methylene chloride	mg/kg	0.074		0.00395	J		
Toluene	mg/kg	0.00683					

MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
mg/kg - Milligrams per kilogram.
PCB - Polychlorinated biphenyl.
Qual - Laboratory qualifier.

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-MW14		MK-MW15		MK-PMU1-SS10		MK-PMU1-SS11		MK-PMU1-SS12		PB-TNTC-S1		PB-TNTC-S10		PB-TNTC-S11	
		SAMPLE_NO		MK01SB06		MK01SB07		MK01SS10		MK01SS11		MK01SS12		PB-TNTC-S1-0.5-1.0		PB-TNTC-S10-2.5-3.5		PB-TNTC-S11-2.5-3.5	
		SAMPLE_DATE		1-Jul-93		1-Jul-93		29-Jun-93		29-Jun-93		29-Jun-93		12-Oct-94		14-Oct-94		14-Oct-94	
		FK.DEPTH		0 - 2 FT		0 - 2 FT		0 - 2 FT		0 - 2 FT		0 - 2 FT		0.5 - 1 FT		2.5 - 3.5 FT		2.5 - 3.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6																	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38																	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7																	
Dinitrotoluene, 2,6-	mg/kg	1.9																	
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297																	
Nitrobenzene	mg/kg	0.3																	
Nitrotoluene, 2-	mg/kg	50.8																	
Nitrotoluene, 3-	mg/kg	8.61																	
Nitrotoluene, 4-	mg/kg	67.4																	
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1																	
Trinitrotoluene, 2,4,6-	mg/kg	54969																	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2																	
METALS																			
Aluminum	mg/kg	11900		4800		3370		11900		2010		11200							
Antimony	mg/kg	13.2														8		7.2	
Arsenic	mg/kg	18.5		0.9	B	0.74	B							10.9		7.6		8.3	
Barium	mg/kg	427		25		11	B	101		44		79.6							
Beryllium	mg/kg	0.823						0.57	B			0.6	B						
Cadmium	mg/kg	2.19		0.06	B	0.03	B	0.35	BN	0.1	BN	0.13	BN						
Calcium	mg/kg	252000		740		620		11700		19400	B	4370	B						
Chromium	mg/kg	202		4.2		3.7		18.7		3.6		17.8		15		22		24	
Cobalt	mg/kg	21				2.3	B	9.1				21							
Copper	mg/kg	99.8		2	B	1.8	B	17.7				23.9		15		9.1		15	
Iron	mg/kg	35500		4640		3740		22100		4960		31000							
Lead	mg/kg	934		19.1		2.1								15		22		20	
Magnesium	mg/kg	18700		431	B	645													
Manganese	mg/kg	5160		43.2		31		376		73.7		834		322		824		663	
Mercury	mg/kg	0.98						0.1		0.11									
Nickel	mg/kg	90.8		4.5		4.5		24.3				50.2		26		34		39	
Potassium	mg/kg	2830		111	B	217	B	2620		315	B	1040							
Selenium	mg/kg	ND																	
Silver	mg/kg	ND						0.04	B			0.04	B						
Sodium	mg/kg	403		124	B	111	B	172	B	150	B	146	B						
Vanadium	mg/kg	28.8		8.6		5.6				5.1	B*								
Zinc	mg/kg	708		16.4		12.5								69		67		135	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	MK-MW14		MK-MW15		MK-PMU1-SS10		MK-PMU1-SS11		MK-PMU1-SS12		PB-TNTC-S1		PB-TNTC-S10		PB-TNTC-S11	
			SAMPLE_NO	MK01SB06		MK01SB07		MK01SS10		MK01SS11		MK01SS12		PB-TNTC-S1-0.5-1.0		PB-TNTC-S10-2.5-3.5		PB-TNTC-S11-2.5-3.5	
			SAMPLE_DATE	1-Jul-93		1-Jul-93		29-Jun-93		29-Jun-93		29-Jun-93		12-Oct-94		14-Oct-94		14-Oct-94	
			FK.DEPTH	0 - 2 FT		0 - 2 FT		0 - 2 FT		0 - 2 FT		0 - 2 FT		0.5 - 1 FT		2.5 - 3.5 FT		2.5 - 3.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14																	
Benzo(a)anthracene	mg/kg	11.1																	
Benzo(a)pyrene	mg/kg	8.2						0.14											
Benzo(b)fluoranthene	mg/kg	10.2						0.19											
Benzo(ghi)perylene	mg/kg	3.4	J																
Benzo(k)fluoranthene	mg/kg	4.38						0.079											
Bis(2-ethylhexyl)phthalate	mg/kg	0.97		0.13		0.97				0.24									
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74																	
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J																
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275																	
Dinitrotoluene, 2,6-	mg/kg	65.5																	
Fluoranthene	mg/kg	20.3						0.34											
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J																
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21						0.16											
Pyrene	mg/kg	17.1						0.35											
VOLATILES																			
Acetone	mg/kg	0.456																	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272																	
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104																	
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781																	
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S12		PB-TNTC-S13		PB-TNTC-S14		PB-TNTC-S15		PB-TNTC-S16		PB-TNTC-S17		PB-TNTC-S18		PB-TNTC-S19	
		SAMPLE_NO		PB-TNTC-S12-2.3-3.5		PB-TNTC-S13-2.5-3.5		PB-TNTC-S14-1.0-2.0		PB-TNTC-S15-1.0-2.0		PB-TNTC-S16-0.5-1.0		PB-TNTC-S17-0.0-1.5		PB-TNTC-S18-0.0-1.5		PB-TNTC-S19-0.5-2.0	
		SAMPLE_DATE		14-Oct-94		14-Oct-94		14-Oct-94		14-Oct-94		16-Oct-94		16-Oct-94		16-Oct-94		17-Oct-94	
		FK.DEPTH		2.3 - 3.5 FT		2.5 - 3.5 FT		1 - 2 FT		1 - 2 FT		0.5 - 1 FT		0 - 1.5 FT		0 - 1.5 FT		0.5 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6																	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38																	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7										1							
Dinitrotoluene, 2,6-	mg/kg	1.9										1							
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297																	
Nitrobenzene	mg/kg	0.3																	
Nitrotoluene, 2-	mg/kg	50.8																	
Nitrotoluene, 3-	mg/kg	8.61																	
Nitrotoluene, 4-	mg/kg	67.4																	
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1																	
Trinitrotoluene, 2,4,6-	mg/kg	54969																	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2																	
METALS																			
Aluminum	mg/kg	11900																	
Antimony	mg/kg	13.2								9				13.2		8.1		5.5	
Arsenic	mg/kg	18.5		8.5												6		3.2	
Barium	mg/kg	427																	
Beryllium	mg/kg	0.823																	
Cadmium	mg/kg	2.19																	
Calcium	mg/kg	252000																	
Chromium	mg/kg	202		23		11		6		8.6		15		7.8		5.2		5.9	
Cobalt	mg/kg	21																	
Copper	mg/kg	99.8		5.5		3.1						8		7.1		5.9		4.5	
Iron	mg/kg	35500																	
Lead	mg/kg	934		14		9.2		4.5		6.4		15		75		35		90	
Magnesium	mg/kg	18700																	
Manganese	mg/kg	5160		598		244		137		98		642		1074		1376		925	
Mercury	mg/kg	0.98																	
Nickel	mg/kg	90.8		34		14		5.7		7.2		36		12.6		8.5		7.8	
Potassium	mg/kg	2830																	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND																	
Sodium	mg/kg	403																	
Vanadium	mg/kg	28.8																	
Zinc	mg/kg	708		74		39		20		25		22		144		72		80	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S12		PB-TNTC-S13		PB-TNTC-S14		PB-TNTC-S15		PB-TNTC-S16		PB-TNTC-S17		PB-TNTC-S18		PB-TNTC-S19	
		SAMPLE_NO		PB-TNTC-S12-2.3-3.5		PB-TNTC-S13-2.5-3.5		PB-TNTC-S14-1.0-2.0		PB-TNTC-S15-1.0-2.0		PB-TNTC-S16-0.5-1.0		PB-TNTC-S17-0.0-1.5		PB-TNTC-S18-0.0-1.5		PB-TNTC-S19-0.5-2.0	
		SAMPLE_DATE		14-Oct-94		14-Oct-94		14-Oct-94		14-Oct-94		16-Oct-94		16-Oct-94		16-Oct-94		17-Oct-94	
		FK.DEPTH		2.3 - 3.5 FT		2.5 - 3.5 FT		1 - 2 FT		1 - 2 FT		0.5 - 1 FT		0 - 1.5 FT		0 - 1.5 FT		0.5 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14																	
Benzo(a)anthracene	mg/kg	11.1																	
Benzo(a)pyrene	mg/kg	8.2																	
Benzo(b)fluoranthene	mg/kg	10.2																	
Benzo(ghi)perylene	mg/kg	3.4	J																
Benzo(k)fluoranthene	mg/kg	4.38																	
Bis(2-ethylhexyl)phthalate	mg/kg	0.97																	
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74																	
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J																
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275																	
Dinitrotoluene, 2,6-	mg/kg	65.5																	
Fluoranthene	mg/kg	20.3																	
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J																
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21																	
Pyrene	mg/kg	17.1																	
VOLATILES																			
Acetone	mg/kg	0.456																	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272																	
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104																	
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781																	
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S2		PB-TNTC-S20		PB-TNTC-S21		PB-TNTC-S22		PB-TNTC-S23		PB-TNTC-S24		PB-TNTC-S25		PB-TNTC-S26	
		SAMPLE_NO		PB-TNTC-S2-0.5-1.0		PB-TNTC-S20-0.0-1.25		PB-TNTC-S21-0.5-1.0		PB-TNTC-S22-0.5-1.0		PB-TNTC-S23-0.0-2.0		PB-TNTC-S24-0.0-1.75		PB-TNTC-S25-0.0-1.2		PB-TNTC-S26-0.0-1.3	
		SAMPLE_DATE		12-Oct-94		17-Oct-94		16-Oct-94		19-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94	
		FK.DEPTH		0.5 - 1 FT		0 - 1.25 FT		0.5 - 1 FT		0.5 - 1 FT		0 - 2 FT		0 - 1.75 FT		0 - 1.2 FT		0.0 - 1.3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6								1								0.4	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38								4.7								0.4	
Amino-4-nitrotoluene, 2-	mg/kg	0.4								0.4									
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7								8.7								0.3	
Dinitrotoluene, 2,6-	mg/kg	1.9								1									
Dinitrotoluene, 3,4-	mg/kg	1.2								0.4									
Dinitrotoluene, total	mg/kg	297																	
Nitrobenzene	mg/kg	0.3																	
Nitrotoluene, 2-	mg/kg	50.8								2.7									
Nitrotoluene, 3-	mg/kg	8.61								0.5									
Nitrotoluene, 4-	mg/kg	67.4								0.4									
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1																	
Trinitrotoluene, 2,4,6-	mg/kg	54969								2.7								0.5	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2																	
METALS																			
Aluminum	mg/kg	11900																	
Antimony	mg/kg	13.2								7.6									
Arsenic	mg/kg	18.5		10.4						9									
Barium	mg/kg	427																	
Beryllium	mg/kg	0.823																	
Cadmium	mg/kg	2.19																	
Calcium	mg/kg	252000																	
Chromium	mg/kg	202		24		5.8		20		21		6.6		17		11		24	
Cobalt	mg/kg	21																	
Copper	mg/kg	99.8		10						13				26					
Iron	mg/kg	35500																	
Lead	mg/kg	934		23		12		10.1		22		6		19		125		34	
Magnesium	mg/kg	18700																	
Manganese	mg/kg	5160		310		325		830		756		164		123		188		330	
Mercury	mg/kg	0.98																	
Nickel	mg/kg	90.8		36		5.7		15		45		7.8		6.4		7.6		15	
Potassium	mg/kg	2830																	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND																	
Sodium	mg/kg	403																	
Vanadium	mg/kg	28.8																	
Zinc	mg/kg	708		76		25		35		90		29		71		49		44	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S2		PB-TNTC-S20		PB-TNTC-S21		PB-TNTC-S22		PB-TNTC-S23		PB-TNTC-S24		PB-TNTC-S25		PB-TNTC-S26	
		SAMPLE_NO		PB-TNTC-S2-0.5-1.0		PB-TNTC-S20-0.0-1.25		PB-TNTC-S21-0.5-1.0		PB-TNTC-S22-0.5-1.0		PB-TNTC-S23-0.0-2.0		PB-TNTC-S24-0.0-1.75		PB-TNTC-S25-0.0-1.2		PB-TNTC-S26-0.0-1.3	
		SAMPLE_DATE		12-Oct-94		17-Oct-94		16-Oct-94		19-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94	
		FK.DEPTH		0.5 - 1 FT		0 - 1.25 FT		0.5 - 1 FT		0.5 - 1 FT		0 - 2 FT		0 - 1.75 FT		0 - 1.2 FT		0.0 - 1.3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14																	
Benzo(a)anthracene	mg/kg	11.1																	
Benzo(a)pyrene	mg/kg	8.2																	
Benzo(b)fluoranthene	mg/kg	10.2																	
Benzo(ghi)perylene	mg/kg	3.4	J																
Benzo(k)fluoranthene	mg/kg	4.38																	
Bis(2-ethylhexyl)phthalate	mg/kg	0.97																	
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74																	
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J																
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275																	
Dinitrotoluene, 2,6-	mg/kg	65.5																	
Fluoranthene	mg/kg	20.3																	
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J																
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21																	
Pyrene	mg/kg	17.1																	
VOLATILES																			
Acetone	mg/kg	0.456																	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272																	
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104																	
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781																	
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S27		PB-TNTC-S28		PB-TNTC-S29		PB-TNTC-S3		PB-TNTC-S3		PB-TNTC-S4		PB-TNTC-S4		PB-TNTC-S5	
		SAMPLE_NO		PB-TNTC-S27-0.5-1.0		PB-TNTC-S28-0.0-1.5		PB-TNTC-S29-0.0-2.0		PB-TNTC-S3-0.0-1.5		PB-TNTC-S3-1.5-3.5		PB-TNTC-S4-0.0-1.5		PB-TNTC-S4-1.5-5.0		PB-TNTC-S5-0.0-1.5	
		SAMPLE_DATE		16-Oct-94		16-Oct-94		17-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94	
		FK.DEPTH		0.5 - 1 FT		0 - 1.5 FT		0 - 2 FT		0 - 1.5 FT		1.5 - 3.5 FT		0 - 1.5 FT		1.5 - 5 FT		0 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6																	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38																	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7		0.5															
Dinitrotoluene, 2,6-	mg/kg	1.9		0.4															
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297																	
Nitrobenzene	mg/kg	0.3																	
Nitrotoluene, 2-	mg/kg	50.8																	
Nitrotoluene, 3-	mg/kg	8.61																	
Nitrotoluene, 4-	mg/kg	67.4																	
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1																	
Trinitrotoluene, 2,4,6-	mg/kg	54969								0.8				0.6					
GENERAL CHEMISTRY																			
% Solids	Percent	92.2																	
METALS																			
Aluminum	mg/kg	11900																	
Antimony	mg/kg	13.2				5.8													
Arsenic	mg/kg	18.5				4.8				5.7		4.2		5.9		6.7		5.3	
Barium	mg/kg	427																	
Beryllium	mg/kg	0.823																	
Cadmium	mg/kg	2.19																	
Calcium	mg/kg	252000																	
Chromium	mg/kg	202		20		5.8		5.2		10.9		10.4		15		18		15	
Cobalt	mg/kg	21																	
Copper	mg/kg	99.8				7				11		19		9.5		10		8.1	
Iron	mg/kg	35500																	
Lead	mg/kg	934		8		32		5.6		79		85		173		16		51	
Magnesium	mg/kg	18700																	
Manganese	mg/kg	5160		617		1682		123		231		194		333		386		236	
Mercury	mg/kg	0.98																0.98	
Nickel	mg/kg	90.8		31		10.1		5.3		13		9.4		20		26		17	
Potassium	mg/kg	2830																	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND																	
Sodium	mg/kg	403																	
Vanadium	mg/kg	28.8																	
Zinc	mg/kg	708		23		77		20		86		94		99		67		71	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	PB-TNTC-S27		PB-TNTC-S28		PB-TNTC-S29		PB-TNTC-S3		PB-TNTC-S3		PB-TNTC-S4		PB-TNTC-S4		PB-TNTC-S5	
			SAMPLE_NO	PB-TNTC-S27-0.5-1.0		PB-TNTC-S28-0.0-1.5		PB-TNTC-S29-0.0-2.0		PB-TNTC-S3-0.0-1.5		PB-TNTC-S3-1.5-3.5		PB-TNTC-S4-0.0-1.5		PB-TNTC-S4-1.5-5.0		PB-TNTC-S5-0.0-1.5	
			SAMPLE_DATE	16-Oct-94		16-Oct-94		17-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94	
			FK.DEPTH	0.5 - 1 FT		0 - 1.5 FT		0 - 2 FT		0 - 1.5 FT		1.5 - 3.5 FT		0 - 1.5 FT		1.5 - 5 FT		0 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14																	
Benzo(a)anthracene	mg/kg	11.1																	
Benzo(a)pyrene	mg/kg	8.2																	
Benzo(b)fluoranthene	mg/kg	10.2																	
Benzo(ghi)perylene	mg/kg	3.4	J																
Benzo(k)fluoranthene	mg/kg	4.38																	
Bis(2-ethylhexyl)phthalate	mg/kg	0.97																	
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74																	
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J																
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275																	
Dinitrotoluene, 2,6-	mg/kg	65.5																	
Fluoranthene	mg/kg	20.3																	
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J																
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21																	
Pyrene	mg/kg	17.1																	
VOLATILES																			
Acetone	mg/kg	0.456																	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272																	
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104																	
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781																	
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-TNTC-S5		PB-TNTC-S6		PB-TNTC-S6		PB-TNTC-S7		PB-TNTC-S8		PB-TNTC-S9		TNTC-SO001		TNTC-SO001	
		SAMPLE_NO		PB-TNTC-S5-1.5-5.0		PB-TNTC-S6-0.0-1.5		PB-TNTC-S6-1.5-4.5		PB-TNTC-S7-0.5-1.0		PB-TNTC-S8-0.5-1.0		PB-TNTC-S9-0.5-1.0		AB0426		AB0460	
		SAMPLE_DATE		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		12-Oct-00		28-Sep-00	
		FK.DEPTH		1.5 - 5 FT		0 - 1.5 FT		1.5 - 4.5 FT		0.5 - 1 FT		0.5 - 1 FT		0.5 - 1 FT		0 - 1 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6														6.93		0.436	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38										0.4				3.76			
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7										7.6							
Dinitrotoluene, 2,6-	mg/kg	1.9										1.9							
Dinitrotoluene, 3,4-	mg/kg	1.2										1.2							
Dinitrotoluene, total	mg/kg	297														8.33		3.65	
Nitrobenzene	mg/kg	0.3										0.3							
Nitrotoluene, 2-	mg/kg	50.8										1.1						3.27	
Nitrotoluene, 3-	mg/kg	8.61																0.45	
Nitrotoluene, 4-	mg/kg	67.4																2.86	
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1																	
Trinitrotoluene, 2,4,6-	mg/kg	54969										1.2				4.76		1.96	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2														87.2		89.4	
METALS																			
Aluminum	mg/kg	11900														4560	H	1420	
Antimony	mg/kg	13.2				7		7.2										0.757	B
Arsenic	mg/kg	18.5		7.4		6		7.4		6.2		7.5		9.5		10.5		3.64	
Barium	mg/kg	427														141		56.5	
Beryllium	mg/kg	0.823														0.442		0.178	B
Cadmium	mg/kg	2.19														1.15		0.281	B
Calcium	mg/kg	252000														38300	H	252000	
Chromium	mg/kg	202		22		14		19		14		21		15		8.13		3.86	
Cobalt	mg/kg	21														4.79		1.94	
Copper	mg/kg	99.8		8		18		6.2		8.4		9.7		13		21.3		8.19	
Iron	mg/kg	35500														18100		9790	
Lead	mg/kg	934		20		23		15		18		19		18		355		76.4	
Magnesium	mg/kg	18700														11300		18700	
Manganese	mg/kg	5160		367		356		618		456		472		512		512		713	
Mercury	mg/kg	0.98														0.173		0.059	
Nickel	mg/kg	90.8		26		23		29		23		31		30		21.1		7.55	
Potassium	mg/kg	2830														858		510	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND																	
Sodium	mg/kg	403														182	B	235	
Vanadium	mg/kg	28.8														12.7		5.87	
Zinc	mg/kg	708		62		74		70		61		79		70		199		56.9	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07														1.42		0.183	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	PB-TNTC-S5		PB-TNTC-S6		PB-TNTC-S6		PB-TNTC-S7		PB-TNTC-S8		PB-TNTC-S9		TNTC-SO001		TNTC-SO001	
			SAMPLE_NO	PB-TNTC-S5-1.5-5.0		PB-TNTC-S6-0.0-1.5		PB-TNTC-S6-1.5-4.5		PB-TNTC-S7-0.5-1.0		PB-TNTC-S8-0.5-1.0		PB-TNTC-S9-0.5-1.0		AB0426		AB0460	
			SAMPLE_DATE	13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		13-Oct-94		12-Oct-00		28-Sep-00	
			FK.DEPTH	1.5 - 5 FT		0 - 1.5 FT		1.5 - 4.5 FT		0.5 - 1 FT		0.5 - 1 FT		0.5 - 1 FT		0 - 1 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14																	
Benzo(a)anthracene	mg/kg	11.1														0.0753	J	0.0465	J
Benzo(a)pyrene	mg/kg	8.2														0.0787	J	0.0413	J
Benzo(b)fluoranthene	mg/kg	10.2														0.176	J		
Benzo(ghi)perylene	mg/kg	3.4	J																
Benzo(k)fluoranthene	mg/kg	4.38																	
Bis(2-ethylhexyl)phthalate	mg/kg	0.97														0.0493	J		
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74														0.114	J	0.0535	J
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J																
Diethyl phthalate	mg/kg	ND														0.425	B		
Dinitrotoluene, 2,4-	mg/kg	275														1.01		0.689	
Dinitrotoluene, 2,6-	mg/kg	65.5														0.458		0.0977	J
Fluoranthene	mg/kg	20.3														0.189	J		
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J																
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21														0.0543	J		
Pyrene	mg/kg	17.1														0.131	J		
VOLATILES																			
Acetone	mg/kg	0.456														0.456		0.0307	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272																0.00398	J
Ethylbenzene	mg/kg	0.00248	J													0.00207	J		
Methylene chloride	mg/kg	0.0104														0.0355	B	0.00198	JB
Styrene	mg/kg	0.00197	J													0.00197	J		
Toluene	mg/kg	0.0781														0.0264			
Xylene, o-	mg/kg	0.00323	J													0.00307	J		
Xylenes, m,p-	mg/kg	0.0075														0.0075			

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO065		TNTC-SO066		TNTC-SO066		TNTC-SO066		TNTC-SO066		TNTC-SO074		TNTC-SO100		TNTC-SO107	
		SAMPLE_NO		AB0475		AB0429		AB0430		AB0461		AB0462		AB0431		AB0476		AB0432	
		SAMPLE_DATE		12-Oct-00		27-Sep-00		12-Oct-00		28-Sep-00		28-Sep-00		12-Oct-00		12-Oct-00		10-Oct-00	
		FK.DEPTH		2.5 - 3.5 FT		0 - 1 FT		2.5 - 3.5 FT		5 - 7 FT		8 - 10 FT		2.5 - 3.5 FT		2 - 3 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6				0.0721	J							0.784					
Amino-4,6-dinitrotoluene, 2-	mg/kg	38				0.0538	J							2.67		6.44			
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751																	
Dinitrotoluene, 2,4-	mg/kg	8.7																	
Dinitrotoluene, 2,6-	mg/kg	1.9																	
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297				0.451		165		297		36.3							
Nitrobenzene	mg/kg	0.3														0.195			
Nitrotoluene, 2-	mg/kg	50.8						2.05		50.8		6.32							
Nitrotoluene, 3-	mg/kg	8.61						4.82		8.61		1.09							
Nitrotoluene, 4-	mg/kg	67.4								67.4		6.59							
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1								3.59						0.499			
Trinitrotoluene, 2,4,6-	mg/kg	54969				0.164		38		5.19		0.167		1.41		2226		0.566	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2		83		78.9		85.9		83.2		92		83.3		82.3		76.3	
METALS																			
Aluminum	mg/kg	11900		11200	H	6560		2330	H	7850		5180		8310	H	4540	H	5290	
Antimony	mg/kg	13.2		1.09	B	8.15										0.654	B	1.59	
Arsenic	mg/kg	18.5		6.79		7.55		7.43		6.06		2.47		8.45		3.32		3.86	
Barium	mg/kg	427		96.6		365		427		35.4		22.9		63.2		28.3		57.7	
Beryllium	mg/kg	0.823		0.721		0.602		0.219	B	0.595		0.5		0.543		0.36		0.403	
Cadmium	mg/kg	2.19		0.194	B									0.316	B	0.498	B	0.316	B
Calcium	mg/kg	252000		28700	H	18500		28200	H	157000		225000		15400	H	10700	H	10700	
Chromium	mg/kg	202		14.3		11		3.71		13.7		9.53		16.5		9.85		13.7	
Cobalt	mg/kg	21		7.71		9.63		0.297	B	12		6.24		7.29		3.23		5.03	
Copper	mg/kg	99.8		12.9		17.1		3.56		19.2		11		30.1		35.9		99.8	
Iron	mg/kg	35500		30500		35500		4010		32600		11300		19100		11500		12900	
Lead	mg/kg	934		41.1		132		761		9.86		4.86		134		111		361	
Magnesium	mg/kg	18700		3320		5780		422		3670		3390		3260		1910		1660	
Manganese	mg/kg	5160		2120		5160		105		1130		1620		454		211		505	
Mercury	mg/kg	0.98		0.068		0.048		0.059						0.022	B	0.072		0.04	
Nickel	mg/kg	90.8		21.8		15.8		4.17		46.6		18.5		23.8		8.95		11.9	
Potassium	mg/kg	2830		951		800		1180		2730		2410		1640		706		1070	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND																	
Sodium	mg/kg	403		140	B	223	B	78.2	B	292		387		140	B	134	B	227	B
Vanadium	mg/kg	28.8		24.6		16		6.68		12		8.92		18.6		17.1		16.9	
Zinc	mg/kg	708		96.1		93.1		5.8		44.5		10.9		123		86.1		171	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969		0.969															
Aroclor 1260	mg/kg	5.07		1.58		5.07		2.09		0.16		0.103		0.15		0.26		0.088	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	TNTC-SO065		TNTC-SO066		TNTC-SO066		TNTC-SO066		TNTC-SO066		TNTC-SO074		TNTC-SO100		TNTC-SO107	
			SAMPLE_NO	AB0475		AB0429		AB0430		AB0461		AB0462		AB0431		AB0476		AB0432	
			SAMPLE_DATE	12-Oct-00		27-Sep-00		12-Oct-00		28-Sep-00		28-Sep-00		12-Oct-00		12-Oct-00		10-Oct-00	
			FK.DEPTH	2.5 - 3.5 FT		0 - 1 FT		2.5 - 3.5 FT		5 - 7 FT		8 - 10 FT		2.5 - 3.5 FT		2 - 3 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14												0.151	J				
Benzo(a)anthracene	mg/kg	11.1		0.0454	J									0.135	J			0.269	J
Benzo(a)pyrene	mg/kg	8.2		0.043	J									0.0536	J			0.305	J
Benzo(b)fluoranthene	mg/kg	10.2												0.116	J			0.443	
Benzo(ghi)perylene	mg/kg	3.4	J															0.222	J
Benzo(k)fluoranthene	mg/kg	4.38																0.178	J
Bis(2-ethylhexyl)phthalate	mg/kg	0.97		0.0237	J											0.0324	J	0.0328	J
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74												0.113	J			0.31	J
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J															0.0817	J
Diethyl phthalate	mg/kg	ND		0.585	B									0.307	JB	0.622	B		
Dinitrotoluene, 2,4-	mg/kg	275		0.0558	J	0.239	J	43.1		170		13.2		0.068	J	0.496			
Dinitrotoluene, 2,6-	mg/kg	65.5				0.0668	J	6.92		65.5		6.83							
Fluoranthene	mg/kg	20.3												0.469				0.409	J
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J															0.21	J
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21												0.227	J			0.107	J
Pyrene	mg/kg	17.1												0.248	J			0.33	J
VOLATILES																			
Acetone	mg/kg	0.456		0.112		0.445		0.0495						0.0986		0.0196		0.0861	
Benzene	mg/kg	0.00601		0.00241	J					0.00342	J	0.00492		0.00216	J				
Butanone, 2-	mg/kg	0.0818				0.0818													
Carbon disulfide	mg/kg	0.0272		0.0109		0.0123		0.00365	J					0.00376	J	0.00175	J		
Ethylbenzene	mg/kg	0.00248	J									0.00248	J						
Methylene chloride	mg/kg	0.0104		0.0061	B	0.0188	B	0.00902	B	0.00358	JB	0.00456	JB	0.00434	JB	0.00798	B	0.0188	B
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781		0.00385	J					0.0781		0.0186		0.00255	J				
Xylene, o-	mg/kg	0.00323	J							0.0019	J	0.00323	J						
Xylenes, m,p-	mg/kg	0.0075										0.00605							

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO107		TNTC-SO123		TNTC-SO123		TNTC-SO134		TNTC-SO134		TNTC-SO150		TNTC-SO151		TNTC-SO151	
		SAMPLE_NO		AB0433		AB0463		AB0464		AB0436		AB0465		AB0437		AB0438		AB0439	
		SAMPLE_DATE		10-Oct-00		27-Sep-00		27-Sep-00		26-Sep-00		27-Sep-00		10-Oct-00		10-Oct-00		10-Oct-00	
		FK.DEPTH		3 - 4 FT		5 - 7 FT		8 - 10 FT		2.5 - 3.5 FT		5 - 7 FT		0.33 - 1 FT		0 - 1 FT		1.3 - 2.3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6		0.293		0.934		0.896		0.146				14.6		10.8			
Amino-4,6-dinitrotoluene, 2-	mg/kg	38		0.226		3.61		10.3		0.108				38		9.41		4.8	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751												0.12		0.142		0.127	
Dinitrotoluene, 2,4-	mg/kg	8.7																	
Dinitrotoluene, 2,6-	mg/kg	1.9																	
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297				3.5		16.8		0.165						1.59			
Nitrobenzene	mg/kg	0.3																	
Nitrotoluene, 2-	mg/kg	50.8				0.27		2.8											
Nitrotoluene, 3-	mg/kg	8.61				0.275		0.328						1.71				0.271	
Nitrotoluene, 4-	mg/kg	67.4						1.47											
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1		0.238		0.205		0.507						0.902		2.43		2.69	
Trinitrotoluene, 2,4,6-	mg/kg	54969		47.3		5.26		15.1		0.049	J	0.119		51.1		5067		2588	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2		76.7		83.9		86.2		88.8		84.7		78.8		76		85.3	
METALS																			
Aluminum	mg/kg	11900		3750		4310		6950		5490		5010		3630		3090		3690	
Antimony	mg/kg	13.2												0.68	B			0.783	B
Arsenic	mg/kg	18.5		3.68		2.99		2.9		3.95		4.22		3.94		4.02		2.95	
Barium	mg/kg	427		14.6		24.4		21.5		30.5		25.3		24.1		26.4		22.5	
Beryllium	mg/kg	0.823		0.28		0.321		0.515		0.36		0.342		0.297		0.247	B	0.275	
Cadmium	mg/kg	2.19				0.136	B					0.16	B	0.272	B	0.545	B	0.606	B
Calcium	mg/kg	252000		2790		65300		126000		35800		16600		35600		55100		13400	
Chromium	mg/kg	202		7.44		7.13		14.1		8.44		9.89		6.76		8.17		7.85	
Cobalt	mg/kg	21		3.16		3.62		8.38		6.29		4.78		2.25		2.25		2.56	
Copper	mg/kg	99.8		5.36		11.2		11.5		11.1		28		43.7		28.6		30.3	
Iron	mg/kg	35500		8140		10100		14000		13100		10600		10900		11400		9550	
Lead	mg/kg	934		15.3		27.9		4.05		21.6		157		195		621		212	
Magnesium	mg/kg	18700		1660		1160		3960		2230		1910		5890		6770		2710	
Manganese	mg/kg	5160		122		361		764		484		244		334		286		199	
Mercury	mg/kg	0.98		0.114										0.269		0.39			
Nickel	mg/kg	90.8		9.44		10.4		23.1		18.4		13		8.17		8.74		8.26	
Potassium	mg/kg	2830		639		897		2640		1250		1150		441		452		469	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND										0.497	B						
Sodium	mg/kg	403		110	B	288		355		196	B	263		223	B	173	B	207	B
Vanadium	mg/kg	28.8		12.2		8.95		9.79		9.69		12.7		10.9		10.5		11.7	
Zinc	mg/kg	708		31.3		41.2		17.3		55.1		33.8		121		240		193	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969								0.46		0.176							
Aroclor 1260	mg/kg	5.07		0.03	J							0.135		1.37		2.11		1.02	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	TNTC-SO107		TNTC-SO123		TNTC-SO123		TNTC-SO134		TNTC-SO134		TNTC-SO150		TNTC-SO151		TNTC-SO151	
			SAMPLE_NO	AB0433		AB0463		AB0464		AB0436		AB0465		AB0437		AB0438		AB0439	
			SAMPLE_DATE	10-Oct-00		27-Sep-00		27-Sep-00		26-Sep-00		27-Sep-00		10-Oct-00		10-Oct-00		10-Oct-00	
			FK.DEPTH	3 - 4 FT		5 - 7 FT		8 - 10 FT		2.5 - 3.5 FT		5 - 7 FT		0.33 - 1 FT		0 - 1 FT		1.3 - 2.3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J											0.545	J				
Anthracene	mg/kg	4.14												0.351	J	1.34	J		
Benzo(a)anthracene	mg/kg	11.1												3.32		6.94			
Benzo(a)pyrene	mg/kg	8.2												3.63		6.33			
Benzo(b)fluoranthene	mg/kg	10.2												4.82		9.05			
Benzo(ghi)perylene	mg/kg	3.4	J											1.78		2.78	J		
Benzo(k)fluoranthene	mg/kg	4.38												1.65		3.02	J		
Bis(2-ethylhexyl)phthalate	mg/kg	0.97		0.0883	J							0.0264	J						
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74												3.02		6.28			
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J											0.601	J	1.03	J		
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275				0.617	J	8.19		0.0732	J					1.65	J		
Dinitrotoluene, 2,6-	mg/kg	65.5				7.21		6.83											
Fluoranthene	mg/kg	20.3												4.75		12.9			
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J											1.89		2.91	J		
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21												0.667	J	4.13	J		
Pyrene	mg/kg	17.1												4.61		10.1			
VOLATILES																			
Acetone	mg/kg	0.456		0.0204		0.0081	J	0.034		0.0535		0.015		0.187		0.0969			
Benzene	mg/kg	0.00601														0.00194	J		
Butanone, 2-	mg/kg	0.0818										0.00545	J						
Carbon disulfide	mg/kg	0.0272						0.00215	J	0.00379	J	0.00175	J						
Ethylbenzene	mg/kg	0.00248	J											0.00156	J				
Methylene chloride	mg/kg	0.0104		0.00523	JB	0.00443	J	0.00272	J	0.00878	JB	0.0104		0.0266	B	0.00597	B		
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781												0.0142		0.00324	J	0.00726	
Xylene, o-	mg/kg	0.00323	J											0.00246	J			0.00166	J
Xylenes, m,p-	mg/kg	0.0075																0.00399	J

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO165		TNTC-SO171		TNTC-SO171		TNTC-SO173		TNTC-SO190		TNTC-SO192		TNTC-SO192		TNTC-SO206	
		SAMPLE_NO		AB0442		AB0466		AB0467		AB0443		AB0444		AB0445		AB0446		AB0447	
		SAMPLE_DATE		27-Sep-00		28-Sep-00		28-Sep-00		11-Oct-00		11-Oct-00		11-Oct-00		11-Oct-00		12-Oct-00	
		FK.DEPTH		1.5 - 2.5 FT		4 - 6 FT		8 - 10 FT		1 - 2 FT		1 - 2 FT		0 - 1 FT		2 - 2.5 FT		1 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6		7.28				3.76		2.26		0.99		6.62		4.76		4.48	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38		11.9				0.647		1.28		1.24		5.14		3.27		6.9	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751												0.751					
Dinitrotoluene, 2,4-	mg/kg	8.7																	
Dinitrotoluene, 2,6-	mg/kg	1.9																	
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297		5.63		236		47.8		0.288				3.7		0.705			
Nitrobenzene	mg/kg	0.3		0.0966	J	0.0963	J									0.212			
Nitrotoluene, 2-	mg/kg	50.8																	
Nitrotoluene, 3-	mg/kg	8.61		1.28				0.484											
Nitrotoluene, 4-	mg/kg	67.4						0.29											
Tetryl	mg/kg	0.626		0.626															
Trinitrobenzene, 1,3,5-	mg/kg	10.1		7.93		0.146		0.119		0.153				0.723		0.811			
Trinitrotoluene, 2,4,6-	mg/kg	54969		1343		448		173		8.07		0.634		878		251		3.45	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2		92.2		87		84.4		89.6		82.6		81.4		88		88.3	
METALS																			
Aluminum	mg/kg	11900		2610		3150		3930		4110		7340		5580		2820		7260	H
Antimony	mg/kg	13.2						0.904	B	0.78	B								
Arsenic	mg/kg	18.5		2.26		1.77		1.79		3.63		5.58		7.12		2.58		6.59	
Barium	mg/kg	427		28.2		31.9		33.3		42.8		50.3		89.8		398		40.4	
Beryllium	mg/kg	0.823		0.156	B	0.203	B	0.246		0.274		0.482		0.394		0.205	B	0.823	
Cadmium	mg/kg	2.19								0.191	B	0.693	B	2.19		0.913		0.345	B
Calcium	mg/kg	252000		9330		1430		1420		2590		25000		45900		46800		34900	H
Chromium	mg/kg	202		4.36		5.24		6.25		5.92		13.1		16.2		202		13.2	
Cobalt	mg/kg	21		1.39		1.37		1.75		2.61		6.25		4.36		3.69		5.77	
Copper	mg/kg	99.8		4.54		1.36		2.96		5.09		9.9		52.2		16.4		19	
Iron	mg/kg	35500		6600		4310		5200		8480		20600		21400		8120		16900	
Lead	mg/kg	934		25.6		8.8		43.8		8.07		20.1		934		228		79.5	
Magnesium	mg/kg	18700		1040		658		761		1170		2130		4660		5360		4250	
Manganese	mg/kg	5160		74		33.7		38.1		388		562		614		374		387	
Mercury	mg/kg	0.98		0.027	B							0.03	B	0.107		0.085		0.086	
Nickel	mg/kg	90.8		4.48		3.72		4.8		6.73		18.8		22.1		90.8		17	
Potassium	mg/kg	2830		308		242		369		339		1140		878		492		1080	
Selenium	mg/kg	ND										1.11	B	0.948	B				
Silver	mg/kg	ND						0.421	B										
Sodium	mg/kg	403		195	B	249		118	B	170	B	185	B	403		146	B	186	B
Vanadium	mg/kg	28.8		7.9		8.01		9.2		11.9		21.9		28.8		19.9		18.8	
Zinc	mg/kg	708		25.6		23.9		25		45.8		204		708		170		151	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07		0.509		0.0768		0.106		0.0366	J			0.373		0.3		0.14	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO165		TNTC-SO171		TNTC-SO171		TNTC-SO173		TNTC-SO190		TNTC-SO192		TNTC-SO192		TNTC-SO206	
		SAMPLE_NO		AB0442		AB0466		AB0467		AB0443		AB0444		AB0445		AB0446		AB0447	
		SAMPLE_DATE		27-Sep-00		28-Sep-00		28-Sep-00		11-Oct-00		11-Oct-00		11-Oct-00		11-Oct-00		12-Oct-00	
		FK.DEPTH		1.5 - 2.5 FT		4 - 6 FT		8 - 10 FT		1 - 2 FT		1 - 2 FT		0 - 1 FT		2 - 2.5 FT		1 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14														4.14			
Benzo(a)anthracene	mg/kg	11.1										0.0648	J	1	J	11.1		0.0498	J
Benzo(a)pyrene	mg/kg	8.2										0.0596	J	0.704	J	8.2		0.0449	J
Benzo(b)fluoranthene	mg/kg	10.2										0.102	J	0.929	J	10.2		0.0826	J
Benzo(ghi)perylene	mg/kg	3.4	J													3.4	J		
Benzo(k)fluoranthene	mg/kg	4.38														4.38			
Bis(2-ethylhexyl)phthalate	mg/kg	0.97								0.0409	J	0.0302	J					0.0419	J
Carbazole	mg/kg	0.109	J																
Chrysene	mg/kg	8.74										0.0656	J	0.831	J	8.74			
Di-n-butyl phthalate	mg/kg	0.169	J															0.0494	J
Dibenz(a,h)anthracene	mg/kg	1.4	J													1.4	J		
Diethyl phthalate	mg/kg	ND																0.624	B
Dinitrotoluene, 2,4-	mg/kg	275		10.6		275		24.1		0.0916	J			2.41	J	1.64	J		
Dinitrotoluene, 2,6-	mg/kg	65.5		2.88	J	23.8	J	1.68	J										
Fluoranthene	mg/kg	20.3										0.11	J	2.05	J	20.3		0.086	J
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J													3.64	J		
Methylnaphthalene, 2-	mg/kg	0.0381	J																
Phenanthrene	mg/kg	5.21												1.35	J	5.21			
Pyrene	mg/kg	17.1										0.0873	J	1.54	J	17.1			
VOLATILES																			
Acetone	mg/kg	0.456		0.0114	J					0.0444		0.109		0.0975				0.0846	
Benzene	mg/kg	0.00601												0.00601		0.00291	J	0.00162	J
Butanone, 2-	mg/kg	0.0818																	
Carbon disulfide	mg/kg	0.0272		0.0022	J	0.00337	J					0.00598				0.00423	J	0.01	
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104		0.0155	B	0.00625	B	0.00668	B	0.00594	B	0.00731	B	0.0054	JB	0.00443	JB	0.00622	B
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781										0.00302	J	0.00258	J	0.00692		0.00184	J
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO222		TNTC-SO241		TNTC-SO241		TNTC-SO252		TNTC-SO252		TNTC-SO252		TNTC-SO280		TNTC-SO311	
		SAMPLE_NO		AB0468		AB0448		AB0469		AB0451		AB0473		AB0474		AB0454		AB0455	
		SAMPLE_DATE		28-Sep-00		11-Oct-00		27-Sep-00		27-Sep-00		29-Sep-00		29-Sep-00		27-Sep-00		27-Sep-00	
		FK.DEPTH		3 - 5 FT		1 - 2 FT		4 - 6 FT		0.5 - 1.5 FT		4 - 6 FT		8 - 10 FT		0.25 - 1.25 FT		0.5 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6		0.151		11.5		0.589		4.78								0.588	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38				17.3		0.911		3.77		0.275						0.948	
Amino-4-nitrotoluene, 2-	mg/kg	0.4																	
Dinitrobenzene, 1,3-	mg/kg	0.751								0.0829	J					0.566			
Dinitrotoluene, 2,4-	mg/kg	8.7																	
Dinitrotoluene, 2,6-	mg/kg	1.9																	
Dinitrotoluene, 3,4-	mg/kg	1.2																	
Dinitrotoluene, total	mg/kg	297		0.483		2.75		0.257		0.57		0.121				22.1		0.781	
Nitrobenzene	mg/kg	0.3								0.283						0.227			
Nitrotoluene, 2-	mg/kg	50.8		1.94															
Nitrotoluene, 3-	mg/kg	8.61		0.263						0.462									
Nitrotoluene, 4-	mg/kg	67.4		1.99															
Tetryl	mg/kg	0.626																	
Trinitrobenzene, 1,3,5-	mg/kg	10.1				2.6		0.0616	J	0.966						10.1			
Trinitrotoluene, 2,4,6-	mg/kg	54969		0.166		900		0.213		681		1.32				54969		1.35	
GENERAL CHEMISTRY																			
% Solids	Percent	92.2		88.6		86.6		88.6		81.6		82		86.7		85		90	
METALS																			
Aluminum	mg/kg	11900		6810		5570		5360		3880		11000		10800		1870		4060	
Antimony	mg/kg	13.2								1.03	B			1.15	B			0.82	B
Arsenic	mg/kg	18.5		9.27		9.38		3.43		3.75		18.5		13.2		3.83		5.59	
Barium	mg/kg	427		57.5		81.6		28.3		19.6		62.3		43		30.3		27.9	
Beryllium	mg/kg	0.823		0.487		0.46		0.325		0.294		0.683		0.633		0.159	B	0.311	
Cadmium	mg/kg	2.19		0.385	B	1.19				0.163	B							0.285	B
Calcium	mg/kg	252000		67600		24000		7710		5710		34700		50800		959		5300	
Chromium	mg/kg	202		11		9.87		6.49		38		17.2		17.3		3.04		12.5	
Cobalt	mg/kg	21		3.89		4.5		2.41		3.45		10.8		12.1		1.14		2.41	
Copper	mg/kg	99.8		15.2		14.2		4.46		13.1		29.7		27.2		6.38		23.3	
Iron	mg/kg	35500		15400		28800		9180		11500		27600		25600		5520		9560	
Lead	mg/kg	934		68.9		58.1		9.27		117		14.6		13.4		97		721	
Magnesium	mg/kg	18700		6710		5900		3030		1600		10300		14000		388		1270	
Manganese	mg/kg	5160		396		1400		263		119		295		426		46.7		63.7	
Mercury	mg/kg	0.98		0.113		0.043		0.024	B	0.247		0.019	B	0.019	B	0.034		0.022	B
Nickel	mg/kg	90.8		12		15.4		6		24.9		31.9		33		3.3		12.3	
Potassium	mg/kg	2830		968		506		304		507		2690		2830		390		678	
Selenium	mg/kg	ND																	
Silver	mg/kg	ND				0.455	B												
Sodium	mg/kg	403		214	B	228		173	B	252		264		253		163	B	251	
Vanadium	mg/kg	28.8		16.5		17.3		11		18		20.9		19.8		6.56		11.3	
Zinc	mg/kg	708		158		359		29.3		55.4		91.4		83.9		25.2		112	
PESTICIDES/PCBs																			
Aroclor 1254	mg/kg	0.969																	
Aroclor 1260	mg/kg	5.07		0.0613	J	0.517		0.0196	J	0.41						0.883		0.162	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO222		TNTC-SO241		TNTC-SO241		TNTC-SO252		TNTC-SO252		TNTC-SO252		TNTC-SO280		TNTC-SO311	
		SAMPLE_NO		AB0468		AB0448		AB0469		AB0451		AB0473		AB0474		AB0454		AB0455	
		SAMPLE_DATE		28-Sep-00		11-Oct-00		27-Sep-00		27-Sep-00		29-Sep-00		29-Sep-00		27-Sep-00		27-Sep-00	
		FK.DEPTH		3 - 5 FT		1 - 2 FT		4 - 6 FT		0.5 - 1.5 FT		4 - 6 FT		8 - 10 FT		0.25 - 1.25 FT		0.5 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.545	J																
Anthracene	mg/kg	4.14		0.113	J														
Benzo(a)anthracene	mg/kg	11.1		0.289	J														
Benzo(a)pyrene	mg/kg	8.2		0.356	J														
Benzo(b)fluoranthene	mg/kg	10.2		0.492															
Benzo(ghi)perylene	mg/kg	3.4	J	0.352	J														
Benzo(k)fluoranthene	mg/kg	4.38		0.155	J														
Bis(2-ethylhexyl)phthalate	mg/kg	0.97		0.202	J							0.0207	J						
Carbazole	mg/kg	0.109	J	0.109	J														
Chrysene	mg/kg	8.74		0.357	J														
Di-n-butyl phthalate	mg/kg	0.169	J																
Dibenz(a,h)anthracene	mg/kg	1.4	J	0.123	J														
Diethyl phthalate	mg/kg	ND																	
Dinitrotoluene, 2,4-	mg/kg	275				5.68		0.0493	J	0.899	J					13.9		1.72	
Dinitrotoluene, 2,6-	mg/kg	65.5				10.7										8.43		0.428	
Fluoranthene	mg/kg	20.3		0.666															
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J	0.27	J														
Methylnaphthalene, 2-	mg/kg	0.0381	J	0.0381	J														
Phenanthrene	mg/kg	5.21		0.568															
Pyrene	mg/kg	17.1		0.605															
VOLATILES																			
Acetone	mg/kg	0.456		0.0644		0.0503		0.0519		0.0438						0.118		0.0375	
Benzene	mg/kg	0.00601																	
Butanone, 2-	mg/kg	0.0818								0.015									
Carbon disulfide	mg/kg	0.0272		0.0075						0.00347	J							0.00343	J
Ethylbenzene	mg/kg	0.00248	J																
Methylene chloride	mg/kg	0.0104		0.00308	JB	0.00505	JB	0.0162	B	0.00772	B			0.00138	JB	0.00831	B	0.00864	
Styrene	mg/kg	0.00197	J																
Toluene	mg/kg	0.0781		0.00194	J														
Xylene, o-	mg/kg	0.00323	J																
Xylenes, m,p-	mg/kg	0.0075																	

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO320		TNTC-SO325		TNTC-SO327		TNTC-SO383		TNTC-SO397		TNTC-SO407	
		SAMPLE_NO		AB0477		AB0478		AB0479		AB0470		AB0471		AB0472	
		SAMPLE_DATE		12-Oct-00		12-Oct-00		12-Oct-00		27-Sep-00		28-Sep-00		28-Sep-00	
		FK.DEPTH		1.5 - 2.5 FT		1 - 2 FT		2 - 3 FT		4 - 6 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES															
Amino-2,6-dinitrotoluene, 4-	mg/kg	14.6		2.6		2.45		2.2		0.192		0.946		0.333	
Amino-4,6-dinitrotoluene, 2-	mg/kg	38		6.23		11.4		3.02		0.182		0.359		0.433	
Amino-4-nitrotoluene, 2-	mg/kg	0.4													
Dinitrobenzene, 1,3-	mg/kg	0.751													
Dinitrotoluene, 2,4-	mg/kg	8.7													
Dinitrotoluene, 2,6-	mg/kg	1.9													
Dinitrotoluene, 3,4-	mg/kg	1.2													
Dinitrotoluene, total	mg/kg	297								0.156		2.03		0.824	
Nitrobenzene	mg/kg	0.3													
Nitrotoluene, 2-	mg/kg	50.8										0.921		0.295	
Nitrotoluene, 3-	mg/kg	8.61										0.31			
Nitrotoluene, 4-	mg/kg	67.4										1.18		0.39	
Tetryl	mg/kg	0.626													
Trinitrobenzene, 1,3,5-	mg/kg	10.1		3.24		0.283									
Trinitrotoluene, 2,4,6-	mg/kg	54969		38.7		33.7		9.91		0.0956	J	0.448		0.257	
GENERAL CHEMISTRY															
% Solids	Percent	92.2		87.5		82.7		87.5		85.8		87.7		79.4	
METALS															
Aluminum	mg/kg	11900		4170	H	3750	H	6190	H	7180		4630		1610	
Antimony	mg/kg	13.2						0.633	B					0.779	B
Arsenic	mg/kg	18.5		9.88		2.14		4.07		2.9		6.08		3.39	
Barium	mg/kg	427		52.8		14.1		46		27.3		92.4		38.7	
Beryllium	mg/kg	0.823		0.42		0.277		0.408		0.389		0.376		0.154	B
Cadmium	mg/kg	2.19		0.159	B										
Calcium	mg/kg	252000		45900	H	7300	H	6520	H	1410		26300		1610	
Chromium	mg/kg	202		8.08		6.27		10.1		6.34		8.03		3.84	
Cobalt	mg/kg	21		3.77		2.2		4.59		1.63		4.4		1.11	B
Copper	mg/kg	99.8		10.5		3.73		7.22		3.38		13		3.53	
Iron	mg/kg	35500		28500		6800		18000		6930		23100		6370	
Lead	mg/kg	934		9.46		14.2		8.61		6.03		129		4.22	
Magnesium	mg/kg	18700		13200		1870		1640		629		7380		434	
Manganese	mg/kg	5160		1120		111		424		81.9		1700		34.2	
Mercury	mg/kg	0.98				0.021	B	0.031	B	0.02	B	0.026	B		
Nickel	mg/kg	90.8		14		6.44		14.3		4.37		12.6		3.29	
Potassium	mg/kg	2830		680		354		822		253		476		355	
Selenium	mg/kg	ND													
Silver	mg/kg	ND													
Sodium	mg/kg	403		152	B	151	B	109	B	210	B	133	B	115	B
Vanadium	mg/kg	28.8		14.8		12.4		18		11.9		14.6		10.1	
Zinc	mg/kg	708		94.6		19.2		29.5		27.1		51		12.3	
PESTICIDES/PCBs															
Aroclor 1254	mg/kg	0.969													
Aroclor 1260	mg/kg	5.07		0.0237	J	0.0542	J	0.00951	J	0.0244	J	0.0592	J	0.0405	J

Table 3-11

TNTC - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		TNTC-SO320		TNTC-SO325		TNTC-SO327		TNTC-SO383		TNTC-SO397		TNTC-SO407	
		SAMPLE_NO		AB0477		AB0478		AB0479		AB0470		AB0471		AB0472	
		SAMPLE_DATE		12-Oct-00		12-Oct-00		12-Oct-00		27-Sep-00		28-Sep-00		28-Sep-00	
		FK.DEPTH		1.5 - 2.5 FT		1 - 2 FT		2 - 3 FT		4 - 6 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES															
Acenaphthylene	mg/kg	0.545	J												
Anthracene	mg/kg	4.14													
Benzo(a)anthracene	mg/kg	11.1										0.0384	J		
Benzo(a)pyrene	mg/kg	8.2										0.0361	J		
Benzo(b)fluoranthene	mg/kg	10.2													
Benzo(ghi)perylene	mg/kg	3.4	J												
Benzo(k)fluoranthene	mg/kg	4.38													
Bis(2-ethylhexyl)phthalate	mg/kg	0.97		0.0335	J			0.0392	J						
Carbazole	mg/kg	0.109	J												
Chrysene	mg/kg	8.74													
Di-n-butyl phthalate	mg/kg	0.169	J	0.169	J										
Dibenz(a,h)anthracene	mg/kg	1.4	J												
Diethyl phthalate	mg/kg	ND				0.672	B	0.529	B						
Dinitrotoluene, 2,4-	mg/kg	275		0.176	J	0.06	J					0.74			
Dinitrotoluene, 2,6-	mg/kg	65.5		0.386								0.117	J		
Fluoranthene	mg/kg	20.3													
Indeno(1,2,3-cd)pyrene	mg/kg	3.64	J												
Methylnaphthalene, 2-	mg/kg	0.0381	J												
Phenanthrene	mg/kg	5.21													
Pyrene	mg/kg	17.1													
VOLATILES															
Acetone	mg/kg	0.456				0.0602		0.0696		0.0228		0.151			
Benzene	mg/kg	0.00601				0.00184	J	0.00185	J						
Butanone, 2-	mg/kg	0.0818										0.0165			
Carbon disulfide	mg/kg	0.0272						0.0272				0.00605			
Ethylbenzene	mg/kg	0.00248	J					0.00119	J						
Methylene chloride	mg/kg	0.0104		0.0514	B	0.0122	B	0.00583	B	0.00706	B	0.0052	JB	0.006	JB
Styrene	mg/kg	0.00197	J												
Toluene	mg/kg	0.0781		0.0139		0.0032	J	0.00296	J			0.00208	J		
Xylene, o-	mg/kg	0.00323	J												
Xylenes, m,p-	mg/kg	0.0075		0.00389	J			0.00114	J						

MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
mg/kg - Milligrams per kilogram.
ND - Not detected in this Area of Concern without a "B" qualifier.
PCB - Polychlorinated biphenyl.
Qual - Laboratory qualifier.

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-BED-MW13			PB-BED-MW13			PB-BED-MW13			PB-BED-MW13		
				Sample No:		PB-BED-MW13			5160			5890			5895		
				Sample Date:		14-DEC-94			17-OCT-96			13-NOV-97			29-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			3.9			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		3.7			4.4			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			0.20			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		-			0.22			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		0.1			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		0.7			0.66			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		-			-			-			-		
Nitrobenzene		µg/L	0.34	0.5		-			0.50			-			-		
Nitrotoluene, 2-		µg/L	6.1	2310		1.9			0.34	X1 B	UJ	-			-		
Nitrotoluene, 3-		µg/L	6.1	182		11			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1290		-			-			-			-		
Tetryl		µg/L	36	ND		-			1.8	B	B	-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		2.2			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		-			-			-			-		
GENERAL CHEMISTRY																	
Alkalinity		µg/L	NE	610000		-			-			430000			300000		
Chloride		µg/L	NE	2500000		-			-			2500000			-		
Cyanide, total		µg/L	73	11		-			-			-			-		
Hardness		µg/L	NE	13000000		-			-			1600000			450000		
Nitrate		µg/L	1000	91000	J	-			-			-			-		
Nitrate		µg/L	1000	400		-			-			-			-		
Sulfate		µg/L	NE	2000000		-			-			13000			5000		
Total dissolved solids		µg/L	NE	4800000		-			-			4800000			510000		
Total organic carbon		µg/L	NE	10000		-			-			9600			2000		
Total suspended solids		µg/L	NE	280000		-			-			16000			-		
METALS																	
Aluminum	Y	µg/L	3650	432		-			-			-			-		
Aluminum		µg/L	3650	221000		-			-			-			-		
Antimony	Y	µg/L	1.5	14		14			-			-			-		
Antimony		µg/L	1.5	4.02	J	-			-			-			-		
Arsenic		µg/L	0.045	432	J	-			-			-			-		
Barium	Y	µg/L	255	3300		-			3300			1680			208		
Barium		µg/L	255	3700		-			3700			1680			-		
Beryllium	Y	µg/L	7.3	ND		-			-			-			-		
Beryllium		µg/L	7.3	17.2	J	-			-			-			-		
Cadmium		µg/L	1.8	0.962	J	-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-BED-MW13			PB-BED-MW13			PB-BED-MW13			PB-BED-MW13		
				Sample No:		PB-BED-MW13			5160			5890			5895		
				Sample Date:		14-DEC-94			17-OCT-96			13-NOV-97			29-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		-			381000			270000			140000		J
Calcium		µg/L	NE	2664000		-			418000			248000		J	125000		J
Chromium	Y	µg/L	11	15		-			13.4			-			-		
Chromium		µg/L	11	450		-			10.8			-			-		
Cobalt	Y	µg/L	73	112		-			-			-			-		
Cobalt		µg/L	73	471		-			-			-			-		
Copper	Y	µg/L	146	2.58	J	-			-			-			-		
Copper		µg/L	146	1110		-			-			-			-		
Iron	Y	µg/L	1095	22900		-			-			116		B	-		
Iron		µg/L	1095	979000		-			187			244		B	207		
Lead	Y	µg/L	15	36.1		-			-			-			-		
Lead		µg/L	15	2050		-			-			-			-		
Magnesium	Y	µg/L	NE	277000		-			277000			200000			14600		J
Magnesium		µg/L	NE	726000		-			308000		J	180000			9250		
Manganese	Y	µg/L	88	5300	J	-			16.0			-			43.8		
Manganese		µg/L	88	38100		-			21.0			17.4			41.9		
Mercury	Y	µg/L	1.1	0.68		-			-			-			-		
Mercury		µg/L	1.1	9.3		-			-			-			-		
Nickel	Y	µg/L	73	170		-			-			-			-		
Nickel		µg/L	73	1540		-			-			-			-		
Potassium	Y	µg/L	NE	110000		-			71100			110000			-		
Potassium		µg/L	NE	101000		-			79000			101000			-		
Selenium	Y	µg/L	18	11.4		-			-			-			-		
Selenium		µg/L	18	202	J	-			-			-			-		
Silver		µg/L	18	0.703	J	-			-			-			-		
Sodium	Y	µg/L	NE	1510000		-			1010000		J	1510000			53500		
Sodium		µg/L	NE	1330000		-			1080000		J	1330000			29500		
Vanadium	Y	µg/L	26	68.6		-			55.3			-			-		
Vanadium		µg/L	26	647		-			52.4			-			-		
Zinc	Y	µg/L	1095	52	J	-			40.2			30.1			-		
Zinc		µg/L	1095	3960		23			34.9		UJ	47.2			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-BED-MW13			PB-BED-MW13			PB-BED-MW13			PB-BED-MW13		
				Sample No:		PB-BED-MW13			5160			5890			5895		
				Sample Date:		14-DEC-94			17-OCT-96			13-NOV-97			29-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																	
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	-			4.7	J	J	39			55		J
Dimethylphenol, 2,4-		µg/L	73	16		10			13	J	J	16			13		J
Dinitrotoluene, 2,4-		µg/L	0.099	37600		-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	1330		-			-			-			-		
Isophorone		µg/L	71	2.7	J	-			-			-			2.7	J	J
Methylnaphthalene, 2-		µg/L	12	34		24			34			20			14		J
Methylphenol, 2-		µg/L	182	4.1	J	-			-			4.1	J	J	3.3	J	J
Methylphenol, 4-		µg/L	18	4.7	J	-			-			4.7	J	J	3.3	J	J
Naphthalene		µg/L	0.62	36		28			36			15			10		J
Phenol		µg/L	2190	69	J	-			-			62			69		J
VOLATILES																	
Acetone		µg/L	61	13.4	J	-			-			-			-		
Benzene		µg/L	0.34	190		50			190			130	D	D	47		
Carbon disulfide		µg/L	104	5.8		-			3.7	J	J	5.8			-		
Ethylbenzene		µg/L	130	86		82			86			73	D	D	57		
Methylene chloride		µg/L	4.3	ND		-			-			-			51	B	B
Toluene		µg/L	72	190		190			190			170	D	D	120	B	
Trichloroethene		µg/L	0.028	ND		-			-			-			-		
Xylenes, total		µg/L	21	860		720			860			620	D	D	540		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW4		
				Sample No:		5070			5630			5635			5080			5640		
				Sample Date:		27-SEP-96			21-NOV-97			18-MAY-98			30-SEP-96			24-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			-			-			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		-			-			-			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	0.5		-			-			-			-			-		
Nitrotoluene, 2-		µg/L	6.1	2310		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	182		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1290		-			-			-			-			-		
Tetryl		µg/L	36	ND		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	610000		-			270000			350000			-			330000		
Chloride		µg/L	NE	2500000		-			17000			14000			-			23000		
Cyanide, total		µg/L	73	11		-			-			-			-			-		
Hardness		µg/L	NE	13000000		-			13000000			1800000			-			9200000		
Nitrate		µg/L	1000	91000	J	-			-			-			-			91000		J
Nitrate		µg/L	1000	400		-			-			-			-			-		
Sulfate		µg/L	NE	2000000		-			2000000			1300000			-			1100000		
Total dissolved solids		µg/L	NE	4800000		-			3000000			2900000			-			2100000		
Total organic carbon		µg/L	NE	10000		-			2400			3000			-			2600		
Total suspended solids		µg/L	NE	280000		-			-			150000			-			5000		
METALS																				
Aluminum	Y	µg/L	3650	432		-			-			-			-			432		
Aluminum		µg/L	3650	221000		9540			-			6030			6590			3820		J
Antimony	Y	µg/L	1.5	14		-			-			-			-			-		
Antimony		µg/L	1.5	4.02	J	-			-			-			-			-		
Arsenic		µg/L	0.045	432	J	51.6			-			18.6			47.8			21.5		
Barium	Y	µg/L	255	3300		-			-			-			-			-		
Barium		µg/L	255	3700		286			-			-			-			-		
Beryllium	Y	µg/L	7.3	ND		-			-			-			-			-		
Beryllium		µg/L	7.3	17.2	J	-			-			-			-			-		
Cadmium		µg/L	1.8	0.962	J	-			-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW4		
				Sample No:		5070			5630			5635			5080			5640		
				Sample Date:		27-SEP-96			21-NOV-97			18-MAY-98			30-SEP-96			24-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		547000			529000			402000			313000			386000		
Calcium		µg/L	NE	2664000		527000			566000		J	341000			290000			285000		J
Chromium	Y	µg/L	11	15		15.0			-			-			-			-		
Chromium		µg/L	11	450		57.5			-			30.0			46.9			25.2		
Cobalt	Y	µg/L	73	112		112			-			-			-			-		
Cobalt		µg/L	73	471		131			67.5			-			-			-		
Copper	Y	µg/L	146	2.58	J	-			-			-			-			-		
Copper		µg/L	146	1110		48.6			-			31.5			31.8			-		
Iron	Y	µg/L	1095	22900		-			132		B	-			188			403		B
Iron		µg/L	1095	979000		41100			805			23500		J	36800			17400		
Lead	Y	µg/L	15	36.1		36.1			-			-			20.9			11.0		
Lead		µg/L	15	2050		47.7			-			13.8			36.4			14.5		
Magnesium	Y	µg/L	NE	277000		216000		J	204000			171000			168000		J	181000		
Magnesium		µg/L	NE	726000		211000			215000			137000			150000			145000		
Manganese	Y	µg/L	88	5300	J	5300		J	2900			617			998		J	1120		
Manganese		µg/L	88	38100		5100			2950			973			1130			800		
Mercury	Y	µg/L	1.1	0.68		-			-			-			-			-		
Mercury		µg/L	1.1	9.3		-			-			-			-			-		
Nickel	Y	µg/L	73	170		170			77.1			-			-			56.8		
Nickel		µg/L	73	1540		198			120			-			46.6			52.4		
Potassium	Y	µg/L	NE	110000		23700			25800			12000			30600			34500		
Potassium		µg/L	NE	101000		25300			26700			10100			28100			28200		
Selenium	Y	µg/L	18	11.4		-			-			-			-			11.4		
Selenium		µg/L	18	202	J	-			-			-			-			7.2		
Silver		µg/L	18	0.703	J	-			-			-			-			-		
Sodium	Y	µg/L	NE	1510000		78900			79400			74000			92300			94900		
Sodium		µg/L	NE	1330000		77000		J	86100		J	58900			79200		J	79700		J
Vanadium	Y	µg/L	26	68.6		68.6			-			-			52.5			-		
Vanadium		µg/L	26	647		87.7			-			-			70.1			-		
Zinc	Y	µg/L	1095	52	J	41.9			28.5		J	45.5		B	32.0			52.0		J
Zinc		µg/L	1095	3960		133			34.5			80.8		B	112			58.7		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW4		
				Sample No:		5070			5630			5635			5080			5640		
				Sample Date:		27-SEP-96			21-NOV-97			18-MAY-98			30-SEP-96			24-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	1.2	J	J	-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	37600		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	1330		-			-			-			-			-		
Isophorone		µg/L	71	2.7	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	34		-			-			-			-			-		
Methylphenol, 2-		µg/L	182	4.1	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	4.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	36		-			-			-			-			-		
Phenol		µg/L	2190	69	J	-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	13.4	J	-			-			-			-			-		
Benzene		µg/L	0.34	190		-			-			-			-			-		
Carbon disulfide		µg/L	104	5.8		-			-			-			-			-		
Ethylbenzene		µg/L	130	86		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		6.9		U	-			0.47	J B	B	5.9	B	U	-		
Toluene		µg/L	72	190		-			-			-			-			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	860		1.0	J	J	-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW4			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW6		
				Sample No:		5645			5090			5650			5655			5100		
				Sample Date:		18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98			02-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			-			-			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		-			-			-			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	0.5		-			-			-			-			-		
Nitrotoluene, 2-		µg/L	6.1	2310		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	182		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1290		-			-			-			-			-		
Tetryl		µg/L	36	ND		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	610000		250000			-			320000			380000			-		
Chloride		µg/L	NE	2500000		27000			-			50000			26000			-		
Cyanide, total		µg/L	73	11		-			-			-			-			-		
Hardness		µg/L	NE	13000000		720000			-			500000			850000			-		
Nitrate		µg/L	1000	91000	J	-			-			-			-			-		
Nitrate		µg/L	1000	400		400			-			-			200			-		
Sulfate		µg/L	NE	2000000		990000			-			430000			240000			-		
Total dissolved solids		µg/L	NE	4800000		1600000			-			1000000			1200000			-		
Total organic carbon		µg/L	NE	10000		3000			-			3000			3000			-		
Total suspended solids		µg/L	NE	280000		280000			-			7000			240000			-		
METALS																				
Aluminum	Y	µg/L	3650	432		-			-			-			-			-		
Aluminum		µg/L	3650	221000		4570		J	1960			3490		J	5230			2660		J
Antimony	Y	µg/L	1.5	14		-			-			-			-			-		
Antimony		µg/L	1.5	4.02	J	-			-			-			-			-		
Arsenic		µg/L	0.045	432	J	-			-			10.1			21.3			-		
Barium	Y	µg/L	255	3300		-			-			-			-			-		
Barium		µg/L	255	3700		-			-			-			-			-		
Beryllium	Y	µg/L	7.3	ND		-			-			-			-			-		
Beryllium		µg/L	7.3	17.2	J	-			-			-			-			-		
Cadmium		µg/L	1.8	0.962	J	-			-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW4			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW6		
				Sample No:		5645			5090			5650			5655			5100		
				Sample Date:		18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98			02-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		306000			126000			138000			130000			253000		
Calcium		µg/L	NE	2664000		299000			135000			146000		J	132000			255000		
Chromium	Y	µg/L	11	15		-			-			-			-			**14.9**		
Chromium		µg/L	11	450		11.0			**17.4**			**18.4**			**28.0**			**50.7**		
Cobalt	Y	µg/L	73	112		-			-			-			-			-		
Cobalt		µg/L	73	471		-			-			-			-			-		
Copper	Y	µg/L	146	2.58	J	-			-			-			-			-		
Copper		µg/L	146	1110		-			-			-			31.0			-		
Iron	Y	µg/L	1095	22900		-			-			-			-			146		
Iron		µg/L	1095	979000		**8230**			**6540**			**13900**			**22700**		J	**9940**		
Lead	Y	µg/L	15	36.1		-			-			4.2			-			3.6		
Lead		µg/L	15	2050		3.2			**23.6**			13.8			**20.1**			18.0		U
Magnesium	Y	µg/L	NE	277000		140000			51700		J	54600			47700			16800		
Magnesium		µg/L	NE	726000		136000			53100			55900			46400			17800		
Manganese	Y	µg/L	88	5300	J	**582**			**503**		J	**522**			**452**			**2540**		
Manganese		µg/L	88	38100		**715**			**717**			**713**			**616**			**2580**		
Mercury	Y	µg/L	1.1	0.68		-			-			-			-			-		
Mercury		µg/L	1.1	9.3		-			-			-			-			-		
Nickel	Y	µg/L	73	170		-			-			-			-			-		
Nickel		µg/L	73	1540		-			-			-			-			-		
Potassium	Y	µg/L	NE	110000		21100			15900			14700			12300			14500		
Potassium		µg/L	NE	101000		22100			16400			15400			11700			14100		
Selenium	Y	µg/L	18	11.4		-			-			-			-			-		
Selenium		µg/L	18	202	J	-			-			-			-			-		
Silver		µg/L	18	0.703	J	-			-			-			-			-		
Sodium	Y	µg/L	NE	1510000		60200			178000			163000			127000			17300		
Sodium		µg/L	NE	1330000		62100			178000		J	161000		J	113000			17200		
Vanadium	Y	µg/L	26	68.6		-			-			-			-			-		
Vanadium		µg/L	26	647		-			-			-			-			-		
Zinc	Y	µg/L	1095	52	J	-			45.0			-			27.0		B	32.9		U
Zinc		µg/L	1095	3960		41.2		B	48.9			53.0			56.3		B	83.1		U

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW4			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW5			PB-TNTC-MW6		
				Sample No:		5645			5090			5650			5655			5100		
				Sample Date:		18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98			02-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	37600		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	1330		-			-			-			-			-		
Isophorone		µg/L	71	2.7	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	34		-			-			-			-			-		
Methylphenol, 2-		µg/L	182	4.1	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	4.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	36		-			-			-			-			-		
Phenol		µg/L	2190	69	J	-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	13.4	J	2.5	J B	B	-			-			-			-		
Benzene		µg/L	0.34	190		-			-			-			-			-		
Carbon disulfide		µg/L	104	5.8		-			-			0.51	J B	B	-			-		
Ethylbenzene		µg/L	130	86		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			5.7		U	0.43	J B	B	0.51	J B	B	-		
Toluene		µg/L	72	190		-			-			-			-			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	860		-			-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW6			PB-TNTC-MW6			PB-TNTC-MW6		
				Sample No:		5660			5665			5665R		
				Sample Date:		20-NOV-97			16-MAY-98			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		-			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		-			-			-		
Nitrobenzene		µg/L	0.34	0.5		-			-			-		
Nitrotoluene, 2-		µg/L	6.1	2310		-			-			-		
Nitrotoluene, 3-		µg/L	6.1	182		-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1290		-			-			-		
Tetryl		µg/L	36	ND		-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		-			-			-		
GENERAL CHEMISTRY														
Alkalinity		µg/L	NE	610000		610000			610000			-		
Chloride		µg/L	NE	2500000		3000			180000			-		
Cyanide, total		µg/L	73	11		-			-			-		
Hardness		µg/L	NE	13000000		920000			790000			-		
Nitrate		µg/L	1000	91000	J	-			-			-		
Nitrate		µg/L	1000	400		-			-			-		
Sulfate		µg/L	NE	2000000		-			-			-		
Total dissolved solids		µg/L	NE	4800000		640000			620000			-		
Total organic carbon		µg/L	NE	10000		10000			9000			-		
Total suspended solids		µg/L	NE	280000		130000			4000			-		
METALS														
Aluminum	Y	µg/L	3650	432		-			-			-		
Aluminum		µg/L	3650	221000		496		J	-			-		
Antimony	Y	µg/L	1.5	14		-			-			-		
Antimony		µg/L	1.5	4.02	J	-			-			-		
Arsenic		µg/L	0.045	432	J	-			-			-		
Barium	Y	µg/L	255	3300		-			-			-		
Barium		µg/L	255	3700		-			-			-		
Beryllium	Y	µg/L	7.3	ND		-			-			-		
Beryllium		µg/L	7.3	17.2	J	-			-			-		
Cadmium		µg/L	1.8	0.962	J	-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW6			PB-TNTC-MW6			PB-TNTC-MW6		
				Sample No:		5660			5665			5665R		
				Sample Date:		20-NOV-97			16-MAY-98			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		243000			213000			-		
Calcium		µg/L	NE	2664000		223000			194000			-		
Chromium	Y	µg/L	11	15		-			-			-		
Chromium		µg/L	11	450		-			-			-		
Cobalt	Y	µg/L	73	112		-			-			-		
Cobalt		µg/L	73	471		-			-			-		
Copper	Y	µg/L	146	2.58	J	-			-			-		
Copper		µg/L	146	1110		-			-			-		
Iron	Y	µg/L	1095	22900		1570			684			-		
Iron		µg/L	1095	979000		2460			2080		J	-		
Lead	Y	µg/L	15	36.1		-			-			-		
Lead		µg/L	15	2050		-			-			-		
Magnesium	Y	µg/L	NE	277000		17500			14100			-		
Magnesium		µg/L	NE	726000		15600			12700			-		
Manganese	Y	µg/L	88	5300	J	4020			3970			-		
Manganese		µg/L	88	38100		3700			3830			-		
Mercury	Y	µg/L	1.1	0.68		-			-			-		
Mercury		µg/L	1.1	9.3		-			-			-		
Nickel	Y	µg/L	73	170		-			-			-		
Nickel		µg/L	73	1540		-			-			-		
Potassium	Y	µg/L	NE	110000		14300			12200			-		
Potassium		µg/L	NE	101000		12200			9830			-		
Selenium	Y	µg/L	18	11.4		-			-			-		
Selenium		µg/L	18	202	J	-			-			-		
Silver		µg/L	18	0.703	J	-			-			-		
Sodium	Y	µg/L	NE	1510000		21300			15400			-		
Sodium		µg/L	NE	1330000		17600			9450			-		
Vanadium	Y	µg/L	26	68.6		-			-			-		
Vanadium		µg/L	26	647		-			-			-		
Zinc	Y	µg/L	1095	52	J	-			-			-		
Zinc		µg/L	1095	3960		-			66.7		B	-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC		
				Location Code:		PB-TNTC-MW6			PB-TNTC-MW6			PB-TNTC-MW6		
				Sample No:		5660			5665			5665R		
				Sample Date:		20-NOV-97			16-MAY-98			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	73	J	J	-			-		
Dimethylphenol, 2,4-		µg/L	73	16		-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	37600		-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	1330		-			-			-		
Isophorone		µg/L	71	2.7	J	-			-			-		
Methylnaphthalene, 2-		µg/L	12	34		-			-			-		
Methylphenol, 2-		µg/L	182	4.1	J	-			-			-		
Methylphenol, 4-		µg/L	18	4.7	J	-			-			-		
Naphthalene		µg/L	0.62	36		-			-			-		
Phenol		µg/L	2190	69	J	-			-			-		
VOLATILES														
Acetone		µg/L	61	13.4	J	-			-			1.7	J	B
Benzene		µg/L	0.34	190		-			-			-		
Carbon disulfide		µg/L	104	5.8		-			-			-		
Ethylbenzene		µg/L	130	86		-			-			-		
Methylene chloride		µg/L	4.3	ND		0.32	J B	B	-			-		
Toluene		µg/L	72	190		-			-			22		
Trichloroethene		µg/L	0.028	ND		-			-			-		
Xylenes, total		µg/L	21	860		-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW02			TNTC-GW03			TNTC-GW04			TNTC-GW05			TNTC-GW06		
				Sample No:		AB3002			AB3003			AB3004			AB3005			AB3006		
				Sample Date:		10-OCT-00			28-SEP-00			28-SEP-00			10-OCT-00			28-SEP-00		
				Sample Depth:		10 to 15			7.4 to 8.4			9 to 10			1.9 to 16.55			13 to 14		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			-			-			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		436			0.715			59.4			48			2.27		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	-			0.181	J	J	147	D	D	34.9			2.88		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		0.802			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		-			-			-			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		1260			-			338	D	D	9.64			0.754		
Nitrobenzene		µg/L	0.34	0.5		-			-			-			0.488			-		
Nitrotoluene, 2-		µg/L	6.1	2310		258			-			4.73			-			-		
Nitrotoluene, 3-		µg/L	6.1	182		16.1			-			0.88			-			-		
Nitrotoluene, 4-		µg/L	6.1	1290		94.7			-			-			-			-		
Tetryl		µg/L	36	ND		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		-			-			-			10.3			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		1880			2.13			620	D	D	9720			0.547		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	610000		-			-			-			-			-		
Chloride		µg/L	NE	2500000		-			-			-			-			-		
Cyanide, total		µg/L	73	11		-			-			-			-			-		
Hardness		µg/L	NE	13000000		-			-			-			-			-		
Nitrate		µg/L	1000	91000	J	-			-			-			-			-		
Nitrate		µg/L	1000	400		-			-			-			-			-		
Sulfate		µg/L	NE	2000000		-			-			-			-			-		
Total dissolved solids		µg/L	NE	4800000		-			-			-			-			-		
Total organic carbon		µg/L	NE	10000		-			-			-			-			-		
Total suspended solids		µg/L	NE	280000		-			-			-			-			-		
METALS																				
Aluminum	Y	µg/L	3650	432		-			-			107	B	B	-			334		
Aluminum		µg/L	3650	221000		15400			9370			12300			26400			7310		
Antimony	Y	µg/L	1.5	14		-			-			-			-			-		
Antimony		µg/L	1.5	4.02	J	4.02	B	J	-			-			-			-		
Arsenic		µg/L	0.045	432	J	9.86		J	11		J	8.22		J	21.6		J	9.23		J
Barium	Y	µg/L	255	3300		-			-			42.4			-			76.1		
Barium		µg/L	255	3700		264			178			143			207			155		
Beryllium	Y	µg/L	7.3	ND		-			-			0.104	B	B	-			-		
Beryllium		µg/L	7.3	17.2	J	1.18			0.766	B	J	1.07			2.35			0.608	B	J
Cadmium		µg/L	1.8	0.962	J	-			-			-			0.962	B	J	-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW02			TNTC-GW03			TNTC-GW04			TNTC-GW05			TNTC-GW06		
				Sample No:		AB3002			AB3003			AB3004			AB3005			AB3006		
				Sample Date:		10-OCT-00			28-SEP-00			28-SEP-00			10-OCT-00			28-SEP-00		
				Sample Depth:		10 to 15			7.4 to 8.4			9 to 10			1.9 to 16.55			13 to 14		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		-			-			132000			-			197000		
Calcium		µg/L	NE	2664000		214000			223000			338000			224000			214000		
Chromium	Y	µg/L	11	15		-			-			-			-			1.54	B	J
Chromium		µg/L	11	450		**48.6**			**32.2**			**24.4**			**64**			**19.3**		
Cobalt	Y	µg/L	73	112		-			-			1.8	B	J	-			-		
Cobalt		µg/L	73	471		15.6			13.5			16.2			28.2			7.23		
Copper	Y	µg/L	146	2.58	J	-			-			2.58	B	J	-			2.07	B	J
Copper		µg/L	146	1110		41.4			29.7			26.5			**516**			14		
Iron	Y	µg/L	1095	22900		-			-			240			-			771		
Iron		µg/L	1095	979000		**32200**			**47100**			**29100**			**72900**			**21800**		
Lead	Y	µg/L	15	36.1		-			-			-			-			-		
Lead		µg/L	15	2050		**46.1**			**241**			**23.6**			**2050**			**15.5**		
Magnesium	Y	µg/L	NE	277000		-			-			29100			-			46500		
Magnesium		µg/L	NE	726000		37000			43600			34700			50100			49100		
Manganese	Y	µg/L	88	5300	J	-			-			**236**			-			**226**		
Manganese		µg/L	88	38100		**1170**			**1070**			**1890**			**1040**			**958**		
Mercury	Y	µg/L	1.1	0.68		-			-			0.11	B	J	-			-		
Mercury		µg/L	1.1	9.3		-			-			0.146	B	J	**9.3**			-		
Nickel	Y	µg/L	73	170		-			-			2.04	B	J	-			-		
Nickel		µg/L	73	1540		38.6			52.5			40.8			**86.4**			18.5		
Potassium	Y	µg/L	NE	110000		-			-			1110			-			848		
Potassium		µg/L	NE	101000		4560			5080			6490			13600			2220		
Selenium	Y	µg/L	18	11.4		-			-			-			-			2.73	B	J
Selenium		µg/L	18	202	J	-			-			-			-			-		
Silver		µg/L	18	0.703	J	-			-			-			0.703	B	J	-		
Sodium	Y	µg/L	NE	1510000		-			-			2030			-			3190		
Sodium		µg/L	NE	1330000		2640			2730			2520			23600			3630		
Vanadium	Y	µg/L	26	68.6		-			-			-			-			1.27	B	J
Vanadium		µg/L	26	647		**70.4**			**49.3**			24			**111**			**32.6**		
Zinc	Y	µg/L	1095	52	J	-			-			5.89	B	J	-			5.74	B	J
Zinc		µg/L	1095	3960		137			162			99.6			993			53.2		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW02			TNTC-GW03			TNTC-GW04			TNTC-GW05			TNTC-GW06		
				Sample No:		AB3002			AB3003			AB3004			AB3005			AB3006		
				Sample Date:		10-OCT-00			28-SEP-00			28-SEP-00			10-OCT-00			28-SEP-00		
				Sample Depth:		10 to 15			7.4 to 8.4			9 to 10			1.9 to 16.55			13 to 14		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	37600		4610			-			215			3.64	J	J	-		
Dinitrotoluene, 2,6-		µg/L	0.099	1330		1330			-			45.5	J	J	-			-		
Isophorone		µg/L	71	2.7	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	34		-			-			-			-			-		
Methylphenol, 2-		µg/L	182	4.1	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	4.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	36		-			-			-			-			-		
Phenol		µg/L	2190	69	J	-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	13.4	J	6.92	B	B	13.4		J	-			-			-		
Benzene		µg/L	0.34	190		-			0.51	J	J	-			-			-		
Carbon disulfide		µg/L	104	5.8		0.76	J	J	-			-			-			-		
Ethylbenzene		µg/L	130	86		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		1.18	B	B	0.68	J	B	1.2		B	1.15	B	B	0.91	J	B
Toluene		µg/L	72	190		1	J	J	0.83	J	J	-			-			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	860		-			-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW07			TNTC-GW08			TNTC-GW09			TNTC-GW10		
				Sample No:		AB3007			AB3008			AB3009			AB3010		
				Sample Date:		28-SEP-00			10-OCT-00			29-SEP-00			27-SEP-00		
				Sample Depth:		12. to 12.6			10 to 15			11. to 20			4 to 6		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	Y	µg/L	0.22	3.9		-			-			-			-		
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	436		2.74			419			17.4			21.1		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	147	D	3.2			-			40.3			15.1		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	0.2		-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	0.802		-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	0.1		-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	0.7		-			-			-			-		
Dinitrotoluene, total		µg/L	0.1	21100		1.8			21100			453			7.9		
Nitrobenzene		µg/L	0.34	0.5		-			-			-			-		
Nitrotoluene, 2-		µg/L	6.1	2310		0.791			236			2310			2.61		
Nitrotoluene, 3-		µg/L	6.1	182		-			18.4			182			0.481	J	J
Nitrotoluene, 4-		µg/L	6.1	1290		-			189			1290			0.396	J	J
Tetryl		µg/L	36	ND		-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	10.3		-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	20100		0.208	J	J	20100			3.9			9.7		
GENERAL CHEMISTRY																	
Alkalinity		µg/L	NE	610000		-			-			-			-		
Chloride		µg/L	NE	2500000		-			-			-			-		
Cyanide, total		µg/L	73	11		-			-			-			-		
Hardness		µg/L	NE	13000000		-			-			-			-		
Nitrate		µg/L	1000	91000	J	-			-			-			-		
Nitrate		µg/L	1000	400		-			-			-			-		
Sulfate		µg/L	NE	2000000		-			-			-			-		
Total dissolved solids		µg/L	NE	4800000		-			-			-			-		
Total organic carbon		µg/L	NE	10000		-			-			-			-		
Total suspended solids		µg/L	NE	280000		-			-			-			-		
METALS																	
Aluminum	Y	µg/L	3650	432		-			-			-			-		
Aluminum		µg/L	3650	221000		19500			4470			221000			426		
Antimony	Y	µg/L	1.5	14		-			-			-			-		
Antimony		µg/L	1.5	4.02	J	-			-			-			-		
Arsenic		µg/L	0.045	432	J	39.1		J	5.15		J	432		J	-		
Barium	Y	µg/L	255	3300		-			-			-			16.4		
Barium		µg/L	255	3700		579			140			3540			21.5		
Beryllium	Y	µg/L	7.3	ND		-			-			-			-		
Beryllium		µg/L	7.3	17.2	J	1.6			0.343	B	B	17.2	B	J	-		
Cadmium		µg/L	1.8	0.962	J	-			-			-			-		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW07			TNTC-GW08			TNTC-GW09			TNTC-GW10		
				Sample No:		AB3007			AB3008			AB3009			AB3010		
				Sample Date:		28-SEP-00			10-OCT-00			29-SEP-00			27-SEP-00		
				Sample Depth:		12. to 12.6			10 to 15			11. to 20			4 to 6		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Calcium	Y	µg/L	NE	547000		-			-			-			135000		
Calcium		µg/L	NE	2664000		514000			154000			2664000			147000		
Chromium	Y	µg/L	11	15		-			-			-			-		
Chromium		µg/L	11	450		47.2			10			450			-		
Cobalt	Y	µg/L	73	112		-			-			-			-		
Cobalt		µg/L	73	471		21.1			5.93			471			-		
Copper	Y	µg/L	146	2.58	J	-			-			-			3.23	B	B
Copper		µg/L	146	1110		45.5			15.2			1110			4.13	B	J
Iron	Y	µg/L	1095	22900		-			-			-			-		
Iron		µg/L	1095	979000		68500			7450			979000			810		
Lead	Y	µg/L	15	36.1		-			-			-			-		
Lead		µg/L	15	2050		54.6			20.8			1460			-		
Magnesium	Y	µg/L	NE	277000		-			-			-			12100		
Magnesium		µg/L	NE	726000		90000			20700			726000			12500		
Manganese	Y	µg/L	88	5300	J	-			-			-			115		
Manganese		µg/L	88	38100		1300			317			38100			108		
Mercury	Y	µg/L	1.1	0.68		-			-			-			-		
Mercury		µg/L	1.1	9.3		0.15	B	J	-			-			0.105	B	J
Nickel	Y	µg/L	73	170		-			-			-			-		
Nickel		µg/L	73	1540		56.3			16.6			1540			2.5	B	J
Potassium	Y	µg/L	NE	110000		-			-			-			4770		
Potassium		µg/L	NE	101000		5820			1650			32500			6020		
Selenium	Y	µg/L	18	11.4		-			-			-			-		
Selenium		µg/L	18	202	J	2.31	B	J	-			202	B	J	-		
Silver		µg/L	18	0.703	J	-			-			-			-		
Sodium	Y	µg/L	NE	1510000		-			-			-			2900		
Sodium		µg/L	NE	1330000		7360			1810			28100	B	J	3400		
Vanadium	Y	µg/L	26	68.6		-			-			-			-		
Vanadium		µg/L	26	647		93.9			17.7			647			1.02	B	J
Zinc	Y	µg/L	1095	52	J	-			-			-			16.5		
Zinc		µg/L	1095	3960		175			42.5			3960			24.9		

Table 3-12

TNTC - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		TNTC			TNTC			TNTC			TNTC		
				Location Code:		TNTC-GW07			TNTC-GW08			TNTC-GW09			TNTC-GW10		
				Sample No:		AB3007			AB3008			AB3009			AB3010		
				Sample Date:		28-SEP-00			10-OCT-00			29-SEP-00			27-SEP-00		
				Sample Depth:		12. to 12.6			10 to 15			11. to 20			4 to 6		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																	
Bis(2-ethylhexyl)phthalate		µg/L	4.8	55	J	-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16		-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	37600		**6.91**	J	J	**37600**			**442**			**4.05**	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	1330		-			**1060**	J	J	**122**			**23**	J	J
Isophorone		µg/L	71	2.7	J	-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	34		-			-			-			-		
Methylphenol, 2-		µg/L	182	4.1	J	-			-			-			-		
Methylphenol, 4-		µg/L	18	4.7	J	-			-			-			-		
Naphthalene		µg/L	0.62	36		-			-			-			-		
Phenol		µg/L	2190	69	J	-			-			-			-		
VOLATILES																	
Acetone		µg/L	61	13.4	J	-			-			-			-		
Benzene		µg/L	0.34	190		-			-			**0.59**	J	J	-		
Carbon disulfide		µg/L	104	5.8		-			-			-			-		
Ethylbenzene		µg/L	130	86		-			-			-			-		
Methylene chloride		µg/L	4.3	ND		1.34		B	0.94	JB	B	0.96	J	B	0.71	J	B
Toluene		µg/L	72	190		-			-			7.88			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-		
Xylenes, total		µg/L	21	860		-			-			-			-		

"-" - Indicates the parameter was not detected.
Bold text and shaded cell indicates value above RBSC value.
FI - Filtered ("Y" = Yes).
RBSC - Risk-based screening concentration.]Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1.For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established.
Qual - Laboratory qualifier.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method or field blank(s).
N - Tentative identification. Consider present. Special methods may be needed to confirm its presence in future sampling efforts.
D - Dilution.

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		MK-PMU1-SW-SD02		MK-PMU1-SW-SD03		PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
			SAMPLE_NO		MK01SW02		MK01SW03		PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
			SAMPLE_DATE		29-Jun-93		29-Jun-93		25-Oct-94		25-Oct-94		25-Oct-94		25-Oct-94		27-Oct-94	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																		
Amino-2-nitrotoluene, 4-	µg/L		0.6										0.6					
Dinitrobenzene, 1,3-	µg/L		0.3						0.3									
Dinitrotoluene, 2,4-	µg/L		0.5						0.5									
Dinitrotoluene, 2,6-	µg/L		0.8														0.8	
Dinitrotoluene, 3,4-	µg/L		0.6						0.5		0.6		0.6		0.6			
Nitrotoluene, 3-	µg/L		54								2.3		2.4		2.5		54	
GENERAL CHEMISTRY																		
Hardness	µg/L		592000															
Phosphorous	µg/L		370															
Total suspended solids	µg/L		220000						17000		21000		21000		24000		220000	
METALS																		
Aluminum	µg/L		13800		790		720											
Aluminum	µg/L	Y	11400															
Arsenic	µg/L		21.8															
Arsenic	µg/L	Y	17.2															
Barium	µg/L		131		35.9	B	36	B										
Calcium	µg/L		115000		84100		85800											
Calcium	µg/L	Y	106000															
Chromium	µg/L		23.3														10	
Chromium	µg/L	Y	21.2															
Cobalt	µg/L		18.7															
Copper	µg/L		20.5															
Iron	µg/L		26000		954		1000											
Iron	µg/L	Y	15500															
Lead	µg/L		77										77					
Lead	µg/L	Y	20.4															
Magnesium	µg/L		50700		20400		20700											
Magnesium	µg/L	Y	49100															
Manganese	µg/L		2960		31.2		37.7		190		260		230		260		1600	
Manganese	µg/L	Y	1300						150		210		210		200		1300	
Nickel	µg/L		32.7														20	
Potassium	µg/L		12800		3860	B	4030	B										
Potassium	µg/L	Y	9370															
Sodium	µg/L		107000		21700		22200											
Sodium	µg/L	Y	112000															
Vanadium	µg/L		52.2															
Zinc	µg/L		191		16.6	B	191						43		46		70	
Zinc	µg/L	Y	68						20		23							

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		MK-PMU1-SW-SD02		MK-PMU1-SW-SD03		PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
			SAMPLE_NO		MK01SW02		MK01SW03		PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
			SAMPLE_DATE		29-Jun-93		29-Jun-93		25-Oct-94		25-Oct-94		25-Oct-94		25-Oct-94		27-Oct-94	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																		
Bis(2-ethylhexyl)phthalate	µg/L		2.7	J														
Di-n-octyl phthalate	µg/L		7.8	J														
Phenol	µg/L		ND															
VOLATILES																		
Acetone	µg/L		ND															
Bromomethane	µg/L		0.22	J														
Butanone, 2-	µg/L		7		7													

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		PB-WA-SW7		WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05		WARP-SW06	
			SAMPLE_NO		PB-WA-SW7		12100		12110		12120		12130		12140		12150	
			SAMPLE_DATE		25-Oct-94		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																		
Amino-2-nitrotoluene, 4-	µg/L		0.6															
Dinitrobenzene, 1,3-	µg/L		0.3															
Dinitrotoluene, 2,4-	µg/L		0.5															
Dinitrotoluene, 2,6-	µg/L		0.8															
Dinitrotoluene, 3,4-	µg/L		0.6															
Nitrotoluene, 3-	µg/L		54		2.2													
GENERAL CHEMISTRY																		
Hardness	µg/L		592000				380000		408000		400000		420000		372000		592000	
Phosphorous	µg/L		370															
Total suspended solids	µg/L		220000		20000													
METALS																		
Aluminum	µg/L		13800				631				300				13800		12400	
Aluminum	µg/L	Y	11400								233				6340		11400	
Arsenic	µg/L		21.8												20.2		21.8	
Arsenic	µg/L	Y	17.2												10.9		17.2	
Barium	µg/L		131															
Calcium	µg/L		115000				107000		106000		106000		105000		31100		115000	
Calcium	µg/L	Y	106000				104000		106000		104000		103000		27600		71500	
Chromium	µg/L		23.3												17.4		23.3	
Chromium	µg/L	Y	21.2														21.2	
Cobalt	µg/L		18.7															
Copper	µg/L		20.5															
Iron	µg/L		26000				1300		126		747		646		21100		19000	
Iron	µg/L	Y	15500				153				484		589		8630		15500	
Lead	µg/L		77		54										25		32.9	
Lead	µg/L	Y	20.4												7.2		20.4	
Magnesium	µg/L		50700				26000		26500		26200		25800		46500		50700	
Magnesium	µg/L	Y	49100				25600		26500		25700		25400		44300		49100	
Manganese	µg/L		2960		240		890		30.6		261		126		1150		1550	
Manganese	µg/L	Y	1300		230		218				97.2		107		669		907	
Nickel	µg/L		32.7															
Potassium	µg/L		12800				9400		9730		9750		9910		5590		5180	
Potassium	µg/L	Y	9370				8870		9340		9080		9370				5900	
Sodium	µg/L		107000				38200		39300		38300		39000		104000		107000	
Sodium	µg/L	Y	112000				37400		38800		37200		37900		103000		112000	
Vanadium	µg/L		52.2														52.2	
Zinc	µg/L		191		26		27								84.8		92.5	
Zinc	µg/L	Y	68												42.3		68	

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		PB-WA-SW7		WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05		WARP-SW06	
			SAMPLE_NO		PB-WA-SW7		12100		12110		12120		12130		12140		12150	
			SAMPLE_DATE		25-Oct-94		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																		
Bis(2-ethylhexyl)phthalate	µg/L		2.7	J					2.7	J							1.7	J
Di-n-octyl phthalate	µg/L		7.8	J											7.8	J		
Phenol	µg/L		ND				6.9	J B	4	J B	4.5	J B	1.4	J B	1.7	J B	2.2	J B
VOLATILES																		
Acetone	µg/L		ND				1.4	J B	2.6	J B	2.4	J B	3.1	J B	1.6	J B	2.7	J B
Bromomethane	µg/L		0.22	J			0.22	J			0.16	J	0.21	J	0.21	J	0.16	J
Butanone, 2-	µg/L		7															

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		WRWP-SW006		WRWP-SW007		WRWP-SW008		WRWP-SW009		WRWP-SW010	
			SAMPLE_NO		AD2006		AD2007		AD2008		AD2009		AD2010	
			SAMPLE_DATE		13-Sep-00		13-Sep-00		13-Sep-00		13-Sep-00		13-Sep-00	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES														
Amino-2-nitrotoluene, 4-	µg/L		0.6											
Dinitrobenzene, 1,3-	µg/L		0.3											
Dinitrotoluene, 2,4-	µg/L		0.5											
Dinitrotoluene, 2,6-	µg/L		0.8											
Dinitrotoluene, 3,4-	µg/L		0.6											
Nitrotoluene, 3-	µg/L		54											
GENERAL CHEMISTRY														
Hardness	µg/L		592000											
Phosphorous	µg/L		370		260		370		260				210	
Total suspended solids	µg/L		220000											
METALS														
Aluminum	µg/L		13800		286		888		313		13500		2610	
Aluminum	µg/L	Y	11400											
Arsenic	µg/L		21.8		9.6		7.2		7.1		10.7			
Arsenic	µg/L	Y	17.2											
Barium	µg/L		131		18.3		22		20.4		131		57.1	
Calcium	µg/L		115000		15400		18800		16000		21800		69600	
Calcium	µg/L	Y	106000											
Chromium	µg/L		23.3				2.5		1.2		19.8		3.3	
Chromium	µg/L	Y	21.2											
Cobalt	µg/L		18.7				1.6				18.7		2.1	
Copper	µg/L		20.5		3		2.9		1.4		20.5		7.2	
Iron	µg/L		26000		331		1060		284		26000		2980	
Iron	µg/L	Y	15500											
Lead	µg/L		77								16.8		2.8	
Lead	µg/L	Y	20.4											
Magnesium	µg/L		50700		29700		43600		34000		9040		15500	
Magnesium	µg/L	Y	49100											
Manganese	µg/L		2960		91.3		265		130		2960		104	
Manganese	µg/L	Y	1300											
Nickel	µg/L		32.7		2.1		3.2		2.1		32.7		8.9	
Potassium	µg/L		12800		878		1810		726		12800		5060	
Potassium	µg/L	Y	9370											
Sodium	µg/L		107000		56000		63200		58400		27100		20100	
Sodium	µg/L	Y	112000											
Vanadium	µg/L		52.2		7.5		9.7		7.9		32.7		7.6	
Zinc	µg/L		191		14		11.3		31.9		145		19.9	
Zinc	µg/L	Y	68											

Table 3-13

WARWP - Historical Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		WRWP-SW006		WRWP-SW007		WRWP-SW008		WRWP-SW009		WRWP-SW010	
			SAMPLE_NO		AD2006		AD2007		AD2008		AD2009		AD2010	
			SAMPLE_DATE		13-Sep-00		13-Sep-00		13-Sep-00		13-Sep-00		13-Sep-00	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate	µg/L		2.7	J										
Di-n-octyl phthalate	µg/L		7.8	J										
Phenol	µg/L		ND											
VOLATILES														
Acetone	µg/L		ND											
Bromomethane	µg/L		0.22	J										
Butanone, 2-	µg/L		7											

Fl - Filtered ("Y" = Yes).
MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
Qual - Laboratory qualifier.

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-PMU1-SW-SD02		MK-PMU1-SW-SD03		PB-WA-SED1		PB-WA-SED1		PB-WA-SED2		PB-WA-SED2		PB-WA-SED3		PB-WA-SED3	
		SAMPLE_NO		MK01SD02		MK01SD03		PB-WA-SED1-0.2-1.7		PB-WA-SED1-1.7-2.5		PB-WA-SED2-0.2-1.0		PB-WA-SED2-1-2		PB-WA-SED3-0.2-1.0		PB-WA-SED3-1.0-2.0	
		SAMPLE_DATE		29-Jun-92		29-Jun-92		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0.2 - 1.7 FT		1.7 - 2.5 FT		0.2 - 1 FT		1 - 2 FT		0.2 - 1 FT		1 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.3																	
Dinitrobenzene, 1,3-	mg/kg	0.7																0.7	
Dinitrotoluene, 2,4-	mg/kg	0.7																0.5	
Dinitrotoluene, 2,6-	mg/kg	0.4																	
Trinitrobenzene, 1,3,5-	mg/kg	0.8																0.6	
GENERAL CHEMISTRY																			
% moisture	Percent	79.7						26		22		37		18		23		18	
% Solids	Percent	79																	
Alkalinity	mg/kg	680						680											
Cation exchange capacity	mg/kg	5.4						5.4											
Kjeldahl Nitrogen	mg/kg	3240						3240											
Nitrate	mg/kg	3.4						3.4											
pH	pH Units	7.73						7.73											
Phosphorous	mg/kg	236						3.1											
Total organic carbon	mg/kg	93400						46											
METALS																			
Aluminum	mg/kg	17600		3570		4080													
Antimony	mg/kg	0.83																	
Arsenic	mg/kg	11.3												11.3				5.2	
Barium	mg/kg	154		28.5		34													
Cadmium	mg/kg	ND		0.13	BN	0.16	BN												
Calcium	mg/kg	74700		48000		7230													
Chromium	mg/kg	28.7						11		17		22		17		16		22	
Cobalt	mg/kg	15.2		10		6.8													
Copper	mg/kg	24.5		15.1		8.8								3.2					
Iron	mg/kg	29300		16800		10300													
Lead	mg/kg	68.5		8.2	N*	6.2	N*	19		15		17		12		16		12	
Magnesium	mg/kg	6770		3960		2070													
Manganese	mg/kg	726		489	N*	350	N*	180		220		190		159		180		220	
Mercury	mg/kg	0.02		0.02															
Nickel	mg/kg	36.5						12		23		19		20		16		23	
Potassium	mg/kg	3230		952		782		1500											
Sodium	mg/kg	1890		179	B	268	B												
Vanadium	mg/kg	36.5		9.8		9.8													
Zinc	mg/kg	117						46		74		94		70		57		73	
PESTICIDES/PCBs																			
DDD, 4,4'-	mg/kg	0.0027		0.0027															
DDE, 4,4'-	mg/kg	0.0027		0.0027															
DDT, 4,4'-	mg/kg	0.0048		0.0048															
Dieldrin	mg/kg	0.0051		0.0051															

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-PMU1-SW-SD02		MK-PMU1-SW-SD03		PB-WA-SED1		PB-WA-SED1		PB-WA-SED2		PB-WA-SED2		PB-WA-SED3		PB-WA-SED3	
		SAMPLE_NO		MK01SD02		MK01SD03		PB-WA-SED1-0.2-1.7		PB-WA-SED1-1.7-2.5		PB-WA-SED2-0.2-1.0		PB-WA-SED2-1-2		PB-WA-SED3-0.2-1.0		PB-WA-SED3-1.0-2.0	
		SAMPLE_DATE		29-Jun-92		29-Jun-92		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94		27-Oct-94	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0.2 - 1.7 FT		1.7 - 2.5 FT		0.2 - 1 FT		1 - 2 FT		0.2 - 1 FT		1 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Benzo(a)anthracene	mg/kg	0.051	J																
Benzo(a)pyrene	mg/kg	0.053	J																
Benzo(k)fluoranthene	mg/kg	0.052	J																
Chrysene	mg/kg	0.06	J																
Fluoranthene	mg/kg	0.11	J																
Phenanthrene	mg/kg	0.055	J																
Pyrene	mg/kg	0.079	J																
VOLATILES																			
Acetone	mg/kg	0.11																	
Butanone, 2-	mg/kg	0.029																	
Methylene chloride	mg/kg	ND																	

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-SED4		PB-WA-SED4		PB-WA-SED5		PB-WA-SED5		PB-WA-SED6		PB-WA-SED6		PB-WA-SED7		PB-WA-SED7	
		SAMPLE_NO		PB-WA-SED4-0.2-0.5		PB-WA-SED4-0.5-1.5		PB-WA-SED5-0.2-0.5		PB-WA-SED5-0.5-1.5		PB-WA-SED6-0.2-1.3		PB-WA-SED6-1.3-1.7		PB-WA-SED7-0.2-1.0		PB-WA-SED8-0.2-1.7	
		SAMPLE_DATE		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		27-Oct-94		27-Oct-94	
		FK_DEPTH		0.2 - 0.5 FT		0.5 - 1.5 FT		0.2 - 0.5 FT		0.5 - 1.5 FT		0.2 - 1.3 FT		1.3 - 1.7 FT		0.2 - 1 FT		0.2 - 1.7 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.3												0.3					
Dinitrobenzene, 1,3-	mg/kg	0.7				0.3				0.7				0.7					
Dinitrotoluene, 2,4-	mg/kg	0.7		0.3		0.4				0.7		0.4		0.7					
Dinitrotoluene, 2,6-	mg/kg	0.4										0.4							
Trinitrobenzene, 1,3,5-	mg/kg	0.8				0.8				0.6									
GENERAL CHEMISTRY																			
% moisture	Percent	79.7		26		16		29		18		27		20		38		50	
% Solids	Percent	79																	
Alkalinity	mg/kg	680																	
Cation exchange capacity	mg/kg	5.4																	
Kjeldahl Nitrogen	mg/kg	3240																	
Nitrate	mg/kg	3.4																	
pH	pH Units	7.73																	
Phosphorous	mg/kg	236																	
Total organic carbon	mg/kg	93400																44	
METALS																			
Aluminum	mg/kg	17600																	
Antimony	mg/kg	0.83																	
Arsenic	mg/kg	11.3				4		4.2		7.2									
Barium	mg/kg	154																	
Cadmium	mg/kg	ND																	
Calcium	mg/kg	74700																	
Chromium	mg/kg	28.7		9.9		13		11.5		17		14		19		10			
Cobalt	mg/kg	15.2																	
Copper	mg/kg	24.5		3.9		3.9													
Iron	mg/kg	29300																	
Lead	mg/kg	68.5		19		10.7		21		13		16		13		16			
Magnesium	mg/kg	6770																	
Manganese	mg/kg	726		149		262		169		329		164		250		160			
Mercury	mg/kg	0.02																	
Nickel	mg/kg	36.5		8.8		18		10.7		20		14		21		13			
Potassium	mg/kg	3230																	
Sodium	mg/kg	1890																	
Vanadium	mg/kg	36.5																	
Zinc	mg/kg	117		36		50		44		62		59		73		63			
PESTICIDES/PCBs																			
DDD, 4,4'-	mg/kg	0.0027																	
DDE, 4,4'-	mg/kg	0.0027																	
DDT, 4,4'-	mg/kg	0.0048																	
Dieldrin	mg/kg	0.0051																	

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-SED4		PB-WA-SED4		PB-WA-SED5		PB-WA-SED5		PB-WA-SED6		PB-WA-SED6		PB-WA-SED7		PB-WA-SED7	
		SAMPLE_NO		PB-WA-SED4-0.2-0.5		PB-WA-SED4-0.5-1.5		PB-WA-SED5-0.2-0.5		PB-WA-SED5-0.5-1.5		PB-WA-SED6-0.2-1.3		PB-WA-SED6-1.3-1.7		PB-WA-SED7-0.2-1.0		PB-WA-SED8-0.2-1.7	
		SAMPLE_DATE		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		27-Oct-94		27-Oct-94	
		FK_DEPTH		0.2 - 0.5 FT		0.5 - 1.5 FT		0.2 - 0.5 FT		0.5 - 1.5 FT		0.2 - 1.3 FT		1.3 - 1.7 FT		0.2 - 1 FT		0.2 - 1.7 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Benzo(a)anthracene	mg/kg	0.051	J																
Benzo(a)pyrene	mg/kg	0.053	J																
Benzo(k)fluoranthene	mg/kg	0.052	J																
Chrysene	mg/kg	0.06	J																
Fluoranthene	mg/kg	0.11	J																
Phenanthrene	mg/kg	0.055	J																
Pyrene	mg/kg	0.079	J																
VOLATILES																			
Acetone	mg/kg	0.11																	
Butanone, 2-	mg/kg	0.029																	
Methylene chloride	mg/kg	ND																	

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05		WARP-SD06		WRWP-SD001		WRWP-SD002	
		SAMPLE_NO		11100		11110		11120		11130		11140		11150		AD1001		AD1002	
		SAMPLE_DATE		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		14-Sep-00		14-Sep-00	
		FK_DEPTH		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - 1 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.3																	
Dinitrobenzene, 1,3-	mg/kg	0.7																	
Dinitrotoluene, 2,4-	mg/kg	0.7																	
Dinitrotoluene, 2,6-	mg/kg	0.4																	
Trinitrobenzene, 1,3,5-	mg/kg	0.8																	
GENERAL CHEMISTRY																			
% moisture	Percent	79.7		19.7		17.1		27.8		17.5		62.4		79.7					
% Solids	Percent	79														52.2		59.3	
Alkalinity	mg/kg	680																	
Cation exchange capacity	mg/kg	5.4																	
Kjeldahl Nitrogen	mg/kg	3240																	
Nitrate	mg/kg	3.4																	
pH	pH Units	7.73																	
Phosphorous	mg/kg	236														17.5			
Total organic carbon	mg/kg	93400		5430		3960		9650		5520		40200		93400		17300		17300	
METALS																			
Aluminum	mg/kg	17600		3170		2450		4260		3230		6880		9600		9150		8690	
Antimony	mg/kg	0.83																	
Arsenic	mg/kg	11.3		5.4		3.5		7.3		8.6		4.6		8.7		5.1		3.6	
Barium	mg/kg	154		26.6				36		34.8		65				83.9		46	
Cadmium	mg/kg	ND																	
Calcium	mg/kg	74700		10800		13900		12300		16000		6710		74700		3220		2710	
Chromium	mg/kg	28.7		6.7		5.3		8.1		7.4		12.6		28.7		12.9		11.7	
Cobalt	mg/kg	15.2		10.9		6.4		10.6		10.8						8.9		6.4	
Copper	mg/kg	24.5		13.7		8.8		15		9.8		15.2		24.5		12.5		9.2	
Iron	mg/kg	29300		14900		9900		16500		24300		16000		18000		18000		14100	
Lead	mg/kg	68.5		9.7		6.5		9.4		8.1		22.6		32.1		25		14.1	
Magnesium	mg/kg	6770		2110		2720		2520		2950		3130		6770		2630		2390	
Manganese	mg/kg	726		305		231		290		255		338		726		301		142	
Mercury	mg/kg	0.02																	
Nickel	mg/kg	36.5		23		13.7		24.4		18.3		15.2		24.5		16.7		12.3	
Potassium	mg/kg	3230						821								1070		937	
Sodium	mg/kg	1890														549		268	
Vanadium	mg/kg	36.5												25		20.2		18	
Zinc	mg/kg	117		48		35.1		58.4		45.3		54.4		77		56.8		47.2	
PESTICIDES/PCBs																			
DDD, 4,4'-	mg/kg	0.0027																	
DDE, 4,4'-	mg/kg	0.0027																	
DDT, 4,4'-	mg/kg	0.0048																	
Dieldrin	mg/kg	0.0051																	

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05		WARP-SD06		WRWP-SD001		WRWP-SD002	
		SAMPLE_NO		11100		11110		11120		11130		11140		11150		AD1001		AD1002	
		SAMPLE_DATE		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98		14-Sep-00		14-Sep-00	
		FK_DEPTH		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - .5 FT		0 - 1 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Benzo(a)anthracene	mg/kg	0.051	J	0.051	J														
Benzo(a)pyrene	mg/kg	0.053	J	0.053	J														
Benzo(k)fluoranthene	mg/kg	0.052	J	0.052	J														
Chrysene	mg/kg	0.06	J	0.06	J														
Fluoranthene	mg/kg	0.11	J	0.11	J					0.047	J								
Phenanthrene	mg/kg	0.055	J	0.055	J														
Pyrene	mg/kg	0.079	J	0.079	J														
VOLATILES																			
Acetone	mg/kg	0.11		0.017	J			0.019	J	0.0078	J	0.11		0.071	J				
Butanone, 2-	mg/kg	0.029						0.029				0.021	J						
Methylene chloride	mg/kg	ND		0.0056	J B	0.0057	J B	0.0066	J B	0.0059	J B	0.011	J B	0.02	J B				

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WRWP-SD003		WRWP-SD004		WRWP-SD005		WRWP-SD006		WRWP-SD007		WRWP-SD008		WRWP-SD009		WRWP-SD010	
		SAMPLE_NO		AD1003		AD1004		AD1005		AD1006		AD1007		AD1008		AD1009		AD1010	
		SAMPLE_DATE		14-Sep-00		14-Sep-00		14-Sep-00		13-Sep-00		14-Sep-00		14-Sep-00		13-Sep-00		13-Sep-00	
		FK_DEPTH		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.3																	
Dinitrobenzene, 1,3-	mg/kg	0.7																	
Dinitrotoluene, 2,4-	mg/kg	0.7																	
Dinitrotoluene, 2,6-	mg/kg	0.4																	
Trinitrobenzene, 1,3,5-	mg/kg	0.8																	
GENERAL CHEMISTRY																			
% moisture	Percent	79.7																	
% Solids	Percent	79		52		58.1		47.2		46.4		53.7		31.1		79		66.2	
Alkalinity	mg/kg	680																	
Cation exchange capacity	mg/kg	5.4																	
Kjeldahl Nitrogen	mg/kg	3240																	
Nitrate	mg/kg	3.4																	
pH	pH Units	7.73																	
Phosphorous	mg/kg	236		29.9				35.2				236		221		208			
Total organic carbon	mg/kg	93400		17100		36600		38000											
METALS																			
Aluminum	mg/kg	17600		17600		10600		12300		6930		9270		16400		2170		3630	
Antimony	mg/kg	0.83								0.83									
Arsenic	mg/kg	11.3		7.7		4.3		4.9		4.9		3.5		5.5		2.9		3.1	
Barium	mg/kg	154		126		94.4		102		62.5		92.2		154		19.2		26.9	
Cadmium	mg/kg	ND																	
Calcium	mg/kg	74700		2890		2880		3570		11000		3400		6470		8810		7990	
Chromium	mg/kg	28.7		22.3		13.9		16.5		12		12.7		22		3.7		5.8	
Cobalt	mg/kg	15.2		11.3		13.1		15.2		10.5		7.7		15		4.9		6.4	
Copper	mg/kg	24.5		18.3		15.5		17.6		13.2		19.7		23.4		5.6		9.8	
Iron	mg/kg	29300		29300		17600		20900		13800		16300		24200		7490		8790	
Lead	mg/kg	68.5		23.4		14.7		19.8		27.3		18		68.5		5		7.5	
Magnesium	mg/kg	6770		3880		2900		3460		2780		2780		5170		1750		1900	
Manganese	mg/kg	726		371		321		347		283		230		637		178		183	
Mercury	mg/kg	0.02																	
Nickel	mg/kg	36.5		29		23.6		23.6		14.3		20.8		36.5		10.6		14.8	
Potassium	mg/kg	3230		2420		1490		1880		838		1040		3230		596		804	
Sodium	mg/kg	1890		488		420		426		553		860		1890		63.5		93.7	
Vanadium	mg/kg	36.5		36.5		20.5		24.8		15.7		18.7		30.1		6.4		9.4	
Zinc	mg/kg	117		94.8		77.6		77.2		45.7		60.2		117		24.7		36.7	
PESTICIDES/PCBs																			
DDD, 4,4'-	mg/kg	0.0027																	
DDE, 4,4'-	mg/kg	0.0027																	
DDT, 4,4'-	mg/kg	0.0048																	
Dieldrin	mg/kg	0.0051																	

Table 3-14

WARWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WRWP-SD003		WRWP-SD004		WRWP-SD005		WRWP-SD006		WRWP-SD007		WRWP-SD008		WRWP-SD009		WRWP-SD010	
		SAMPLE_NO		AD1003		AD1004		AD1005		AD1006		AD1007		AD1008		AD1009		AD1010	
		SAMPLE_DATE		14-Sep-00		14-Sep-00		14-Sep-00		13-Sep-00		14-Sep-00		14-Sep-00		13-Sep-00		13-Sep-00	
		FK_DEPTH		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Benzo(a)anthracene	mg/kg	0.051	J																
Benzo(a)pyrene	mg/kg	0.053	J																
Benzo(k)fluoranthene	mg/kg	0.052	J																
Chrysene	mg/kg	0.06	J																
Fluoranthene	mg/kg	0.11	J																
Phenanthrene	mg/kg	0.055	J																
Pyrene	mg/kg	0.079	J																
VOLATILES																			
Acetone	mg/kg	0.11																	
Butanone, 2-	mg/kg	0.029																	
Methylene chloride	mg/kg	ND																	

MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
mg/kg - Milligrams per kilogram.
ND - Not detected in this Area of Concern without a "B" qualifier.
PCB - Polychlorinated biphenyl.
Qual - Laboratory qualifier.

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S1		PB-WA-S10		PB-WA-S10		PB-WA-S11		PB-WA-S11		PB-WA-S12		PB-WA-S12		PB-WA-S13	
		SAMPLE_NO		PB-WA-S1-0.0-0.5		PB-WA-S10-3.0-5.0		PB-WA-S10-5.0-10.0		PB-WA-S11-0.0-2.0		PB-WA-S11-2.0-5.0		PB-WA-S12-0.0-2.0		PB-WA-S12-2.0-5.0		PB-WA-S13-0.0-0.5	
		SAMPLE_DATE		27-Oct-94		27-Oct-94		27-Oct-94		25-Oct-94		25-Oct-94		25-Oct-94		25-Oct-94		13-Dec-94	
		FK_DEPTH		0 - 0.5 FT		3 - 5 FT		5 - 10 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5				0.7													
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5																	
Dinitrobenzene, 1,3-	mg/kg	6.7				2.3		0.5											
Dinitrotoluene, 2,4-	mg/kg	19				5.1													
Dinitrotoluene, 2,6-	mg/kg	3.6				0.3													
Dinitrotoluene, 3,4-	mg/kg	4.5						0.3											
Trinitrobenzene, 1,3,5-	mg/kg	58				5.5		1.1								0.6			
Trinitrotoluene, 2,4,6-	mg/kg	12000				0.4													
GENERAL CHEMISTRY																			
% moisture	Percent	31		18		23		21		12		10		12		17		19	
METALS																			
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		6		5.8		14		5.1		4.3		4.8		7.2		6.4	
Cadmium	mg/kg	1.6																	
Chromium	mg/kg	35		23		26		25		16		10.6		15		29		14	
Copper	mg/kg	35				3.4				6.8		6.4				3.5		3.2	
Lead	mg/kg	27		16		10		10.9		18		13		10.6		16		17	
Manganese	mg/kg	3300		366		455		392		466		267		216		373		200	
Nickel	mg/kg	52		23		23		25		27		19		16		29		17	
Zinc	mg/kg	187		73		60		68		76		51		41		58		57	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S13		PB-WA-S13		PB-WA-S13		PB-WA-S14		PB-WA-S14		PB-WA-S15		PB-WA-S15		PB-WA-S16	
		SAMPLE_NO		PB-WA-S13-0.0-3.0		PB-WA-S13-3.0-5.0		PB-WA-S13-5.0-10.0		PB-WA-S14-0.0-2.0		PB-WA-S14-2.0-5.0		PB-WA-S15-0.0-2.0		PB-WA-S15-2.0-5.0		PB-WA-S16-0.0-2.0	
		SAMPLE_DATE		18-Oct-94		18-Oct-94		18-Oct-94		25-Oct-94		25-Oct-94		24-Oct-94		24-Oct-94		18-Oct-94	
		FK_DEPTH		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5				0.3													
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5																	
Dinitrobenzene, 1,3-	mg/kg	6.7																	
Dinitrotoluene, 2,4-	mg/kg	19				0.6				0.4		0.3							
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5										0.5							
Trinitrobenzene, 1,3,5-	mg/kg	58				1.6		0.5				0.4							
Trinitrotoluene, 2,4,6-	mg/kg	12000										0.3							
GENERAL CHEMISTRY																			
% moisture	Percent	31		13		18		17		7		9		10		8		15	
METALS																			
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6								5.6		5.5		6.1		4.8		4.4	
Cadmium	mg/kg	1.6																	
Chromium	mg/kg	35		16		11		23		9.2		9.9		16		13		21	
Copper	mg/kg	35		7.4		8.8		12		5.1		7.4		7.1		7.1		2.8	
Lead	mg/kg	27		15		11.1		18		10.3		8.4		17		12		8.4	
Manganese	mg/kg	3300		184		220		434		398		198		433		413		165	
Nickel	mg/kg	52		20		22		35		17		19		21		23		10.1	
Zinc	mg/kg	187		55		54		59		45		46		64		62		32	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S16		PB-WA-S17		PB-WA-S17		PB-WA-S17		PB-WA-S17		PB-WA-S18		PB-WA-S18		PB-WA-S18	
		SAMPLE_NO		PB-WA-S16-2.0-4.0		PB-WA-S17-0.0-0.5		PB-WA-S17-0.0-3.0		PB-WA-S17-3.0-5.0		PB-WA-S17-5.0-10.0		PB-WA-S18-0.0-3.0		PB-WA-S18-3.0-5.0		PB-WA-S18-5.0-10.0	
		SAMPLE_DATE		18-Oct-94		13-Dec-94		19-Oct-94		19-Oct-94		19-Oct-94		18-Oct-94		18-Oct-94		18-Oct-94	
		FK_DEPTH		2 - 4 FT		0 - 0.5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5						0.3											
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5										0.5							
Dinitrobenzene, 1,3-	mg/kg	6.7										1.9				0.3			
Dinitrotoluene, 2,4-	mg/kg	19										3.3				0.7		0.3	
Dinitrotoluene, 2,6-	mg/kg	3.6										0.3							
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Trinitrobenzene, 1,3,5-	mg/kg	58								0.5		4.2				0.9		0.9	
Trinitrotoluene, 2,4,6-	mg/kg	12000						0.3				2.1							
GENERAL CHEMISTRY																			
% moisture	Percent	31		19		22		14		12		16		21		17		25	
METALS																			
Antimony	mg/kg	7.7				7.4													
Arsenic	mg/kg	23.6		6.9		8.5				8.5		5.4		3.9					
Cadmium	mg/kg	1.6																	
Chromium	mg/kg	35		19		19		17		16		11.2		20		11		19	
Copper	mg/kg	35		5.3		3.7		8.5		8.2		11.3		16		9.3		5.9	
Lead	mg/kg	27		8.9		22		23		16		11.4		19		12		15	
Manganese	mg/kg	3300		185		270		1023		398		274		1000		325		333	
Nickel	mg/kg	52		9.5		18		31		22		18		34		18		24	
Zinc	mg/kg	187		33		69		80		64		50		87		54		57	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S19		PB-WA-S19		PB-WA-S2		PB-WA-S20		PB-WA-S21		PB-WA-S22		PB-WA-S23		PB-WA-S24	
		SAMPLE_NO		PB-WA-S19-0.0-2.0		PB-WA-S19-2.0-5.0		PB-WA-S2-0.0-0.5		PB-WA-S20-0.0-0.5		PB-WA-S21-0.0-2.0		PB-WA-S22-2.0-5.0		PB-WA-S23-0.0-0.5		PB-WA-S24-5.0-10	
		SAMPLE_DATE		24-Oct-94		24-Oct-94		27-Oct-94		29-Oct-94		17-Oct-94		18-Oct-94		29-Oct-94		19-Oct-94	
		FK_DEPTH		0 - 2 FT		2 - 5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																0.3	
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5																	
Dinitrobenzene, 1,3-	mg/kg	6.7								0.3								1.5	
Dinitrotoluene, 2,4-	mg/kg	19								0.4						0.4		3.8	
Dinitrotoluene, 2,6-	mg/kg	3.6																0.3	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Trinitrobenzene, 1,3,5-	mg/kg	58								0.7		0.5				0.5		3.1	
Trinitrotoluene, 2,4,6-	mg/kg	12000																3	
GENERAL CHEMISTRY																			
% moisture	Percent	31		14		13		21		17		18		6		16		14	
METALS																			
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		5.7		7.7		5.7		4.6		5.2		5		5			
Cadmium	mg/kg	1.6												1.6					
Chromium	mg/kg	35		22		22		10.8		16		16		12		18		11.2	
Copper	mg/kg	35		6.2		11		7.6		2.9		6		14		3.1		5.3	
Lead	mg/kg	27		20		15		10		12		15		8.5		13		11	
Manganese	mg/kg	3300		442		494		329		190		695		3300		290		198	
Nickel	mg/kg	52		27		31		20		16		29		52		18		15	
Zinc	mg/kg	187		79		66				45		72		37		51		43	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S3		PB-WA-S4		PB-WA-S5		PB-WA-S5		PB-WA-S6		PB-WA-S6		PB-WA-S7		PB-WA-S7	
		SAMPLE_NO		PB-WA-S3-0.0-0.5		PB-WA-S4-0.0-0.5		PB-WA-S5-0.0-2.0		PB-WA-S5-2.0-5.0		PB-WA-S6-0.0-2.0		PB-WA-S6-2.0-5.0		PB-WA-S7-0.0-2.0		PB-WA-S7-2.0-5.0	
		SAMPLE_DATE		27-Oct-94		29-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94		17-Oct-94		18-Oct-94		18-Oct-94	
		FK_DEPTH		0 - 0.5 FT		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5								0.4				0.6				0.3	
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5																	
Dinitrobenzene, 1,3-	mg/kg	6.7								0.7				2.4					
Dinitrotoluene, 2,4-	mg/kg	19						0.3		1.3				3					
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Trinitrobenzene, 1,3,5-	mg/kg	58						0.6		3		0.3		4.2				0.4	
Trinitrotoluene, 2,4,6-	mg/kg	12000								0.3									
GENERAL CHEMISTRY																			
% moisture	Percent	31		31		18		19		18		18		22		10		13	
METALS																			
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		6.5				4.7		4.8				5.6		4.4		5.1	
Cadmium	mg/kg	1.6																	
Chromium	mg/kg	35		16		12		35		17		16		12.7		14		16	
Copper	mg/kg	35		11.3		2.4				7.1		3.3		7.8		3.6		14	
Lead	mg/kg	27		16		12		19		11.7		15		11.5		16		20	
Manganese	mg/kg	3300		841		350		1012		305		268		282		300		1011	
Nickel	mg/kg	52		29		15		35		26		21		22		16		31	
Zinc	mg/kg	187		78		49		91		62		66		56		64		60	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-WA-S8		PB-WA-S8		PB-WA-S9		PB-WA-S9	
		SAMPLE_NO		PB-WA-S8-0.0-2.0		PB-WA-S8-2.0-5.0		PB-WA-S9-0.0-2.0		PB-WA-S9-2.0-5.0	
		SAMPLE_DATE		18-Oct-94		18-Oct-94		18-Oct-94		18-Oct-94	
		FK_DEPTH		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES											
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5									
Amino-4,6-dinitrotoluene, 2-	mg/kg	0.5									
Dinitrobenzene, 1,3-	mg/kg	6.7									
Dinitrotoluene, 2,4-	mg/kg	19									
Dinitrotoluene, 2,6-	mg/kg	3.6									
Dinitrotoluene, 3,4-	mg/kg	4.5									
Trinitrobenzene, 1,3,5-	mg/kg	58									
Trinitrotoluene, 2,4,6-	mg/kg	12000									
GENERAL CHEMISTRY											
% moisture	Percent	31		16		5		14		23	
METALS											
Antimony	mg/kg	7.7									
Arsenic	mg/kg	23.6		4.5		5.3		6.2		3.9	
Cadmium	mg/kg	1.6				1.4					
Chromium	mg/kg	35		14		13		30		23	
Copper	mg/kg	35				2.4		2.6			
Lead	mg/kg	27		13		7.4		7.8		7.9	
Manganese	mg/kg	3300		702		621		163		156	
Nickel	mg/kg	52		17		16		10.3		9.4	
Zinc	mg/kg	187		57		34		33		34	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-MW12		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3		PB-BG-S3		PB-BG-S4	
		SAMPLE_NO		MK01SB04		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0	
		SAMPLE_DATE		29-Jun-93		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		1-Nov-94		1-Nov-94		30-Oct-94	
		FK_DEPTH		0 - 2 FT		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 4 FT		0.5 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58																	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31				8		12		10		14		8		9		17	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000		4770															
Antimony	mg/kg	7.7								6.3								7.6	
Arsenic	mg/kg	23.6				6.8		10		8.4		12		3.5		15		17	
Barium	mg/kg	165		23.4															
Cadmium	mg/kg	1.6		0.14	BN														
Calcium	mg/kg	67600		4710															
Chromium	mg/kg	35				11		14		17		17		6.2		13		13	
Cobalt	mg/kg	21		5.1	B														
Copper	mg/kg	35		6		3.6		5.2		2.3		4				35		34	
Iron	mg/kg	36000		9970															
Lead	mg/kg	27		4.6	N*	8.5		9.5		11		9.9		5.3		24		27	
Magnesium	mg/kg	23400		1540															
Manganese	mg/kg	3300		322	N*	270		400		340		314		152		154		24	
Nickel	mg/kg	52				13		16		16		17		9		33		11	
Potassium	mg/kg	5630		543	B														
Sodium	mg/kg	1270		137	B														
Vanadium	mg/kg	40.5		13.5															
Zinc	mg/kg	187				41		39		51		45		43		187		13	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-MW12		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3		PB-BG-S3		PB-BG-S4	
		SAMPLE_NO		MK01SB04		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0	
		SAMPLE_DATE		29-Jun-93		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		1-Nov-94		1-Nov-94		30-Oct-94	
		FK_DEPTH		0 - 2 FT		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 4 FT		0.5 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07						0.41										1.07	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035		0.002				0.0022				0.0013		0.0017		0.0019		0.0035	
Trichloroethene	mg/kg	0.0046				0.0014						0.0045							
Xylenes, total	mg/kg	0.0035								0.0012								0.0035	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-BG-S5		PB-BG-S5		PB-BG-S6		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
		SAMPLE_NO		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		1-Nov-94		1-Nov-94		1-Nov-94		30-Oct-94		1-Nov-94		1-Nov-94	
		FK_DEPTH		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 4.5 FT		0.5 - 3 FT		0.5 - 3 FT		0.5 - 3 FT		3 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58																	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		10		15		13		13		12		16		10		18	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7		6.7		5.9		6.4				7.5		6.4					
Arsenic	mg/kg	23.6		17		6.1		23		8.3		14		19					
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		17		29		6		9.1		14		10		9.2		15	
Cobalt	mg/kg	21																	
Copper	mg/kg	35		10		6.7		14		7.5		34		27				17	
Iron	mg/kg	36000																	
Lead	mg/kg	27		11		13		15		11		22		23		6.6		15	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		220		330		78		21		63		8.7		133		695	
Nickel	mg/kg	52		28		33		15		20		24		9.4		7.6		30	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		54		64		56		34		32		10		24		61	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-BG-S5		PB-BG-S5		PB-BG-S6		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
		SAMPLE_NO		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		1-Nov-94		1-Nov-94		1-Nov-94		30-Oct-94		1-Nov-94		1-Nov-94	
		FK_DEPTH		0.5 - 3 FT		3 - 5 FT		0.5 - 3 FT		3 - 4.5 FT		0.5 - 3 FT		0.5 - 3 FT		0.5 - 3 FT		3 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07		0.98															
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013												0.0013					
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046		0.0012	J									0.0046				0.0022	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S1		PB-PR-S1		PB-PR-S10		PB-PR-S10		PB-PR-S10		PB-PR-S11		PB-PR-S11		PB-PR-S11	
		SAMPLE_NO		PB-PR-S1-0.0-2.0		PB-PR-S1-2.0-5.0		PB-PR-S10-0.0-3.0		PB-PR-S10-3.0-5.0		PB-PR-S10-5.0-10.0		PB-PR-S11-0.0-3.0		PB-PR-S11-3.0-5.0		PB-PR-S11-5.0-10.0	
		SAMPLE_DATE		31-Oct-94		31-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94	
		FK_DEPTH		0 - 2 FT		2 - 5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7								1.6		2.5							
Dinitrotoluene, 2,4-	mg/kg	19				0.4				2.6		2.2							
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58								2.8		5.2							
Trinitrotoluene, 2,4,6-	mg/kg	12000				0.3													
GENERAL CHEMISTRY																			
% moisture	Percent	31		6		12		15		17		21		9		18		19	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7														7.3			
Arsenic	mg/kg	23.6				4.1		22		9.6		12				8			
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		8.7		11		15		17		18		11		15		15	
Cobalt	mg/kg	21																	
Copper	mg/kg	35				3.3				14		9.4				13		16	
Iron	mg/kg	36000																	
Lead	mg/kg	27		5.9		8.4		12		18		11		5.9		8.9		11	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		150		260		820		1040		490		150		800		720	
Nickel	mg/kg	52		6.7		10		15		35		25		6.4		24		30	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		23		31		38		65		56		24		52		58	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S1		PB-PR-S1		PB-PR-S10		PB-PR-S10		PB-PR-S10		PB-PR-S11		PB-PR-S11		PB-PR-S11	
		SAMPLE_NO		PB-PR-S1-0.0-2.0		PB-PR-S1-2.0-5.0		PB-PR-S10-0.0-3.0		PB-PR-S10-3.0-5.0		PB-PR-S10-5.0-10.0		PB-PR-S11-0.0-3.0		PB-PR-S11-3.0-5.0		PB-PR-S11-5.0-10.0	
		SAMPLE_DATE		31-Oct-94		31-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94	
		FK_DEPTH		0 - 2 FT		2 - 5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S12		PB-PR-S12		PB-PR-S12		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13	
		SAMPLE_NO		PB-PR-S12-0.0-3.0		PB-PR-S12-3.0-5.0		PB-PR-S12-5.0-10.0		PB-PR-S13-0.0-0.5		PB-PR-S13-0.0-3.0		PB-PR-S13-3.0-10.0		PB-PR-S13-3.0-5.0		PB-PR-S13-5.0-10.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		11-Dec-94		31-Oct-94		31-Oct-94		31-Oct-94		31-Oct-94	
		FK_DEPTH		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 0.5 FT		0 - 3 FT		3 - 10 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																0.7	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7				1.1		1.5										3.2	
Dinitrotoluene, 2,4-	mg/kg	19				1.2		1.6								0.4		5.2	
Dinitrotoluene, 2,6-	mg/kg	3.6				0.3		0.3										0.5	
Dinitrotoluene, 3,4-	mg/kg	4.5																0.5	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58				2.7		2.8										9.4	
Trinitrotoluene, 2,4,6-	mg/kg	12000																0.5	
GENERAL CHEMISTRY																			
% moisture	Percent	31		17		18		17		20		12		24.5		11		19	
Alkalinity	mg/kg	830												830					
Cation exchange capacity	mg/kg	5.2												5.2					
Kjeldahl Nitrogen	mg/kg	2130												2130					
Nitrate	mg/kg	150												150					
pH	pH units	8												8					
Phosphorous	mg/kg	31												31					
Sulfate	mg/kg	3330												3330					
Total organic carbon	*mg/kg*	*1990*												*1990*					
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		6.7		11		9.3		10		4.4				3.6		15	
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		8.7		16		14		21		13				17		17	
Cobalt	*mg/kg*	21																	
Copper	mg/kg	35		12		12		14		5.9		3.8				11		12	
Iron	mg/kg	36000																	
Lead	mg/kg	27		18		8.9		9.2		19		9.8				13		15	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		810		520		410		390		330				530		580	
Nickel	mg/kg	52		8.3		23		20		20		9.7				20		22	
Potassium	mg/kg	5630												1500					
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		28		49		47		64		33				53		58	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S12		PB-PR-S12		PB-PR-S12		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13	
		SAMPLE_NO		PB-PR-S12-0.0-3.0		PB-PR-S12-3.0-5.0		PB-PR-S12-5.0-10.0		PB-PR-S13-0.0-0.5		PB-PR-S13-0.0-3.0		PB-PR-S13-3.0-10.0		PB-PR-S13-3.0-5.0		PB-PR-S13-5.0-10.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		11-Dec-94		31-Oct-94		31-Oct-94		31-Oct-94		31-Oct-94	
		FK_DEPTH		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 0.5 FT		0 - 3 FT		3 - 10 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S15		PB-PR-S15		PB-PR-S15		PB-PR-S16	
		SAMPLE_NO		PB-PR-S14-0.0-0.5		PB-PR-S14-0.0-3.0		PB-PR-S14-3.0-5.0		PB-PR-S14-5.0-10.0		PB-PR-S15-0.0-3.0		PB-PR-S15-3.0-5.0		PB-PR-S15-5.0-10.0		PB-PR-S16-0.0-3.0	
		SAMPLE_DATE		11-Dec-94		7-Nov-94		7-Nov-94		7-Nov-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94	
		FK_DEPTH		0 - 0.5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5						9.5		2									
Amino-2-nitrotoluene, 4-	mg/kg	0.9														0.9			
Dinitrobenzene, 1,3-	mg/kg	6.7						6.4		6.7						6.6			
Dinitrotoluene, 2,4-	mg/kg	19								19		0.6		0.3		14			
Dinitrotoluene, 2,6-	mg/kg	3.6								2.9						2			
Dinitrotoluene, 3,4-	mg/kg	4.5						4.5		1.7						1.1			
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9								0.9									
Trinitrobenzene, 1,3,5-	mg/kg	58						58		18						23			
Trinitrotoluene, 2,4,6-	mg/kg	12000						12000		340									
GENERAL CHEMISTRY																			
% moisture	Percent	31		16		5		11		19		9		9		19		8	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6				3.4		6.6		4.3		4.6		6.3		11			
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		9.3		8.2		11		15		9.9		12		21		10	
Cobalt	mg/kg	21																	
Copper	mg/kg	35								7		4.1		3		3.2			
Iron	mg/kg	36000																	
Lead	mg/kg	27		6.9		7.1		16		11		7.8		6.9		11		4.6	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		190		170		225		260		320		340		780		250	
Nickel	mg/kg	52		6.7		6.6		9.4		21		9.3		11		20		7.2	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		24		33		47		85		29		33		59		22	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S15		PB-PR-S15		PB-PR-S15		PB-PR-S16	
		SAMPLE_NO		PB-PR-S14-0.0-0.5		PB-PR-S14-0.0-3.0		PB-PR-S14-3.0-5.0		PB-PR-S14-5.0-10.0		PB-PR-S15-0.0-3.0		PB-PR-S15-3.0-5.0		PB-PR-S15-5.0-10.0		PB-PR-S16-0.0-3.0	
		SAMPLE_DATE		11-Dec-94		7-Nov-94		7-Nov-94		7-Nov-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94	
		FK_DEPTH		0 - 0.5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S16		PB-PR-S16		PB-PR-S17		PB-PR-S17		PB-PR-S17		PB-PR-S18		PB-PR-S18		PB-PR-S19	
		SAMPLE_NO		PB-PR-S16-3.0-5.0		PB-PR-S16-5.0-10.0		PB-PR-S17-0.0-0.5		PB-PR-S17-0.0-2.0		PB-PR-S17-2.0-5.0		PB-PR-S18-0.0-2.0		PB-PR-S18-2.0-5.0		PB-PR-S19-0.0-0.5	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		15-Dec-94		31-Oct-94		31-Oct-94		30-Oct-94		30-Oct-94		11-Dec-94	
		FK_DEPTH		3 - 5 FT		5 - 10 FT		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9				0.6													
Dinitrobenzene, 1,3-	mg/kg	6.7				4.3													
Dinitrotoluene, 2,4-	mg/kg	19				8.9													
Dinitrotoluene, 2,6-	mg/kg	3.6				1													
Dinitrotoluene, 3,4-	mg/kg	4.5				0.8													
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58				14													
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		11		18		19		9		13		10		16		20	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7		5.6								6.1							
Arsenic	mg/kg	23.6		19		9.5		5.8		3.3		7.1		3.6		6.4		6.1	
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		16		17		12		11		18		9.1		14		10	
Cobalt	mg/kg	21																	
Copper	mg/kg	35				9.8						11		2.7		8.6			
Iron	mg/kg	36000																	
Lead	mg/kg	27		8		13		9		7		11		9		12		8	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		210		480		185		165		1500		160		390		300	
Nickel	mg/kg	52		9.6		23		9.1		7.8		28		8.6		17		7.1	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		28		60		28		26		51		28		43		24	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S16		PB-PR-S16		PB-PR-S17		PB-PR-S17		PB-PR-S17		PB-PR-S18		PB-PR-S18		PB-PR-S19	
		SAMPLE_NO		PB-PR-S16-3.0-5.0		PB-PR-S16-5.0-10.0		PB-PR-S17-0.0-0.5		PB-PR-S17-0.0-2.0		PB-PR-S17-2.0-5.0		PB-PR-S18-0.0-2.0		PB-PR-S18-2.0-5.0		PB-PR-S19-0.0-0.5	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		15-Dec-94		31-Oct-94		31-Oct-94		30-Oct-94		30-Oct-94		11-Dec-94	
		FK_DEPTH		3 - 5 FT		5 - 10 FT		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S19		PB-PR-S19		PB-PR-S19		PB-PR-S2		PB-PR-S2		PB-PR-S2		PB-PR-S20		PB-PR-S20	
		SAMPLE_NO		PB-PR-S19-0.0-3.0		PB-PR-S19-3.0-5.0		PB-PR-S19-5.0-10.0		PB-PR-S2-0.0-3.0		PB-PR-S2-3.0-5.0		PB-PR-S2-5.0-10.0		PB-PR-S20-0.0-2.0		PB-PR-S20-2.0-5.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		30-Oct-94		30-Oct-94	
		FK_DEPTH		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 2 FT		2 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7						1.4						0.3					
Dinitrotoluene, 2,4-	mg/kg	19						1											
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58						1.5				0.5		2.4					
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	*Percent*	31		7		16		18		11		12		19		9		13	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7				6		6.8				6.8						5.7	
Arsenic	mg/kg	23.6		4.6		14		7.9				6.5		6		3.8			
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		11		13		15		11		14		19		11		16	
Cobalt	mg/kg	21																	
Copper	mg/kg	35				7.5		8.8		2.5		7.4		8.4		4.4			
Iron	mg/kg	36000																	
Lead	mg/kg	27		7.5		11		12		6.9		8.5		9.5		12		10	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		370		380		570		110		280		400		340		140	
Nickel	mg/kg	52		9.9		18		24		6.7		13		19		13		14	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		37		43		48		22		36		49		35		38	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S19		PB-PR-S19		PB-PR-S19		PB-PR-S2		PB-PR-S2		PB-PR-S2		PB-PR-S20		PB-PR-S20	
		SAMPLE_NO		PB-PR-S19-0.0-3.0		PB-PR-S19-3.0-5.0		PB-PR-S19-5.0-10.0		PB-PR-S2-0.0-3.0		PB-PR-S2-3.0-5.0		PB-PR-S2-5.0-10.0		PB-PR-S20-0.0-2.0		PB-PR-S20-2.0-5.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94		30-Oct-94		30-Oct-94	
		FK_DEPTH		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 2 FT		2 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S21		PB-PR-S22		PB-PR-S23		PB-PR-S24		PB-PR-S25		PB-PR-S26		PB-PR-S27		PB-PR-S28	
		SAMPLE_NO		PB-PR-S21-0.0-0.5		PB-PR-S22-0.0-0.5		PB-PR-S23-0.0-0.5		PB-PR-S24-0.0-0.5		PB-PR-S25-5.0-10.0		PB-PR-S26-5.0-10.0		PB-PR-S27-5.0-10.0		PB-PR-S28-5.0-10.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		29-Oct-94		29-Oct-94		30-Oct-94		7-Nov-94	
		FK_DEPTH		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		5 - 10 FT		5 - 10 FT		5 - 10 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																0.8	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7						0.4						2.1		0.9		3.9	
Dinitrotoluene, 2,4-	mg/kg	19		0.3		0.4		1		1.1				1.1		0.8		10	
Dinitrotoluene, 2,6-	mg/kg	3.6																1.8	
Dinitrotoluene, 3,4-	mg/kg	4.5								0.3								1.1	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58				0.4								3.9		2.8		8.5	
Trinitrotoluene, 2,4,6-	mg/kg	12000																280	
GENERAL CHEMISTRY																			
% moisture	Percent	31		7		10		13		10		18		16		19		16	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7												6.7					
Arsenic	mg/kg	23.6										9.8		13		12		5.6	
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		10		7		7.1		5.6		15		19		16		20	
Cobalt	mg/kg	21																	
Copper	mg/kg	35										13		7.7		11		3.6	
Iron	mg/kg	36000																	
Lead	mg/kg	27		9.8		7.2		8.7		14		13		10		12		9.5	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		460		130		180		180		1100		420		530		570	
Nickel	mg/kg	52		8.8		8.4		6		4.7		40		29		26		20	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		20		19		26		17		52		62		59		54	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S21		PB-PR-S22		PB-PR-S23		PB-PR-S24		PB-PR-S25		PB-PR-S26		PB-PR-S27		PB-PR-S28	
		SAMPLE_NO		PB-PR-S21-0.0-0.5		PB-PR-S22-0.0-0.5		PB-PR-S23-0.0-0.5		PB-PR-S24-0.0-0.5		PB-PR-S25-5.0-10.0		PB-PR-S26-5.0-10.0		PB-PR-S27-5.0-10.0		PB-PR-S28-5.0-10.0	
		SAMPLE_DATE		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		29-Oct-94		29-Oct-94		30-Oct-94		7-Nov-94	
		FK_DEPTH		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		5 - 10 FT		5 - 10 FT		5 - 10 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S29		PB-PR-S3		PB-PR-S3		PB-PR-S30		PB-PR-S4		PB-PR-S4		PB-PR-S4		PB-PR-S5	
		SAMPLE_NO		PB-PR-S29-2.0-5.0		PB-PR-S3-0.0-2.0		PB-PR-S3-2.0-5.0		PB-PR-S30-0.0-0.5		PB-PR-S4-0.0-3.0		PB-PR-S4-3.0-5.0		PB-PR-S4-5.0-10.0		PB-PR-S5-0.0-3.0	
		SAMPLE_DATE		31-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		28-Oct-94	
		FK_DEPTH		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5																	
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7								0.4		0.8		3.2		2.1			
Dinitrotoluene, 2,4-	mg/kg	19								0.9		1.1		5.7		2.8			
Dinitrotoluene, 2,6-	mg/kg	3.6												0.5					
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1																	
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58										1.7		12		6.8			
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		15		6		16		6		14		19		19		11	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		6.2				3.9						8				15	
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		13		9		11		8.3		9.5		15		20		9.8	
Cobalt	mg/kg	21																	
Copper	mg/kg	35		13				6.2				4.3		6.9		6.3		3.5	
Iron	mg/kg	36000																	
Lead	mg/kg	27		10		6.4		9		8.5		12		7.3		11		7.2	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		380		88		310		150		210		560		470		200	
Nickel	mg/kg	52		15		5.5		13		5.9		9.3		16		20		8.8	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		44		23		38		24		34		46		51		28	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S29		PB-PR-S3		PB-PR-S3		PB-PR-S30		PB-PR-S4		PB-PR-S4		PB-PR-S4		PB-PR-S5	
		SAMPLE_NO		PB-PR-S29-2.0-5.0		PB-PR-S3-0.0-2.0		PB-PR-S3-2.0-5.0		PB-PR-S30-0.0-0.5		PB-PR-S4-0.0-3.0		PB-PR-S4-3.0-5.0		PB-PR-S4-5.0-10.0		PB-PR-S5-0.0-3.0	
		SAMPLE_DATE		31-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		30-Oct-94		28-Oct-94	
		FK_DEPTH		2 - 5 FT		0 - 2 FT		2 - 5 FT		0 - 0.5 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S5		PB-PR-S5		PB-PR-S6		PB-PR-S6		PB-PR-S6		PB-PR-S7		PB-PR-S7		PB-PR-S7	
		SAMPLE_NO		PB-PR-S5-3.0-5.0		PB-PR-S5-5.0-10.0		PB-PR-S6-0.0-3.0		PB-PR-S6-3.0-5.0		PB-PR-S6-5.0-10.0		PB-PR-S7-0.0-3.0		PB-PR-S7-3.0-5.0		PB-PR-S7-5.0-10.0	
		SAMPLE_DATE		28-Oct-94		28-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94	
		FK_DEPTH		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5								0.3		1				0.3			
Amino-2-nitrotoluene, 4-	mg/kg	0.9																	
Dinitrobenzene, 1,3-	mg/kg	6.7						0.9		3.4		3.8		0.3		2.1		0.5	
Dinitrotoluene, 2,4-	mg/kg	19						2.1		8.7		7.6		0.4		3.4		0.3	
Dinitrotoluene, 2,6-	mg/kg	3.6						0.4		3.6		0.5				0.4			
Dinitrotoluene, 3,4-	mg/kg	4.5																	
Nitrobenzene	mg/kg	1.1								1.1									
Nitrotoluene, 2-	mg/kg	0.9																	
Trinitrobenzene, 1,3,5-	mg/kg	58		0.7		0.4		0.7		13		18		0.5		6.6		1.3	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		19		19		11		18		18		13		19		19	
Alkalinity	mg/kg	830																	
Cation exchange capacity	mg/kg	5.2																	
Kjeldahl Nitrogen	mg/kg	2130																	
Nitrate	mg/kg	150																	
pH	pH units	8																	
Phosphorous	mg/kg	31																	
Sulfate	mg/kg	3330																	
Total organic carbon	mg/kg	1990																	
METALS																			
Aluminum	mg/kg	21000																	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		9.3		4.8		3.9		6.3		9.4		3.7		14		8.3	
Barium	mg/kg	165																	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600																	
Chromium	mg/kg	35		21		27		13		16		15		11		15		19	
Cobalt	mg/kg	21																	
Copper	mg/kg	35		6.8		3.2						7.9				7.8		4.2	
Iron	mg/kg	36000																	
Lead	mg/kg	27		12		11		12		9.5		12		6.4		11		10	
Magnesium	mg/kg	23400																	
Manganese	mg/kg	3300		270		490		150		280		490		230		650		500	
Nickel	mg/kg	52		19		27		8.9		12		16		8.6		20		20	
Potassium	mg/kg	5630																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5																	
Zinc	mg/kg	187		62		62		35		41		45		25		48		54	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	PB-PR-S5		PB-PR-S5		PB-PR-S6		PB-PR-S6		PB-PR-S6		PB-PR-S7		PB-PR-S7		PB-PR-S7	
			SAMPLE_NO	PB-PR-S5-3.0-5.0		PB-PR-S5-5.0-10.0		PB-PR-S6-0.0-3.0		PB-PR-S6-3.0-5.0		PB-PR-S6-5.0-10.0		PB-PR-S7-0.0-3.0		PB-PR-S7-3.0-5.0		PB-PR-S7-5.0-10.0	
			SAMPLE_DATE	28-Oct-94		28-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94		28-Oct-94		28-Oct-94		28-Oct-94	
			FK_DEPTH	3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT		3 - 5 FT		5 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Bis(2-ethylhexyl)phthalate	mg/kg	1.07																	
VOLATILES																			
Dichloroethene, cis-1,2-	mg/kg	0.0013																	
Toluene	mg/kg	0.0035																	
Trichloroethene	mg/kg	0.0046																	
Xylenes, total	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S8		PB-PR-S8		PB-PR-S8		PB-PR-S9		PB-PR-S9		PB-PR-S9	
		SAMPLE_NO		PB-PR-S8-0.0-0.5		PB-PR-S8-0.0-2.0		PB-PR-S8-2.0-5.0		PB-PR-S9-3.0-5.0		PB-PR-S9-5.0-10.0		PR-PR-S9-0.0-3.0	
		SAMPLE_DATE		15-Dec-94		31-Oct-94		31-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94	
		FK_DEPTH		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES															
Amino-2,6-dinitrotoluene, 4-	mg/kg	9.5													
Amino-2-nitrotoluene, 4-	mg/kg	0.9													
Dinitrobenzene, 1,3-	mg/kg	6.7								1.5		2.2		1.6	
Dinitrotoluene, 2,4-	mg/kg	19								3.8		2		2.4	
Dinitrotoluene, 2,6-	mg/kg	3.6												0.8	
Dinitrotoluene, 3,4-	mg/kg	4.5													
Nitrobenzene	mg/kg	1.1													
Nitrotoluene, 2-	mg/kg	0.9													
Trinitrobenzene, 1,3,5-	mg/kg	58								6.6		4.9		1.1	
Trinitrotoluene, 2,4,6-	mg/kg	12000													
GENERAL CHEMISTRY															
% moisture	Percent	31		14		3		4		19		18		10	
Alkalinity	mg/kg	830													
Cation exchange capacity	mg/kg	5.2													
Kjeldahl Nitrogen	mg/kg	2130													
Nitrate	mg/kg	150													
pH	pH units	8													
Phosphorous	mg/kg	31													
Sulfate	mg/kg	3330													
Total organic carbon	mg/kg	1990													
METALS															
Aluminum	mg/kg	21000													
Antimony	mg/kg	7.7										6.7			
Arsenic	mg/kg	23.6								6		11		4.6	
Barium	mg/kg	165													
Cadmium	mg/kg	1.6													
Calcium	mg/kg	67600													
Chromium	mg/kg	35		7.9		8		8		16		15		10	
Cobalt	mg/kg	21													
Copper	mg/kg	35								6.5		7.3			
Iron	mg/kg	36000													
Lead	mg/kg	27		8.6		3.9		3.9		11		10		7.8	
Magnesium	mg/kg	23400													
Manganese	mg/kg	3300		90		86		230		320		415		130	
Nickel	mg/kg	52		6		5.4		6.4		17		18		7.3	
Potassium	mg/kg	5630													
Sodium	mg/kg	1270													
Vanadium	mg/kg	40.5													
Zinc	mg/kg	187		31		33		23		47		48		28	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PB-PR-S8		PB-PR-S8		PB-PR-S8		PB-PR-S9		PB-PR-S9		PB-PR-S9	
		SAMPLE_NO		PB-PR-S8-0.0-0.5		PB-PR-S8-0.0-2.0		PB-PR-S8-2.0-5.0		PB-PR-S9-3.0-5.0		PB-PR-S9-5.0-10.0		PR-PR-S9-0.0-3.0	
		SAMPLE_DATE		15-Dec-94		31-Oct-94		31-Oct-94		29-Oct-94		29-Oct-94		29-Oct-94	
		FK_DEPTH		0 - 0.5 FT		0 - 2 FT		2 - 5 FT		3 - 5 FT		5 - 10 FT		0 - 3 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES															
Bis(2-ethylhexyl)phthalate	mg/kg	1.07													
VOLATILES															
Dichloroethene, cis-1,2-	mg/kg	0.0013													
Toluene	mg/kg	0.0035													
Trichloroethene	mg/kg	0.0046													
Xylenes, total	mg/kg	0.0035													

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP01		WARP-DP01		WARP-DP01		WARP-DP02		WARP-DP02		WARP-DP02		WARP-DP03		WARP-DP03	
		SAMPLE_NO		8100		8110		8120		8140		8150		8160		8180		8190	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58																	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		12.1		20.4		19.5		16.6		16.9		21.1		15.1		15.2	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		6880		9190		6010		17900		7540		14500		16500		7040	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		2.8		8.6		4.5		7.2		2.5		11.7		8.1		6.8	
Barium	mg/kg	165				40.3		27.9		124		32.1		75.3		112		87.2	
Beryllium	mg/kg	1.2								1				0.7		0.76			
Cadmium	mg/kg	1.6														0.59			
Calcium	mg/kg	67600		1490		35700		67600		5930		3010		56600		2710		2200	
Chromium	mg/kg	35		9.9		16.1		10.9		20.8		12.1		22.2		19.9		11.4	
Cobalt	mg/kg	21				8.5		6.2		16.2				10		17.9		21	
Copper	mg/kg	35		4		20.1		17.1		20		7		25.6		21.4		15.1	
Iron	mg/kg	36000		10300		19600		15000		26800		11500		26400		30200		19600	
Lead	mg/kg	27		3.6		8.1		7.1		13.5		4.8		10.8		11.7		9.4	
Magnesium	mg/kg	23400		1090		14500		20700		4020		2110		15100		3760		2020	
Manganese	mg/kg	3300		89.6		282		329		1190		92.5		423		1340		495	
Mercury	mg/kg	0.1								0.061									
Nickel	mg/kg	52		7.6		19.4		14		29.1		13		27.8		44.3		24	
Potassium	mg/kg	5630				2010		1480		2490		1210		3370		2970		941	
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5		18.9		28		20.5		37.7		17.8		34.6		32.5		19.6	
Zinc	mg/kg	187		21.7		51.2		40		87.4		33.9		68.1		111		64.1	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP01		WARP-DP01		WARP-DP01		WARP-DP02		WARP-DP02		WARP-DP02		WARP-DP03		WARP-DP03	
		SAMPLE_NO		8100		8110		8120		8140		8150		8160		8180		8190	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J																
Anthracene	mg/kg	0.23	J																
Benzo(a)anthracene	mg/kg	0.4																	
Benzo(a)pyrene	mg/kg	0.39																	
Benzo(b)fluoranthene	mg/kg	0.3	J																
Benzo(ghi)perylene	mg/kg	0.22	J																
Benzo(k)fluoranthene	mg/kg	0.35	J																
Chrysene	mg/kg	0.42																	
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76																	
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J																
Phenanthrene	mg/kg	0.36	J																
Pyrene	mg/kg	0.55																	
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J			0.0032	J B			0.0023	J B					0.0039	J B		
Toluene	mg/kg	0.0035				0.0022	J			0.0018	J								

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP03		WARP-DP04		WARP-DP04		WARP-DP04		WARP-DP05		WARP-DP05		WARP-DP05		WARP-DP06	
		SAMPLE_NO		8200		8220		8230		8240		8260		8270		8280		8300	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		16-Jun-98		16-Jun-98		16-Jun-98		23-Jun-98	
		FK_DEPTH		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58		0.28															
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		20.1		14.5		11		21.3		10.9		18.2		17.7		10.7	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		9400		17000		8640		13400		8120		8840		9510		5600	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		5.8		6.1		4.5		11.2		4.8		4.6		6.7		2.3	
Barium	mg/kg	165		58		85.4		45.7		35.3		51.2		62.4		54.3			
Beryllium	mg/kg	1.2				0.78													
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600		40200		1900		1860		40300		2390		54500		50400		1620	
Chromium	mg/kg	35		14.8		19.2		11.9		20		13.1		15.3		17.4		8.9	
Cobalt	mg/kg	21		8.5		14.7		9.2		11.6		8.5		9.6		9.2			
Copper	mg/kg	35		20.3		21.9		12.7		34.7		11.7		19.3		19		4.5	
Iron	mg/kg	36000		20100		23900		14500		27800		17600		17000		18200		10200	
Lead	mg/kg	27		7.6		10.3		6.2		12.3		6.1		10.5		8.4		2.8	
Magnesium	mg/kg	23400		10800		3220		1990		11000		2150		23400		14800		1060	
Manganese	mg/kg	3300		372		915		267		363		468		527		362		143	
Mercury	mg/kg	0.1																	
Nickel	mg/kg	52		23		29.7		20.9		36		17		23.2		21.7		7.1	
Potassium	mg/kg	5630		2460		2510		1370		3570		813		1740		1730			
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5		23.3		32.9		18.2		24.7		24.1		27.1		25.9		17.9	
Zinc	mg/kg	187		54.7		88.1		53.8		80		40.4		53.6		53.4		21.1	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP03		WARP-DP04		WARP-DP04		WARP-DP04		WARP-DP05		WARP-DP05		WARP-DP05		WARP-DP06	
		SAMPLE_NO		8200		8220		8230		8240		8260		8270		8280		8300	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		23-Jun-98		23-Jun-98		16-Jun-98		16-Jun-98		16-Jun-98		23-Jun-98	
		FK_DEPTH		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J																
Anthracene	mg/kg	0.23	J																
Benzo(a)anthracene	mg/kg	0.4																	
Benzo(a)pyrene	mg/kg	0.39																	
Benzo(b)fluoranthene	mg/kg	0.3	J																
Benzo(ghi)perylene	mg/kg	0.22	J																
Benzo(k)fluoranthene	mg/kg	0.35	J																
Chrysene	mg/kg	0.42																	
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76																	
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J																
Phenanthrene	mg/kg	0.36	J																
Pyrene	mg/kg	0.55																	
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J							0.0027	J B							0.0018	J B
Toluene	mg/kg	0.0035								0.0025	J							0.0023	J

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP06		WARP-DP06		WARP-DP07		WARP-DP07		WARP-DP07		WARP-DP08		WARP-DP08		WARP-DP08	
		SAMPLE_NO		8310		8320		8340		8350		8360		8380		8390		8400	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58																	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		14.5		20.3		16.4		14.4		18.1		13.7		15.9		13.5	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		8610		12100		11500		9160		10900		4880		8740		5570	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		6.8		6.6		3.7		3.1		7.4		2.2		6.9		4	
Barium	mg/kg	165		31.3		82.3		69.7		43.3		55.4				43.8			
Beryllium	mg/kg	1.2						0.7				0.65							
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600		2530		55700		2700		2410		25000		1480		1810		1460	
Chromium	mg/kg	35		15.5		17.9		15.8		14.1		17.1		6.8		17.4		7.5	
Cobalt	mg/kg	21		7.9		12.8		9		7.3		13.8				7.4			
Copper	mg/kg	35		12.4		23.5		15.9		12.5		21.4		2.9		10.4		6.9	
Iron	mg/kg	36000		17000		21500		16800		13900		20700		8460		22000		10000	
Lead	mg/kg	27		7.1		11.6		10.1		6.9		11.6		2.2		5.4		4.4	
Magnesium	mg/kg	23400		1860		17700		2720		2340		5620				1810		832	
Manganese	mg/kg	3300		413		768		186		123		472		107		231		215	
Mercury	mg/kg	0.1																	
Nickel	mg/kg	52		14.8		31.4		22.3		18.3		29.7		7.5		17		10.8	
Potassium	mg/kg	5630		924		2860		1650		1650		2390				643			
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270																	
Vanadium	mg/kg	40.5		25.4		30.8		21.1		20.4		24.2		15.8		30		17.8	
Zinc	mg/kg	187		39.3		62.2		70.5		57.5		75.6		15.9		37.8		26.5	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP06		WARP-DP06		WARP-DP07		WARP-DP07		WARP-DP07		WARP-DP08		WARP-DP08		WARP-DP08	
		SAMPLE_NO		8310		8320		8340		8350		8360		8380		8390		8400	
		SAMPLE_DATE		23-Jun-98		23-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J																
Anthracene	mg/kg	0.23	J																
Benzo(a)anthracene	mg/kg	0.4																	
Benzo(a)pyrene	mg/kg	0.39																	
Benzo(b)fluoranthene	mg/kg	0.3	J																
Benzo(ghi)perylene	mg/kg	0.22	J																
Benzo(k)fluoranthene	mg/kg	0.35	J																
Chrysene	mg/kg	0.42																	
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76																	
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J																
Phenanthrene	mg/kg	0.36	J																
Pyrene	mg/kg	0.55																	
VOLATILES																			
Acetone	mg/kg	0.035												0.035					
Methylene chloride	mg/kg	0.0023	J							0.0032	J B			0.002	J				
Toluene	mg/kg	0.0035																	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP09		WARP-DP09		WARP-DP09		WARP-DP10		WARP-DP10		WARP-DP11		WARP-DP11		WARP-DP11	
		SAMPLE_NO		8420		8430		8440		8460		8470		8500		8510		8520	
		SAMPLE_DATE		16-Jun-98		16-Jun-98		16-Jun-98		26-Jun-98		26-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19						0.49				1.4							
Dinitrotoluene, 2,6-	mg/kg	3.6										1.5							
Trinitrobenzene, 1,3,5-	mg/kg	58						0.31				4.4						0.74	
Trinitrotoluene, 2,4,6-	mg/kg	12000										0.38							
GENERAL CHEMISTRY																			
% moisture	Percent	31		27.8		16.4		21.7		14.2		16.7		16.2		14.4		13.9	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		7610		6470		11100		12300		12000		11300		5980		11400	
Antimony	mg/kg	7.7						7.7											
Arsenic	mg/kg	23.6		6.8		2.2		14		5.2		7.9		3.7		6.5		7.9	
Barium	mg/kg	165		53.9		41.3		78.2		77.4		80.3		72.9		35.5		51.5	
Beryllium	mg/kg	1.2						0.65		0.73		0.86		0.64				0.59	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600		58600		1220		7860		3260		2130		2600		1570		51000	
Chromium	mg/kg	35		22.2		8.2		20.9		15.7		17.9		15.8		9.4		16.8	
Cobalt	mg/kg	21						11.9		15.7		11.2		11.5		6.9		10.1	
Copper	mg/kg	35		18.5		4.9		24.2		16.5		20.4		12.3		10.4		24.3	
Iron	mg/kg	36000		14200		8490		29000		20000		27000		18700		16800		22500	
Lead	mg/kg	27		11.7		5.8		10.6		11		11.5		9.1		6.2		8.2	
Magnesium	mg/kg	23400		4510		2010		4980		2930		2850		3030		1580		11300	
Manganese	mg/kg	3300		213		83.4		405		681		243		375		114		392	
Mercury	mg/kg	0.1		0.1						0.045									
Nickel	mg/kg	52		10.6		7.4		36.6		29		33.5		22.6		16.6		30.2	
Potassium	mg/kg	5630						1160		1600		1340		1660		903		3140	
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270										1270							
Vanadium	mg/kg	40.5		21.1		14.2		27.5		22.4		24.6		21.1		13.9		24.2	
Zinc	mg/kg	187		36.9		30.6		72.5		74.6		94.6		75.4		42.4		58.9	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP09		WARP-DP09		WARP-DP09		WARP-DP10		WARP-DP10		WARP-DP11		WARP-DP11		WARP-DP11	
		SAMPLE_NO		8420		8430		8440		8460		8470		8500		8510		8520	
		SAMPLE_DATE		16-Jun-98		16-Jun-98		16-Jun-98		26-Jun-98		26-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J																
Anthracene	mg/kg	0.23	J																
Benzo(a)anthracene	mg/kg	0.4																	
Benzo(a)pyrene	mg/kg	0.39																	
Benzo(b)fluoranthene	mg/kg	0.3	J																
Benzo(ghi)perylene	mg/kg	0.22	J																
Benzo(k)fluoranthene	mg/kg	0.35	J																
Chrysene	mg/kg	0.42																	
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19												0.043	J				
Fluoranthene	mg/kg	0.76				0.058	J												
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J																
Phenanthrene	mg/kg	0.36	J																
Pyrene	mg/kg	0.55				0.043	J												
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J							0.0027	J B			0.0037	J B				
Toluene	mg/kg	0.0035												0.0032	J				

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP12		WARP-DP12		WARP-DP12		WARP-DP13		WARP-DP13		WARP-DP13		WARP-DP15		WARP-DP15	
		SAMPLE_NO		8540		8550		8560		8580		8590		8600		8660		8670	
		SAMPLE_DATE		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		24-Jun-98		24-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19												6.3					
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58												4.4					
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		10.6		19.7		19.8		12.1		13.7		19.1		17		15.4	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		4720		5080		9320		11900		5910		13700		14300		11100	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		2		23.6		8.3		11.5		3.1		15.3		9.3		3.7	
Barium	mg/kg	165		24.8		39.3		54.5		82		27.9		76.3		91.4		53.8	
Beryllium	mg/kg	1.2								0.67				0.83		0.63			
Cadmium	mg/kg	1.6												0.68					
Calcium	mg/kg	67600		757		18800		57200		16600		4680		3580		31400		2480	
Chromium	mg/kg	35		5.4		10.6		16.2		20.3		10.3		22.2		19.7		13	
Cobalt	mg/kg	21				8.2		8.9		11.1		6		18.4		13		6.2	
Copper	mg/kg	35		3.5		19.3		22.6		26.8		14		29.1		22.7		9.6	
Iron	mg/kg	36000		7190		23200		19500		27400		10900		34000		24700		13400	
Lead	mg/kg	27		2.9		6.4		9.8		11.3		4.9		14		10.7		5.9	
Magnesium	mg/kg	23400		684		6810		17400		8890		2050		4310		12200		2010	
Manganese	mg/kg	3300		172		551		433		391		231		780		781		269	
Mercury	mg/kg	0.1																	
Nickel	mg/kg	52		8.6		24.9		23.9		29.1		10.3		45		32.1		13.6	
Potassium	mg/kg	5630				803		1860		1830				1630		2640		1370	
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270												1030					
Vanadium	mg/kg	40.5		10.1		22.3		25.9		31		17		36.7		36.3		23.2	
Zinc	mg/kg	187		22.9		55		60.6		69.9		27.2		82.9		63.4		45.3	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP12		WARP-DP12		WARP-DP12		WARP-DP13		WARP-DP13		WARP-DP13		WARP-DP15		WARP-DP15	
		SAMPLE_NO		8540		8550		8560		8580		8590		8600		8660		8670	
		SAMPLE_DATE		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		15-Jun-98		24-Jun-98		24-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J							0.041	J								
Anthracene	mg/kg	0.23	J							0.23	J								
Benzo(a)anthracene	mg/kg	0.4								0.4									
Benzo(a)pyrene	mg/kg	0.39								0.39									
Benzo(b)fluoranthene	mg/kg	0.3	J							0.3	J								
Benzo(ghi)perylene	mg/kg	0.22	J							0.22	J								
Benzo(k)fluoranthene	mg/kg	0.35	J							0.35	J								
Chrysene	mg/kg	0.42								0.42									
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76								0.76									
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J							0.23	J								
Phenanthrene	mg/kg	0.36	J							0.36	J								
Pyrene	mg/kg	0.55								0.55									
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J			0.002	J			0.0023	J							0.0025	J B
Toluene	mg/kg	0.0035																0.0021	J

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP15		WARP-DP16		WARP-DP16		WARP-DP16		WARP-DP17		WARP-DP17		WARP-DP17		WARP-DP18	
		SAMPLE_NO		8680		8700		8710		8720		8740		8750		8760		8780	
		SAMPLE_DATE		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98	
		FK_DEPTH		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58																	
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		14.7		16.6		18.5		21.6		14.6		17.8		16.3		11.8	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		13800		20600		12400		18400		11200		9420		12500		10700	
Antimony	mg/kg	7.7				7.4													
Arsenic	mg/kg	23.6		7.6		11.4		11		9.5		5.1		11.6		10		5.3	
Barium	mg/kg	165		165		130		117		118		61.9		67.7		74.8		61.9	
Beryllium	mg/kg	1.2		0.64		1.2				0.82						0.74		0.59	
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600		3480		3760		31700		13300		1460		2240		2460		7330	
Chromium	mg/kg	35		12.9		25.4		15.8		22.7		14.8		15.5		19.6		15.3	
Cobalt	mg/kg	21		16.2		17.1		13		15		11.5		15.5		13.8		11.1	
Copper	mg/kg	35		18		30.9		26.2		26.4		15.4		19.2		21.7		17.3	
Iron	mg/kg	36000		24500		36000		29200		31100		19800		26100		26600		18400	
Lead	mg/kg	27		13.2		11.4		9.1		10.1		10.6		9		8.7		9.6	
Magnesium	mg/kg	23400		4220		4870		10100		6970		2500		2530		2920		4680	
Manganese	mg/kg	3300		1900		982		1280		1170		207		326		362		453	
Mercury	mg/kg	0.1				0.04													
Nickel	mg/kg	52		40.8		46.9		33.9		39.3		20.5		31.6		31.1		23.5	
Potassium	mg/kg	5630		2070		2590		1830		3240		898		1030		1580		1270	
Selenium	mg/kg	0.65										0.65							
Sodium	mg/kg	1270				681				726				858		952			
Vanadium	mg/kg	40.5		27.7		40.5		31		40.3		19.2		22.1		27.5		23	
Zinc	mg/kg	187		75.7		103		70.9		81.2		65.4		66.1		74.3		60.3	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP15		WARP-DP16		WARP-DP16		WARP-DP16		WARP-DP17		WARP-DP17		WARP-DP17		WARP-DP18	
		SAMPLE_NO		8680		8700		8710		8720		8740		8750		8760		8780	
		SAMPLE_DATE		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98	
		FK_DEPTH		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J																
Anthracene	mg/kg	0.23	J																
Benzo(a)anthracene	mg/kg	0.4																	
Benzo(a)pyrene	mg/kg	0.39																	
Benzo(b)fluoranthene	mg/kg	0.3	J																
Benzo(ghi)perylene	mg/kg	0.22	J																
Benzo(k)fluoranthene	mg/kg	0.35	J																
Chrysene	mg/kg	0.42																	
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76																	
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J																
Phenanthrene	mg/kg	0.36	J																
Pyrene	mg/kg	0.55																	
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J			0.0026	J B											0.0019	J B
Toluene	mg/kg	0.0035												0.0022	J				

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP18		WARP-DP18		WARP-DP19		WARP-DP19		WARP-DP19		WARP-DP20		WARP-DP20		WARP-DP20	
		SAMPLE_NO		8790		8800		8820		8830		8840		8860		8870		8880	
		SAMPLE_DATE		25-Jun-98		25-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																			
Dinitrotoluene, 2,4-	mg/kg	19																	
Dinitrotoluene, 2,6-	mg/kg	3.6																	
Trinitrobenzene, 1,3,5-	mg/kg	58				0.98													
Trinitrotoluene, 2,4,6-	mg/kg	12000																	
GENERAL CHEMISTRY																			
% moisture	Percent	31		12.1		26.3		10.7		18		21.9		11.7		13		14.1	
% Solids	Percent	82.4																	
METALS																			
Aluminum	mg/kg	21000		8670		21000		6680		18000		17000		13000		10900		12000	
Antimony	mg/kg	7.7																	
Arsenic	mg/kg	23.6		4.1		4.9		2.1		9.4		9.8		8.5		7		4.6	
Barium	mg/kg	165		58.8		92.7		26.4		70		83.3		66		56.1		80.3	
Beryllium	mg/kg	1.2				1				0.83		0.75							
Cadmium	mg/kg	1.6																	
Calcium	mg/kg	67600		4890		39100		1620		2600		34600		35600		23500		5120	
Chromium	mg/kg	35		13		28.6		9.1		23.3		25.1		16.7		16.1		16.9	
Cobalt	mg/kg	21		8.1		11.5				19		14.5		11.9		7.8		10.1	
Copper	mg/kg	35		14		25.2		5.8		30.6		30.9		15.1		15.1		15.7	
Iron	mg/kg	36000		15400		26000		10600		32000		30000		20900		19100		18800	
Lead	mg/kg	27		7.6		11		3.4		13.2		11.2		9.4		7.4		7.4	
Magnesium	mg/kg	23400		2860		10300		1290		4480		14700		9970		8670		3690	
Manganese	mg/kg	3300		261		374		184		898		568		551		320		484	
Mercury	mg/kg	0.1																	
Nickel	mg/kg	52		20.4		35.9		9.8		42.3		37.9		19.3		18.6		28.7	
Potassium	mg/kg	5630		1080		5630		742		2430		3960		2040		1350		1710	
Selenium	mg/kg	0.65																	
Sodium	mg/kg	1270																619	
Vanadium	mg/kg	40.5		17.8		37.2		19.8		38.9		37.3		35		29.1		24.1	
Zinc	mg/kg	187		55.2		64.9		28.7		85.1		81.6		49.8		48.2		77.5	

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WARP-DP18		WARP-DP18		WARP-DP19		WARP-DP19		WARP-DP19		WARP-DP20		WARP-DP20		WARP-DP20	
		SAMPLE_NO		8790		8800		8820		8830		8840		8860		8870		8880	
		SAMPLE_DATE		25-Jun-98		25-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98		24-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES																			
Acenaphthylene	mg/kg	0.041	J													0.04	J		
Anthracene	mg/kg	0.23	J													0.12	J		
Benzo(a)anthracene	mg/kg	0.4														0.17	J		
Benzo(a)pyrene	mg/kg	0.39														0.14	J		
Benzo(b)fluoranthene	mg/kg	0.3	J													0.14	J		
Benzo(ghi)perylene	mg/kg	0.22	J													0.076	J		
Benzo(k)fluoranthene	mg/kg	0.35	J													0.11	J		
Chrysene	mg/kg	0.42														0.17	J		
Dibenz(a,h)anthracene	mg/kg	0.022																	
Dinitrotoluene, 2,4-	mg/kg	19																	
Fluoranthene	mg/kg	0.76														0.38			
Fluorene	mg/kg	0.0074	J																
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J													0.076	J		
Phenanthrene	mg/kg	0.36	J													0.25	J		
Pyrene	mg/kg	0.55														0.28	J		
VOLATILES																			
Acetone	mg/kg	0.035																	
Methylene chloride	mg/kg	0.0023	J					0.0024	J B							0.0024	J B		
Toluene	mg/kg	0.0035														0.0015	J		

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		WRWP-SO001		WRWP-SO002		WRWP-SO003		WRWP-SO004		WRWP-SO005	
		SAMPLE_NO		AD0001		AD0002		AD0003		AD0004		AD0005	
		SAMPLE_DATE		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00	
		FK_DEPTH		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES													
Dinitrotoluene, 2,4-	mg/kg	19											
Dinitrotoluene, 2,6-	mg/kg	3.6											
Trinitrobenzene, 1,3,5-	mg/kg	58											
Trinitrotoluene, 2,4,6-	mg/kg	12000											
GENERAL CHEMISTRY													
% moisture	Percent	31											
% Solids	Percent	82.4		82.4		80.4		80.5		81		77.9	
METALS													
Aluminum	mg/kg	21000											
Antimony	mg/kg	7.7											
Arsenic	mg/kg	23.6											
Barium	mg/kg	165											
Beryllium	mg/kg	1.2											
Cadmium	mg/kg	1.6											
Calcium	mg/kg	67600											
Chromium	mg/kg	35											
Cobalt	mg/kg	21											
Copper	mg/kg	35											
Iron	mg/kg	36000											
Lead	mg/kg	27											
Magnesium	mg/kg	23400											
Manganese	mg/kg	3300											
Mercury	mg/kg	0.1											
Nickel	mg/kg	52											
Potassium	mg/kg	5630											
Selenium	mg/kg	0.65											
Sodium	mg/kg	1270											
Vanadium	mg/kg	40.5											
Zinc	mg/kg	187											

Table 3-15

WARWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	WRWP-SO001		WRWP-SO002		WRWP-SO003		WRWP-SO004		WRWP-SO005	
			SAMPLE_NO	AD0001		AD0002		AD0003		AD0004		AD0005	
			SAMPLE_DATE	15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00	
			FK_DEPTH	0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1 FT		0 - 1.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
SEMIVOLATILES													
Acenaphthylene	mg/kg	0.041	J										
Anthracene	mg/kg	0.23	J	0.0036								0.001	J
Benzo(a)anthracene	mg/kg	0.4		0.025		0.049	J	0.0059		0.0036	J	0.0066	
Benzo(a)pyrene	mg/kg	0.39		0.039		0.0074		0.0099		0.0055		0.012	
Benzo(b)fluoranthene	mg/kg	0.3	J	0.033		0.006		0.0095		0.0048		0.0099	
Benzo(ghi)perylene	mg/kg	0.22	J	0.016									
Benzo(k)fluoranthene	mg/kg	0.35	J	0.019	D	0.0033		0.0039		0.0026		0.0029	
Chrysene	mg/kg	0.42		0.026		0.0067		0.0082		0.0047	J	0.0092	
Dibenz(a,h)anthracene	mg/kg	0.022		0.022				0.0095	J				
Dinitrotoluene, 2,4-	mg/kg	19											
Fluoranthene	mg/kg	0.76		0.076		0.017		0.021		0.013		0.026	
Fluorene	mg/kg	0.0074	J			0.006	J	0.0074	J	0.0069	J		
Indeno(1,2,3-cd)pyrene	mg/kg	0.23	J	0.029		0.0068		0.0083		0.0046	J	0.0086	
Phenanthrene	mg/kg	0.36	J	0.032		0.033		0.04		0.04		0.032	
Pyrene	mg/kg	0.55		0.055		0.12		0.015		0.009	J	0.02	
VOLATILES													
Acetone	mg/kg	0.035											
Methylene chloride	mg/kg	0.0023	J										
Toluene	mg/kg	0.0035											

MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
mg/kg - Milligrams per kilogram.
Qual - Laboratory qualifier.

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

					Associated Site:	WARP			WARP			WARP			WARP			WARP		
					Location Code:	IT-MW02			IT-MW02			IT-MW02			IT-MW02			MK-MW12		
					Sample No:	PB-WA-IT-MW2			5310			5540			5545			MK01MW12		
					Sample Date:	13-DEC-94			30-SEP-96			21-NOV-97			15-MAY-98			30-JUN-93		
					Sample Depth:	to			0 to 0			0 to 0			0 to 0			0 to 13		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		5.1			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		14			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		0.6			-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		1.7			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		340			12			17			19			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		340			20			47			41			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		24			2.3			7.8			8.9			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		0.5			-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			2.5			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			36			-		
Nitrotoluene, 4-		µg/L	6.1	110		2.8			-			-			-			-		
RDX		µg/L	0.61	11		-			11			-			6.2			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		390			9.7			14			15			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		1.4			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		-			-			550000			650000			-		
Chloride		µg/L	NE	97000		-			-			97000			23000			-		
Cyanide, total		µg/L	73	89		-			26			-			16			-		
Hardness		µg/L	NE	4900000		-			-			1500000			660000			-		
Nitrate		µg/L	1000	80000		-			-			-			-			-		
Nitrate		µg/L	1000	62000		12			-			-			-			-		
Sulfate		µg/L	NE	2300000		-			-			270000			260000			-		
Total dissolved solids		µg/L	NE	7700000		-			-			1300000			1100000			-		
Total organic carbon		µg/L	NE	970000		-			-			41000			28000			-		
Total suspended solids		µg/L	NE	370000		-			-			-			370000			-		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			-			-		
Aluminum		µg/L	3650	206000		-			431			-			-			8280	N*	N*
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			-			-			4	B	B
Barium		µg/L	255	773		-			-			-			-			91.5	B	B
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			0.3	BN	BN
Calcium	Y	µg/L	NE	735000		-			157000			147000			130000			-		
Calcium		µg/L	NE	2680000		-			151000			150000		J	109000			14200	B*	B*

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		IT-MW02			IT-MW02			IT-MW02			IT-MW02			MK-MW12		
				Sample No:		PB-WA-IT-MW2			5310			5540			5545			MK01MW12		
				Sample Date:		13-DEC-94			30-SEP-96			21-NOV-97			15-MAY-98			30-JUN-93		
				Sample Depth:		to			0 to 0			0 to 0			0 to 0			0 to 13		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			-			-		
Chromium		µg/L	11	296		-			-			-			-			18.6		
Cobalt	Y	µg/L	73	162		-			72.6			-			-			-		
Cobalt		µg/L	73	264		-			68.8			-			-			-		
Copper	Y	µg/L	146	130		130			50.2			41.6			-			-		
Copper		µg/L	146	654		140			45.1			62.6			30.7			9.8	B	B
Iron	Y	µg/L	1095	2600		-			-			-			509			-		
Iron		µg/L	1095	339000		-			1120			-			595		J	28000	N*	N*
Lead	Y	µg/L	15	28.4		-			28.4			-			-			-		
Lead		µg/L	15	459		-			27.7			-			-			13		
Magnesium	Y	µg/L	NE	242000		-			67500		J	68000			61900			-		
Magnesium		µg/L	NE	651000		-			65400			70500			53000			29200		
Manganese	Y	µg/L	88	8480		2500			1190		J	877			969			-		
Manganese		µg/L	88	12600		2300			1230			896			754			-		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			-		
Nickel	Y	µg/L	73	199		130			50.3			-			-			-		
Nickel		µg/L	73	515		120			49.8			-			-			73.8		
Potassium	Y	µg/L	NE	64500		-			-			-			-			-		
Potassium		µg/L	NE	49000		-			-			-			-			6840		
Selenium	Y	µg/L	18	6		-			-			-			-			-		
Selenium		µg/L	18	1790		-			-			-			-			-		
Sodium	Y	µg/L	NE	1140000		-			291000			244000			206000			-		
Sodium		µg/L	NE	1060000		-			286000		J	250000		J	175000			6470		
Thallium		µg/L	0.24	1770		-			-			-			-			-		
Vanadium		µg/L	26	381		-			-			-			-			-		
Zinc	Y	µg/L	1095	71		-			71.0			27.2		J	41.4		B	-		
Zinc		µg/L	1095	1260		34			32.2			-			40.2		B	79.9		
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			0.023		J

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		IT-MW02			IT-MW02			IT-MW02			IT-MW02			MK-MW12		
				Sample No:		PB-WA-IT-MW2			5310			5540			5545			MK01MW12		
				Sample Date:		13-DEC-94			30-SEP-96			21-NOV-97			15-MAY-98			30-JUN-93		
				Sample Depth:		to			0 to 0			0 to 0			0 to 0			0 to 13		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			7.9	J	B	-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			60	J	J	12	J	J	-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			110	ISB	J	43			43			-		
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			16	J	J	7.1	J	J	6.7	J	J	-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			1.5	J	J	1.3	J	J	-		
Nitroaniline, 3-		µg/L	0.1	330		-			4.1	J	J	-			3.3	J	J	-		
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	ND		-			-			-			2.0	J B	B	-		
Benzene		µg/L	0.34	1.1		-			-			-			-			-		
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			-			-			-			-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			-			-			-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			6.1		U	0.41	J B	B	-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-			-		
Toluene		µg/L	72	3		-			-			-			0.14	J	B	-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	14		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		MK-MW12			MK-MW12			PB-BED-MW14			PB-BED-MW14			PB-BED-MW14		
				Sample No:		5750			5755			PB-BED-MW14			5170			5900		
				Sample Date:		17-NOV-97			14-MAY-98			14-DEC-94			17-OCT-96			18-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		-			-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		-			-			11			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		-			-			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			2.8			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		340000			270000			-			-			210000		
Chloride		µg/L	NE	97000		6000			1000		J	-			-			79000		
Cyanide, total		µg/L	73	89		-			-			-			20			16		
Hardness		µg/L	NE	4900000		540000			450000			-			-			640000		
Nitrate		µg/L	1000	80000		-			-			-			-			300		
Nitrate		µg/L	1000	62000		-			-			3.3			-			-		
Sulfate		µg/L	NE	2300000		54000			51000		J	-			-			610000		
Total dissolved solids		µg/L	NE	7700000		410000			400000			-			-			2500000		
Total organic carbon		µg/L	NE	970000		2000			2000		J	-			-			190000		
Total suspended solids		µg/L	NE	370000		5000			-			-			-			37000		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			246			-		
Aluminum		µg/L	3650	206000		310			-			-			-			374		J
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			-			-			-		
Barium		µg/L	255	773		-			-			-			-			-		
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			-		
Calcium	Y	µg/L	NE	735000		131000		J	113000			-			132000			120000		
Calcium		µg/L	NE	2680000		133000			98900			-			210000			152000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		MK-MW12			MK-MW12			PB-BED-MW14			PB-BED-MW14			PB-BED-MW14		
				Sample No:		5750			5755			PB-BED-MW14			5170			5900		
				Sample Date:		17-NOV-97			14-MAY-98			14-DEC-94			17-OCT-96			18-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			**11.6**			-		
Chromium		µg/L	11	296		-			-			-			**12.3**			10.2		
Cobalt	Y	µg/L	73	162		-			-			-			53.8			-		
Cobalt		µg/L	73	264		-			-			-			69.1			-		
Copper	Y	µg/L	146	130		-			-			-			-			-		
Copper		µg/L	146	654		-			-			-			-			-		
Iron	Y	µg/L	1095	2600		173		B	-			-			-			-		
Iron		µg/L	1095	339000		830			396			-			450			923		
Lead	Y	µg/L	15	28.4		-			-			-			-			-		
Lead		µg/L	15	459		-			-			-			-			-		
Magnesium	Y	µg/L	NE	242000		21600			19400			-			97700			82500		
Magnesium		µg/L	NE	651000		21900			17000			-			125000		J	70700		
Manganese	Y	µg/L	88	8480		**1060**			**1050**			-			25.0			29.1		
Manganese		µg/L	88	12600		**1130**			**1000**			-			47.5			54.0		
Mercury	Y	µg/L	1.1	0.25		-			-			-			0.25			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			-		
Nickel	Y	µg/L	73	199		-			-			-			53.5			40.7		
Nickel		µg/L	73	515		-			-			-			68.1			42.3		
Potassium	Y	µg/L	NE	64500		-			-			-			64500			40500		
Potassium		µg/L	NE	49000		-			-			-			38300			44700		
Selenium	Y	µg/L	18	6		-			-			-			-			-		
Selenium		µg/L	18	1790		-			-			-			-			-		
Sodium	Y	µg/L	NE	1140000		-			-			-			346000		J	360000		
Sodium		µg/L	NE	1060000		-			-			-			471000		J	311000		
Thallium		µg/L	0.24	1770		-			-			**0.5**			-			-		
Vanadium		µg/L	26	381		-			-			-			-			-		
Zinc	Y	µg/L	1095	71		-			26.0		B	-			26.0			32.4		
Zinc		µg/L	1095	1260		25.8			25.8		B	28			36.0		UJ	39.8		
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		MK-MW12			MK-MW12			PB-BED-MW14			PB-BED-MW14			PB-BED-MW14		
				Sample No:		5750			5755			PB-BED-MW14			5170			5900		
				Sample Date:		17-NOV-97			14-MAY-98			14-DEC-94			17-OCT-96			18-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		28			3.4	J	B	-			1.0	J	J	-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			-			-			1.7	J	J	-		
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	ND		-			-			-			-			-		
Benzene		µg/L	0.34	1.1		-			-			-			-			1.1		
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			-			-			-			1.3		
Chlorobenzene		µg/L	11	1.1		-			-			-			1.1	J	J	-		
Ethylbenzene		µg/L	130	1.6		-			-			1.6			-			0.59	J	J
Hexanone, 2-		µg/L	150	ND		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			0.62	J B	B	-			-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-			-		
Toluene		µg/L	72	3		-			-			3			1.5	J	J	1.7		B
Trichloroethene		µg/L	0.028	ND		-			0.32	J	B	-			-			-		
Xylenes, total		µg/L	21	14		-			-			14			2.7	J	J	3.9		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-BED-MW14			PB-BED-MW14			PB-WA-MW1			PB-WA-MW1			PB-WA-MW1		
				Sample No:		5905			5905R			5110			5670			5675		
				Sample Date:		16-MAY-98			18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		-			-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		-			-			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		500000			-			-			380000			470000		
Chloride		µg/L	NE	97000		3000			-			-			7000			7000		
Cyanide, total		µg/L	73	89		44			-			-			-			-		
Hardness		µg/L	NE	4900000		730000			-			-			4900000			940000		
Nitrate		µg/L	1000	80000		-			-			-			-			-		
Nitrate		µg/L	1000	62000		24000			-			-			-			-		
Sulfate		µg/L	NE	2300000		630000			-			-			170000			200000		
Total dissolved solids		µg/L	NE	7700000		2300000			-			-			650000			630000		
Total organic carbon		µg/L	NE	970000		160000			-			-			2100			3000		
Total suspended solids		µg/L	NE	370000		23000			-			-			-			8000		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			-			-		
Aluminum		µg/L	3650	206000		-			-			1600			2710		J	-		
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			-			-			-		
Barium		µg/L	255	773		-			-			-			-			-		
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			-		
Calcium	Y	µg/L	NE	735000		149000			-			158000			136000			168000		
Calcium		µg/L	NE	2680000		99000			-			156000			150000		J	166000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-BED-MW14			PB-BED-MW14			PB-WA-MW1			PB-WA-MW1			PB-WA-MW1		
				Sample No:		5905			5905R			5110			5670			5675		
				Sample Date:		16-MAY-98			18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			-			-		
Chromium		µg/L	11	296		-			-			11.4			-			-		
Cobalt	Y	µg/L	73	162		65.4			-			-			-			-		
Cobalt		µg/L	73	264		-			-			-			-			-		
Copper	Y	µg/L	146	130		-			-			-			-			-		
Copper		µg/L	146	654		-			-			-			-			-		
Iron	Y	µg/L	1095	2600		269			-			-			150		B	-		
Iron		µg/L	1095	339000		427		J	-			4300			5600			319		J
Lead	Y	µg/L	15	28.4		-			-			-			-			-		
Lead		µg/L	15	459		-			-			5.2			4.7		B	-		
Magnesium	Y	µg/L	NE	242000		99900			-			62100		J	54600			55100		
Magnesium		µg/L	NE	651000		59700			-			65200			58100			52500		
Manganese	Y	µg/L	88	8480		32.6			-			364		J	163			253		
Manganese		µg/L	88	12600		32.0			-			342			235			303		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			-		
Nickel	Y	µg/L	73	199		71.3			-			-			-			-		
Nickel		µg/L	73	515		45.5			-			-			-			-		
Potassium	Y	µg/L	NE	64500		32400			-			-			-			-		
Potassium		µg/L	NE	49000		49000			-			-			-			-		
Selenium	Y	µg/L	18	6		-			-			-			-			-		
Selenium		µg/L	18	1790		-			-			-			-			-		
Sodium	Y	µg/L	NE	1140000		365000			-			14300			13800			13500		
Sodium		µg/L	NE	1060000		269000			-			15200		J	14300		J	12100		
Thallium		µg/L	0.24	1770		-			-			-			-			-		
Vanadium		µg/L	26	381		-			-			-			-			-		
Zinc	Y	µg/L	1095	71		53.9		B	-			44.6			-			39.9		B
Zinc		µg/L	1095	1260		42.2		B	-			66.3			32.5		B	21.3		B
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-BED-MW14			PB-BED-MW14			PB-WA-MW1			PB-WA-MW1			PB-WA-MW1		
				Sample No:		5905			5905R			5110			5670			5675		
				Sample Date:		16-MAY-98			18-MAY-98			30-SEP-96			21-NOV-97			18-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			-			3.4	J	B
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			2.7	J	J	-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			28	J	NJ	-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			14	J	J	-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			16			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	5.8		-			5.8	J	J	-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	ND		-			-			-			-			-		
Benzene		µg/L	0.34	1.1		-			-			-			-			-		
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			0.25	J	J	-			0.33	J B	B	-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			-			-			-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			5.3		U	0.33	J B	B	0.52	J B	B
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-			-		
Toluene		µg/L	72	3		-			-			-			-			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	14		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2		
				Sample No:		PB-WA-DM-MW2			PB-WA-DM-MW22			5120			5680			5685		
				Sample Date:		12-DEC-94			12-DEC-94			30-SEP-96			23-NOV-97			15-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		4.2			2.6			1.1			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		5.7			5.2			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		4.1			4.4			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		470			400			18			-			23		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		320			250			12			-			21		
Dinitrotoluene, 2,6-		µg/L	0.099	850		12			10			-			-			4.1		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		75			2.6			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		550			570			11			-			23		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		34			26			2.4			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		-			-			-			520000			640000		
Chloride		µg/L	NE	97000		-			-			-			2000			-		
Cyanide, total		µg/L	73	89		-			-			57			79			89		
Hardness		µg/L	NE	4900000		-			-			-			3300000			1500000		
Nitrate		µg/L	1000	80000		-			-			-			80000		J	-		
Nitrate		µg/L	1000	62000		15			16			-			-			62000		
Sulfate		µg/L	NE	2300000		-			-			-			2300000			2000000		
Total dissolved solids		µg/L	NE	7700000		-			-			-			7700000			6400000		
Total organic carbon		µg/L	NE	970000		-			-			-			970000			780000		
Total suspended solids		µg/L	NE	370000		-			-			-			40000			160000		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			-			-		
Aluminum		µg/L	3650	206000		-			-			13400			3720		J	4220		
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			11.0			-			-		
Barium		µg/L	255	773		-			-			-			-			-		
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			-		
Calcium	Y	µg/L	NE	735000		-			-			244000			472000			400000		
Calcium		µg/L	NE	2680000		-			-			394000			497000		J	371000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2		
				Sample No:		PB-WA-DM-MW2			PB-WA-DM-MW22			5120			5680			5685		
				Sample Date:		12-DEC-94			12-DEC-94			30-SEP-96			23-NOV-97			15-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			11.9			-			12.4		
Chromium		µg/L	11	296		14			-			30.7			12.8			11.4		
Cobalt	Y	µg/L	73	162		-			-			66.2			-			126		
Cobalt		µg/L	73	264		-			-			114			142			118		
Copper	Y	µg/L	146	130		20			20			31.2			-			66.9		
Copper		µg/L	146	654		38			32			63.3			70.2			61.9		
Iron	Y	µg/L	1095	2600		-			-			138			-			422		
Iron		µg/L	1095	339000		-			-			26800			7930			9390		J
Lead	Y	µg/L	15	28.4		-			-			4.6			-			-		
Lead		µg/L	15	459		10			4			13.2			9.7		B	-		
Magnesium	Y	µg/L	NE	242000		-			-			89300		J	170000			150000		
Magnesium		µg/L	NE	651000		-			-			143000			181000			138000		
Manganese	Y	µg/L	88	8480		1000			970			913		J	1620			2260		
Manganese		µg/L	88	12600		1600			1800			1540			1680			1510		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			-		
Nickel	Y	µg/L	73	199		60			60			123			-			199		
Nickel		µg/L	73	515		63			47			207			228			190		
Potassium	Y	µg/L	NE	64500		-			-			13800			-			22900		
Potassium		µg/L	NE	49000		-			-			23700			28000			20900		
Selenium	Y	µg/L	18	6		-			-			6.0			-			-		
Selenium		µg/L	18	1790		-			-			7.9			16.7			-		
Sodium	Y	µg/L	NE	1140000		-			-			528000			1030000			1140000		
Sodium		µg/L	NE	1060000		-			-			731000		J	1010000		J	914000		
Thallium		µg/L	0.24	1770		-			0.5			-			-			-		
Vanadium		µg/L	26	381		-			-			70.5			-			-		
Zinc	Y	µg/L	1095	71		-			-			24.5			-			136		B
Zinc		µg/L	1095	1260		88			63			107			36.7			57.7		B
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2			PB-WA-MW2		
				Sample No:		PB-WA-DM-MW2			PB-WA-DM-MW22			5120			5680			5685		
				Sample Date:		12-DEC-94			12-DEC-94			30-SEP-96			23-NOV-97			15-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			-			-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-			7.6	J	J
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			-			30			-			55		
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			-			2.8	J	J	-			1.8	J	J
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			-			110	J	J	-			330	E	J
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-			3.7	J	J
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-			1.6	J	J
VOLATILES																				
Acetone		µg/L	61	ND		-			-			-			-			6.9	J B	B
Benzene		µg/L	0.34	1.1		-			-			-			-			-		
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			-			-			-			-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			-			-			-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-			1.9	J B	B
Methylene chloride		µg/L	4.3	ND		-			-			-			-			0.64	J	B
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-			-		
Toluene		µg/L	72	3		-			-			-			-			-		
Trichloroethene		µg/L	0.028	ND		-			-			-			-			-		
Xylenes, total		µg/L	21	14		-			-			-			0.17	J	B	-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-S16			WARP-DP01			WARP-DP02			WARP-DP04			WARP-DP04		
				Sample No:		PB-WA-S16-P			8130			8170			8250			8250B		
				Sample Date:		24-OCT-94			25-JUN-98			24-JUN-98			24-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		370			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		190			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		63			-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		22			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		7200			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		9200			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		850			-			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		1500			-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		110			-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		20000			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		-			-			-			-			-		
Chloride		µg/L	NE	97000		-			-			-			-			-		
Cyanide, total		µg/L	73	89		-			-			-			-			-		
Hardness		µg/L	NE	4900000		-			-			-			-			-		
Nitrate		µg/L	1000	80000		-			-			-			-			-		
Nitrate		µg/L	1000	62000		-			-			-			-			-		
Sulfate		µg/L	NE	2300000		-			-			-			-			-		
Total dissolved solids		µg/L	NE	7700000		-			-			-			-			-		
Total organic carbon		µg/L	NE	970000		-			-			-			-			-		
Total suspended solids		µg/L	NE	370000		-			-			-			-			-		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			-			-		
Aluminum		µg/L	3650	206000		-			-			13100			-			1240		
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			21.4			-			-		
Barium		µg/L	255	773		-			-			-			-			-		
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			-		
Calcium	Y	µg/L	NE	735000		-			-			211000			-			549000		
Calcium		µg/L	NE	2680000		-			-			336000			-			569000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-S16			WARP-DP01			WARP-DP02			WARP-DP04			WARP-DP04		
				Sample No:		PB-WA-S16-P			8130			8170			8250			8250B		
				Sample Date:		24-OCT-94			25-JUN-98			24-JUN-98			24-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			-			-		
Chromium		µg/L	11	296		-			-			**28.8**			-			-		
Cobalt	Y	µg/L	73	162		-			-			-			-			-		
Cobalt		µg/L	73	264		-			-			-			-			-		
Copper	Y	µg/L	146	130		-			-			42.1			-			-		
Copper		µg/L	146	654		-			-			90.2			-			-		
Iron	Y	µg/L	1095	2600		-			-			-			-			-		
Iron		µg/L	1095	339000		-			-			**39900**			-			**2650**		
Lead	Y	µg/L	15	28.4		-			-			-			-			-		
Lead		µg/L	15	459		-			-			14.4			-			-		
Magnesium	Y	µg/L	NE	242000		-			-			62800		J	-			242000		J
Magnesium		µg/L	NE	651000		-			-			95100		J	-			234000		J
Manganese	Y	µg/L	88	8480		-			-			84.5			-			**1450**		
Manganese		µg/L	88	12600		-			-			**750**			-			**1410**		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			-		
Nickel	Y	µg/L	73	199		-			-			-			-			-		
Nickel		µg/L	73	515		-			-			61.5			-			-		
Potassium	Y	µg/L	NE	64500		-			-			-			-			18200		
Potassium		µg/L	NE	49000		-			-			6880			-			17400		
Selenium	Y	µg/L	18	6		-			-			-			-			-		
Selenium		µg/L	18	1790		-			-			-			-			-		
Sodium	Y	µg/L	NE	1140000		-			-			443000			-			114000		
Sodium		µg/L	NE	1060000		-			-			408000			-			81800		
Thallium		µg/L	0.24	1770		-			-			-			-			-		
Vanadium		µg/L	26	381		-			-			**62.0**			-			-		
Zinc	Y	µg/L	1095	71		-			-			-			-			-		
Zinc		µg/L	1095	1260		-			-			123			-			22.1		
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		PB-WA-S16			WARP-DP01			WARP-DP02			WARP-DP04			WARP-DP04		
				Sample No:		PB-WA-S16-P			8130			8170			8250			8250B		
				Sample Date:		24-OCT-94			25-JUN-98			24-JUN-98			24-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			-			5.1	J B	B
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			-			-			-			3.2	J	J
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-			-		
VOLATILES																				
Acetone		µg/L	61	ND		-			4.3	J	B	3.0	J	B	2.4	J	B	-		
Benzene		µg/L	0.34	1.1		-			-			0.15	J	J	-			-		
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			-			-			-			-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			-			-			-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-			-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-			-		
Toluene		µg/L	72	3		-			-			0.43	J	B	-			-		
Trichloroethene		µg/L	0.028	ND		-			-			0.30	J	B	-			-		
Xylenes, total		µg/L	21	14		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP06			WARP-DP07			WARP-DP08			WARP-DP09			WARP-DP11		
				Sample No:		8330			8370			8410			8450			8530		
				Sample Date:		23-JUN-98			26-JUN-98			16-JUN-98			16-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		-			-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		0.20			-			0.74			8.6			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		-			-			2.3			24			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		-			-			0.28			2.7			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		-			-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		-			-			-			9.4			7.2		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-			-			-			7.1		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1000000		-			-			-			1000000			-		
Chloride		µg/L	NE	97000		-			-			-			-			-		
Cyanide, total		µg/L	73	89		-			-			-			-			-		
Hardness		µg/L	NE	4900000		-			-			-			1400000			-		
Nitrate		µg/L	1000	80000		-			-			-			-			-		
Nitrate		µg/L	1000	62000		-			-			-			-			-		
Sulfate		µg/L	NE	2300000		-			-			-			305000			-		
Total dissolved solids		µg/L	NE	7700000		-			-			-			1710000			-		
Total organic carbon		µg/L	NE	970000		-			-			-			32000			-		
Total suspended solids		µg/L	NE	370000		-			-			-			85000			-		
METALS																				
Aluminum	Y	µg/L	3650	1350		-			-			-			-			-		
Aluminum		µg/L	3650	206000		-			51100			-			11100			59700		
Antimony		µg/L	1.5	106		-			-			-			-			-		
Arsenic		µg/L	0.045	1780		-			-			-			15.2			56.2		
Barium		µg/L	255	773		-			248			-			-			386		
Beryllium		µg/L	7.3	9.5		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	46		-			-			-			-			-		
Cadmium		µg/L	1.8	ND		-			-			-			-			-		
Calcium	Y	µg/L	NE	735000		-			364000			-			237000			395000		
Calcium		µg/L	NE	2680000		-			644000			-			230000			982000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP06			WARP-DP07			WARP-DP08			WARP-DP09			WARP-DP11		
				Sample No:		8330			8370			8410			8450			8530		
				Sample Date:		23-JUN-98			26-JUN-98			16-JUN-98			16-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			-			-		
Chromium		µg/L	11	296		-			**91.6**			-			-			**96.8**		
Cobalt	Y	µg/L	73	162		-			-			-			-			-		
Cobalt		µg/L	73	264		-			68.4			-			-			**85.2**		
Copper	Y	µg/L	146	130		-			-			-			-			67.0		
Copper		µg/L	146	654		-			126			-			-			**214**		
Iron	Y	µg/L	1095	2600		-			-			-			120			121		
Iron		µg/L	1095	339000		-			**123000**			-			**28500**			**137000**		
Lead	Y	µg/L	15	28.4		-			-			-			4.4			-		
Lead		µg/L	15	459		-			-			-			11.8			**68.3**		
Magnesium	Y	µg/L	NE	242000		-			71400		J	-			227000			80100		J
Magnesium		µg/L	NE	651000		-			105000		J	-			219000			242000		J
Manganese	Y	µg/L	88	8480		-			**480**			-			**8480**			**1070**		
Manganese		µg/L	88	12600		-			**3310**			-			**8810**			**4840**		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-			-		
Mercury		µg/L	1.1	0.65		-			-			-			-			0.24		
Nickel	Y	µg/L	73	199		-			-			-			-			62.0		
Nickel		µg/L	73	515		-			**220**			-			-			**249**		
Potassium	Y	µg/L	NE	64500		-			6170			-			-			10200		
Potassium		µg/L	NE	49000		-			17100			-			-			20500		
Selenium	Y	µg/L	18	6		-			-			-			-			-		
Selenium		µg/L	18	1790		-			-			-			-			-		
Sodium	Y	µg/L	NE	1140000		-			185000			-			44800			614000		
Sodium		µg/L	NE	1060000		-			182000			-			44300			503000		
Thallium		µg/L	0.24	1770		-			-			-			-			-		
Vanadium		µg/L	26	381		-			**125**			-			-			**161**		
Zinc	Y	µg/L	1095	71		-			-			-			-			-		
Zinc		µg/L	1095	1260		-			411			-			-			467		
PESTICIDES/PCBs																				
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP06			WARP-DP07			WARP-DP08			WARP-DP09			WARP-DP11		
				Sample No:		8330			8370			8410			8450			8530		
				Sample Date:		23-JUN-98			26-JUN-98			16-JUN-98			16-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			-			-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-			-			24	J	J	-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			-			-			60			1.8	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			-			-			6.3	J	J	-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			-			-			5.1	J	J	2.1	J	J
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			2.4	J	J	-		
VOLATILES																				
Acetone		µg/L	61	ND		2.5	J	B	7.2	J	B	3.3	J	B	-			4.9	J	B
Benzene		µg/L	0.34	1.1		-			-			-			-			0.13	J	J
Butanone, 2-		µg/L	190	1.8		-			-			-			-			-		
Carbon disulfide		µg/L	104	1.3		-			-			0.15	J	J	-			-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			-			-			-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-			-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-			0.20	J	J	0.15	J	J	-		
Toluene		µg/L	72	3		-			0.34	J	B	0.17	J	B	-			0.57	J	B
Trichloroethene		µg/L	0.028	ND		-			-			-			-			0.16	J	B
Xylenes, total		µg/L	21	14		-			-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP12			WARP-DP13			WARP-DP15			WARP-DP16		
				Sample No:		8570			8610			8690			8730		
				Sample Date:		15-JUN-98			15-JUN-98			26-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		-			-			-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		0.69			270			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		2.0			950			1.1			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		0.25			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		-			-			-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-			-			-		
RDX		µg/L	0.61	11		-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		-			680			-			40		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-			-			-		
GENERAL CHEMISTRY																	
Alkalinity		µg/L	NE	1000000		-			643000			-			-		
Chloride		µg/L	NE	97000		-			-			-			-		
Cyanide, total		µg/L	73	89		-			-			-			-		
Hardness		µg/L	NE	4900000		-			960000			-			-		
Nitrate		µg/L	1000	80000		-			-			-			-		
Nitrate		µg/L	1000	62000		-			1600			-			-		
Sulfate		µg/L	NE	2300000		-			278000			-			-		
Total dissolved solids		µg/L	NE	7700000		-			1260000			-			-		
Total organic carbon		µg/L	NE	970000		-			36600			-			-		
Total suspended solids		µg/L	NE	370000		-			15000			-			-		
METALS																	
Aluminum	Y	µg/L	3650	1350		-			-			-			203		
Aluminum		µg/L	3650	206000		-			77200			-			206000		
Antimony		µg/L	1.5	106		-			-			-			106		
Arsenic		µg/L	0.045	1780		-			1780			-			11.1		
Barium		µg/L	255	773		-			-			-			773		
Beryllium		µg/L	7.3	9.5		-			-			-			9.5		
Cadmium	Y	µg/L	1.8	46		-			-			-			46.0		
Cadmium		µg/L	1.8	ND		-			-			-			-		
Calcium	Y	µg/L	NE	735000		-			156000			-			735000		
Calcium		µg/L	NE	2680000		-			315000			-			2680000		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP12			WARP-DP13			WARP-DP15			WARP-DP16		
				Sample No:		8570			8610			8690			8730		
				Sample Date:		15-JUN-98			15-JUN-98			26-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		-			-			-			-		
Chromium		µg/L	11	296		-			127			-			296		
Cobalt	Y	µg/L	73	162		-			-			-			162		
Cobalt		µg/L	73	264		-			-			-			264		
Copper	Y	µg/L	146	130		-			-			-			117		
Copper		µg/L	146	654		-			-			-			654		
Iron	Y	µg/L	1095	2600		-			-			-			373		
Iron		µg/L	1095	339000		-			153000			-			339000		
Lead	Y	µg/L	15	28.4		-			-			-			-		
Lead		µg/L	15	459		-			459			-			157		
Magnesium	Y	µg/L	NE	242000		-			-			-			193000		J
Magnesium		µg/L	NE	651000		-			86200			-			651000		J
Manganese	Y	µg/L	88	8480		-			7870			-			635		
Manganese		µg/L	88	12600		-			12600			-			9250		
Mercury	Y	µg/L	1.1	0.25		-			-			-			-		
Mercury		µg/L	1.1	0.65		-			0.65			-			0.47		
Nickel	Y	µg/L	73	199		-			-			-			46.3		
Nickel		µg/L	73	515		-			-			-			515		
Potassium	Y	µg/L	NE	64500		-			-			-			-		
Potassium		µg/L	NE	49000		-			-			-			33100		
Selenium	Y	µg/L	18	6		-			-			-			-		
Selenium		µg/L	18	1790		-			1790			-			-		
Sodium	Y	µg/L	NE	1140000		-			192000			-			1040000		
Sodium		µg/L	NE	1060000		-			187000			-			907000		
Thallium		µg/L	0.24	1770		-			1770			-			-		
Vanadium		µg/L	26	381		-			-			-			381		
Zinc	Y	µg/L	1095	71		-			-			-			28.2		
Zinc		µg/L	1095	1260		-			397			-			1260		
PESTICIDES/PCBs																	
Endosulfan sulfate		µg/L	22	0.023		-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP			WARP			WARP		
				Location Code:		WARP-DP12			WARP-DP13			WARP-DP15			WARP-DP16		
				Sample No:		8570			8610			8690			8730		
				Sample Date:		15-JUN-98			15-JUN-98			26-JUN-98			25-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES																	
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-			-			-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		-			660			-			60	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	56		-			56	J	J	-			16	J	J
Nitroaniline, 2-		µg/L	0.1	1.5		-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	330		-			15	J	J	-			43	J	J
Nitrobenzene		µg/L	0.34	5.8		-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-			-			-		
VOLATILES																	
Acetone		µg/L	61	ND		2.4	J	B	1.5	J	B	9.6	J	B	1.6	J	B
Benzene		µg/L	0.34	1.1		-			-			-			-		
Butanone, 2-		µg/L	190	1.8		-			-			1.2	J	J	-		
Carbon disulfide		µg/L	104	1.3		-			-			-			-		
Chlorobenzene		µg/L	11	1.1		-			-			-			-		
Ethylbenzene		µg/L	130	1.6		-			0.19	J	J	-			-		
Hexanone, 2-		µg/L	150	ND		-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-			-			-		
Toluene		µg/L	72	3		0.14	J	B	0.53	J	B	0.15	J	B	0.26	J	B
Trichloroethene		µg/L	0.028	ND		-			-			-			-		
Xylenes, total		µg/L	21	14		-			-			-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP		
				Location Code:		WARP-DP17			WARP-DP19		
				Sample No:		8770			8850		
				Sample Date:		25-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES											
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	370		-			-		
Amino-2-nitrotoluene, 4-		µg/L	2	190		-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	63		-			-		
Amino-4-nitrotoluene, 2-		µg/L	2	22		-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	7200		-			0.24		
Dinitrotoluene, 2,4-		µg/L	0.099	9200		22			-		
Dinitrotoluene, 2,6-		µg/L	0.099	850		-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	1500		-			-		
Nitrobenzene		µg/L	0.34	2.5		-			-		
Nitrotoluene, 3-		µg/L	6.1	36		-			-		
Nitrotoluene, 4-		µg/L	6.1	110		-			-		
RDX		µg/L	0.61	11		-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	20000		32			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	34		-			-		
GENERAL CHEMISTRY											
Alkalinity		µg/L	NE	1000000		-			-		
Chloride		µg/L	NE	97000		-			-		
Cyanide, total		µg/L	73	89		-			-		
Hardness		µg/L	NE	4900000		-			-		
Nitrate		µg/L	1000	80000		-			-		
Nitrate		µg/L	1000	62000		-			-		
Sulfate		µg/L	NE	2300000		-			-		
Total dissolved solids		µg/L	NE	7700000		-			-		
Total organic carbon		µg/L	NE	970000		-			-		
Total suspended solids		µg/L	NE	370000		-			-		
METALS											
Aluminum	Y	µg/L	3650	1350		1350			-		
Aluminum		µg/L	3650	206000		38500			-		
Antimony		µg/L	1.5	106		-			-		
Arsenic		µg/L	0.045	1780		-			-		
Barium		µg/L	255	773		217			-		
Beryllium		µg/L	7.3	9.5		-			-		
Cadmium	Y	µg/L	1.8	46		-			-		
Cadmium		µg/L	1.8	ND		-			-		
Calcium	Y	µg/L	NE	735000		301000			-		
Calcium		µg/L	NE	2680000		555000			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP		
				Location Code:		WARP-DP17			WARP-DP19		
				Sample No:		8770			8850		
				Sample Date:		25-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ
Chromium	Y	µg/L	11	32.9		32.9			-		
Chromium		µg/L	11	296		56.7			-		
Cobalt	Y	µg/L	73	162		142			-		
Cobalt		µg/L	73	264		173			-		
Copper	Y	µg/L	146	130		94.6			-		
Copper		µg/L	146	654		153			-		
Iron	Y	µg/L	1095	2600		2600			-		
Iron		µg/L	1095	339000		73000			-		
Lead	Y	µg/L	15	28.4		-			-		
Lead		µg/L	15	459		28.9			-		
Magnesium	Y	µg/L	NE	242000		145000		J	-		
Magnesium		µg/L	NE	651000		178000		J	-		
Manganese	Y	µg/L	88	8480		891			-		
Manganese		µg/L	88	12600		2470			-		
Mercury	Y	µg/L	1.1	0.25		-			-		
Mercury		µg/L	1.1	0.65		0.25			-		
Nickel	Y	µg/L	73	199		-			-		
Nickel		µg/L	73	515		134			-		
Potassium	Y	µg/L	NE	64500		-			-		
Potassium		µg/L	NE	49000		7640			-		
Selenium	Y	µg/L	18	6		-			-		
Selenium		µg/L	18	1790		-			-		
Sodium	Y	µg/L	NE	1140000		993000			-		
Sodium		µg/L	NE	1060000		1060000			-		
Thallium		µg/L	0.24	1770		-			-		
Vanadium		µg/L	26	381		113			-		
Zinc	Y	µg/L	1095	71		-			-		
Zinc		µg/L	1095	1260		265			-		
PESTICIDES/PCBs											
Endosulfan sulfate		µg/L	22	0.023		-			-		

Table 3-16

WARWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		WARP			WARP		
				Location Code:		WARP-DP17			WARP-DP19		
				Sample No:		8770			8850		
				Sample Date:		25-JUN-98			26-JUN-98		
				Sample Depth:		0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ
SEMIVOLATILES											
Bis(2-ethylhexyl)phthalate		µg/L	4.8	28		-			-		
Di-n-octyl phthalate		µg/L	146	2.7		-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	60		-			-		
Dinitrophenol, 2,4-		µg/L	7.3	14		-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	660		**52**	J	J	-		
Dinitrotoluene, 2,6-		µg/L	0.099	56		**18**	J	J	-		
Nitroaniline, 2-		µg/L	0.1	1.5		-			-		
Nitroaniline, 3-		µg/L	0.1	330		**49**	J	J	-		
Nitrobenzene		µg/L	0.34	5.8		-			-		
Nitrophenol, 4-		µg/L	4.9	2.4		-			-		
VOLATILES											
Acetone		µg/L	61	ND		1.6	J	B	10		B
Benzene		µg/L	0.34	1.1		-			-		
Butanone, 2-		µg/L	190	1.8		-			1.8	J	J
Carbon disulfide		µg/L	104	1.3		-			0.18	J	J
Chlorobenzene		µg/L	11	1.1		-			-		
Ethylbenzene		µg/L	130	1.6		-			-		
Hexanone, 2-		µg/L	150	ND		-			-		
Methylene chloride		µg/L	4.3	ND		-			-		
Tetrachloroethene		µg/L	0.66	0.2		-			-		
Toluene		µg/L	72	3		0.16	J	B	-		
Trichloroethene		µg/L	0.028	ND		-			-		
Xylenes, total		µg/L	21	14		-			-		

"-" - Indicates the parameter was not detected.
Bold text and shaded cell indicates value above RBSC value.
Fl - Filtered ("Y" = Yes).
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established.
PCB - Polychlorinated biphenyl.
Qual - Laboratory qualifier.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method or field blank(s).
N - Tentative identification. Consider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 3-17

PRRWP - Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		MK-PMU3-SW-SD14		MK-PMU3-SW-SD15		MK-PMU3-SW-SD22		PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
			SAMPLE_NO		MK03SW14		MK03SW15		MK03SW22		12160		12170		12180		12190	
			SAMPLE_DATE		12-Jul-93		12-Jul-93		12-Jul-93		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GENERAL CHEMISTRY																		
Hardness	µg/L		488000								328000		284000		488000		432000	
Phosphorous	µg/L		120															
METALS																		
Aluminum	µg/L		3040		363		363				778		530		3040			
Aluminum	µg/L	Y	*10200*						*252*		*463*		*874*		*10200*			
Barium	µg/L		89.7		68.9	B	68.9	B	51.9	B								
Barium	µg/L	Y	215		59.4	B	44.1	B	52.2	B					215			
Calcium	µg/L		118000		40400	B	40400	B			74200		71700		118000		97900	
Calcium	µg/L	Y	179000		35500	B	44200	B	55600		74000		71400		179000		98100	
Chromium	µg/L		1.9															
Chromium	µg/L	Y	17.2												17.2			
Cobalt	µg/L		1.8															
Copper	µg/L		7.4						5.8	B								
Iron	µg/L		5790		1680		1680				1420		972		5790		948	
Iron	µg/L	Y	16800		250		986		233		809		1260		16800		550	
Lead	µg/L	Y	8.7												8.7			
Magnesium	µg/L		37300		15600		15600				16000		15800		37300		36800	
Magnesium	µg/L	Y	*46700*		*15600*		*15500*		*21400*		*15700*		*15800*		*46700*		*36900*	
Manganese	µg/L		718		718		718				245		261		404		67.1	
Manganese	µg/L	Y	720		617		720		217		144		249		649		34.4	
Nickel	µg/L		1.7															
Potassium	µg/L		2330		2200	B	2200	B	4880	B								
Potassium	µg/L	Y	7130		2100	B	3850	B	4880	B					7130			
Sodium	µg/L		24900		8950		8950		17300		24900		24700		13700		14800	
Sodium	µg/L	Y	25700		8360		15600		16600		25700		24500		15000		15300	
Vanadium	µg/L		7.2															
Vanadium	µg/L	Y	53.9												53.9			
Zinc	µg/L		58		16	B	16	B	10.5	B					58		20.2	
Zinc	µg/L	Y	145				34.5								145			
SEMIVOLATILES																		
Bis(2-ethylhexyl)phthalate	µg/L		2.1	J									2.1	J				
Phenol	µg/L		ND								2.2	J B	1.9	J B	2.3	J B		
VOLATILES																		
Acetone	µg/L		ND								2.5	J B	1.7	J B	2.5	J B	1.2	J B
Bromodichloromethane	µg/L		0.72	J							0.72	J						
Bromomethane	µg/L		0.17	J							0.17	J	0.11	J				
Chloroform	µg/L		3.5								3.5		0.55	J				
Dibromochloromethane	µg/L		0.21	J							0.21	J						

Table 3-17

PRRWP - Surface Water Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE		PRWP-SW004		PRWP-SW006		PRWP-SW007		PRWP-SW008		PRWP-SW009		PRWP-SW010	
			SAMPLE_NO		AC2004		AC2006		AC2007		AC2008		AC2009		AC2010	
			SAMPLE_DATE		14-Sep-00		14-Sep-00		14-Sep-00		14-Sep-00		14-Sep-00		14-Sep-00	
			FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0 FT	
Parameter	Units	Fl	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GENERAL CHEMISTRY																
Hardness	µg/L		488000													
Phosphorous	µg/L		120				50		66		120		51		86	
METALS																
Aluminum	µg/L		3040		712				137		237				494	
Aluminum	µg/L	Y	10200													
Barium	µg/L		89.7		88.6		74.1		82.5		86.9		83.1		89.7	
Barium	µg/L	Y	215													
Calcium	µg/L		118000		109000		107000		118000		117000		118000		113000	
Calcium	µg/L	Y	179000													
Chromium	µg/L		1.9		1.2		1.1		0.8		0.9		1.9		0.9	
Chromium	µg/L	Y	17.2													
Cobalt	µg/L		1.8		1.8											
Copper	µg/L		7.4		2.4		1.8		1.8		1.8				7.4	
Iron	µg/L		5790		1220		388		364		608		314		1010	
Iron	µg/L	Y	16800													
Lead	µg/L	Y	8.7													
Magnesium	µg/L		37300		26000		24400		27100		27100		27300		26400	
Magnesium	µg/L	Y	46700													
Manganese	µg/L		718		149		104		106		148		101		147	
Manganese	µg/L	Y	720													
Nickel	µg/L		1.7		1.7											
Potassium	µg/L		2330		2330		1870		2100		2190		2110		2090	
Potassium	µg/L	Y	7130													
Sodium	µg/L		24900		9510		8950		9910		9790		9920		9620	
Sodium	µg/L	Y	25700													
Vanadium	µg/L		7.2		7.2		3.6		4.1		5		4.4		4.3	
Vanadium	µg/L	Y	53.9													
Zinc	µg/L		58		54.3		14		13		15.2		12.1		14	
Zinc	µg/L	Y	145													
SEMIVOLATILES																
Bis(2-ethylhexyl)phthalate	µg/L		2.1	J												
Phenol	µg/L		ND													
VOLATILES																
Acetone	µg/L		ND													
Bromodichloromethane	µg/L		0.72	J												
Bromomethane	µg/L		0.17	J												
Chloroform	µg/L		3.5													
Dibromochloromethane	µg/L		0.21	J												

Fl - Filtered ("Y" = Yes).
MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
Qual - Laboratory qualifier.

Table 3-18

PRRWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-PMU3-SW-SD14		MK-PMU3-SW-SD15		MK-PMU3-SW-SD22		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
		SAMPLE_NO		MK03SD14		MK03SD15		MK03SD22		11160		11170		11180		11190	
		SAMPLE_DATE		12-Jul-93		12-Jul-93		12-Jul-93		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GENERAL CHEMISTRY																	
% moisture	Percent	61.8								61.8		20.8		42.2		24.2	
% Solids	Percent	74.3															
Phosphorous	mg/kg	138															
Total organic carbon	mg/kg	33000								33000		5450		17000		12000	
METALS																	
Aluminum	mg/kg	8420		2160		6510				6020		2830		5130		3400	
Arsenic	mg/kg	10		2.5		4.7		10		4.5		5.1		4.3		4.4	
Barium	mg/kg	100		17.3	B	83.3				53.4				48.1		30.9	
Cadmium	mg/kg	ND		0.07	B	0.39	B	0.26	BN								
Calcium	mg/kg	96000		19900	B	7910	B			96000		46300		62000		8110	
Chromium	mg/kg	13.8		3.7		10.9				11.5		6.3		10.4		6.8	
Cobalt	mg/kg	8.8		3.8	B	10.8	B										
Copper	mg/kg	19.6						11.2		17.9		7.6		14.5		7.4	
Iron	mg/kg	19800		5420		15900				16200		9620		13700		9330	
Lead	mg/kg	12.8		3.2		10.5				12.8		4.8		7.8		5.6	
Magnesium	mg/kg	19300		7090		2330				10700		19300		13500		2710	
Manganese	mg/kg	1050		288		379				865		421		404		104	
Nickel	mg/kg	46.3		9.5		25		46.3		18.6		9.5		17.9		10.4	
Potassium	mg/kg	2480		372	B	629	B							1040			
Selenium	mg/kg	ND				0.98	B										
Sodium	mg/kg	174		206	B	312	B	168	B								
Vanadium	mg/kg	23.5		6.9		17.4				17.4		12.9		14.2		7.9	
Zinc	mg/kg	135		36.3		101		76.5		73.3		23.2		58.4		42.1	
SEMIVOLATILES																	
Acenaphthene	mg/kg	0.11	J									0.11	J				
Anthracene	mg/kg	0.077	J					0.017				0.077	J			0.029	J
Benzo(a)anthracene	mg/kg	0.084	J					0.067								0.084	J
Benzo(a)pyrene	mg/kg	0.096	J					0.054								0.096	J
Benzo(b)fluoranthene	mg/kg	0.1	J					0.065								0.1	J
Benzo(ghi)perylene	mg/kg	0.053	J					0.037								0.053	J
Benzo(k)fluoranthene	mg/kg	0.084	J					0.026								0.084	J
Bis(2-ethylhexyl)phthalate	mg/kg	0.57		0.57				0.18									
Carbazole	mg/kg	0.18	J									0.18	J				
Chrysene	mg/kg	0.11	J					0.07								0.11	J
Dibenzofuran	mg/kg	0.06	J									0.06	J				
Fluoranthene	mg/kg	0.23	J					0.082				0.14	J			0.23	J
Fluorene	mg/kg	0.11	J									0.11	J				
Indeno(1,2,3-cd)pyrene	mg/kg	0.054	J													0.054	J
Phenanthrene	mg/kg	0.32	J					0.064				0.32	J			0.12	J
Pyrene	mg/kg	0.19	J					0.098				0.11	J			0.16	J

Table 3-18

PRRWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		MK-PMU3-SW-SD14		MK-PMU3-SW-SD15		MK-PMU3-SW-SD22		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
		SAMPLE_NO		MK03SD14		MK03SD15		MK03SD22		11160		11170		11180		11190	
		SAMPLE_DATE		12-Jul-93		12-Jul-93		12-Jul-93		5-Nov-98		5-Nov-98		5-Nov-98		5-Nov-98	
		FK_DEPTH		0 - 0 FT		0 - 0 FT		0 - 0 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
VOLATILES																	
Acetone	mg/kg	0.066		0.017		0.066				0.051				0.049		0.017	J
Bromomethane	mg/kg	ND								0.0052	J B						
Butanone, 2-	mg/kg	0.011	J	0.002						0.011	J			0.01	J		
Chloroform	mg/kg	0.002				0.002											
Methylene chloride	mg/kg	ND								0.013	J B	0.0056	J B	0.0069	J B	0.0059	J B
Toluene	mg/kg	0.002		0.002													

Table 3-18

PRRWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRWP-SD001		PRWP-SD002		PRWP-SD003		PRWP-SD004		PRWP-SD005	
		SAMPLE_NO		AC1001		AC1002		AC1003		AC1004		AC1005	
		SAMPLE_DATE		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00	
		FK_DEPTH		0 - 0 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GENERAL CHEMISTRY													
% moisture	Percent	61.8											
% Solids	Percent	74.3		43.6		60		72		74.3		60.7	
Phosphorous	mg/kg	138		138								87.4	
Total organic carbon	mg/kg	33000		24800		25900		9040		5190		10400	
METALS													
Aluminum	mg/kg	8420		6520		5570		8420		5840		6880	
Arsenic	mg/kg	10		5.7		5.6		5		6.3		7.7	
Barium	mg/kg	100		100		63.3		62.5		55.1		49	
Cadmium	mg/kg	ND											
Calcium	mg/kg	96000		93400		44500		48700		39400		27500	
Chromium	mg/kg	13.8		12.6		10.1		13.8		10.3		12.2	
Cobalt	mg/kg	8.8		6.7		6.2		8.8		7		6.7	
Copper	mg/kg	19.6		17.2		14.8		19.6		13.9		13.7	
Iron	mg/kg	19800		15500		13700		19800		15800		18100	
Lead	mg/kg	12.8		9.8		9.4		9.5		7.2		9	
Magnesium	mg/kg	19300		11200		9140		15900		12400		6920	
Manganese	mg/kg	1050		491		310		461		361		1050	
Nickel	mg/kg	46.3		16.2		15.1		22.9		17.1		16.6	
Potassium	mg/kg	2480		1530		1170		2480		1650		1520	
Selenium	mg/kg	ND											
Sodium	mg/kg	174		158		113		174		138		118	
Vanadium	mg/kg	23.5		19.3		16.5		23.5		19.9		22.3	
Zinc	mg/kg	135		130		135		47.8		36.2		50.5	
SEMIVOLATILES													
Acenaphthene	mg/kg	0.11	J										
Anthracene	mg/kg	0.077	J										
Benzo(a)anthracene	mg/kg	0.084	J	0.067	J								
Benzo(a)pyrene	mg/kg	0.096	J	0.082	J								
Benzo(b)fluoranthene	mg/kg	0.1	J	0.1	J								
Benzo(ghi)perylene	mg/kg	0.053	J										
Benzo(k)fluoranthene	mg/kg	0.084	J	0.068	J								
Bis(2-ethylhexyl)phthalate	mg/kg	0.57											
Carbazole	mg/kg	0.18	J										
Chrysene	mg/kg	0.11	J	0.1	J								
Dibenzofuran	mg/kg	0.06	J										
Fluoranthene	mg/kg	0.23	J	0.14	J								
Fluorene	mg/kg	0.11	J										
Indeno(1,2,3-cd)pyrene	mg/kg	0.054	J										
Phenanthrene	mg/kg	0.32	J	0.096	J								
Pyrene	mg/kg	0.19	J	0.19	J								

Table 3-18

PRRWP - Historical Sediment Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	PRWP-SD001		PRWP-SD002		PRWP-SD003		PRWP-SD004		PRWP-SD005	
			SAMPLE_NO	AC1001		AC1002		AC1003		AC1004		AC1005	
			SAMPLE_DATE	15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00		15-Sep-00	
			FK_DEPTH	0 - 0 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT		0 - 0.5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
VOLATILES													
Acetone	mg/kg	0.066											
Bromomethane	mg/kg	ND											
Butanone, 2-	mg/kg	0.011	J										
Chloroform	mg/kg	0.002											
Methylene chloride	mg/kg	ND											
Toluene	mg/kg	0.002											

MDC - Maximum detected concentration for Area of Concern ("B" qualified data not included).
mg/kg - Milligrams per kilogram.
ND - Not detected in this Area of Concern without a "B" qualifier.
Qual - Laboratory qualifier.

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP01		PRRP-DP01		PRRP-DP01		PRRP-DP02		PRRP-DP02		PRRP-DP02		PRRP-DP03	
		SAMPLE_NO		7200		7210		7220		7240R		7250		7260		7280	
		SAMPLE_DATE		11-Jun-98		11-Jun-98		11-Jun-98		22-Jun-98		14-Jun-98		14-Jun-98		8-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3															
Dinitrotoluene, 2,4-	mg/kg	25				0.96		0.29						0.28		1.2	
Dinitrotoluene, 2,6-	mg/kg	1.7				0.35											
Trinitrobenzene, 1,3,5-	mg/kg	43				0.56		2.7									
Trinitrotoluene, 2,4,6-	mg/kg	0.38												0.38			
GENERAL CHEMISTRY																	
% moisture	Percent	25		19		19.7		20.8		13.2		19.3		25		8.7	
METALS																	
Aluminum	mg/kg	12700		9370		11500		10100		9210		11200		11500		6330	
Antimony	mg/kg	9.3				7.9											
Arsenic	mg/kg	42.8		4.5		27.9		9.1		5		6.1		12.5		5.4	
Barium	mg/kg	239		84.3		239		88.5		45.1		61.5		91.9		65.7	
Beryllium	mg/kg	0.83		0.69		0.71						0.68					
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		5740		35300		35600		10300		3670		7720		2560	
Chromium	mg/kg	20.8		14.7		9		17.7		13.3		20.4		20.8		8.7	
Cobalt	mg/kg	30.3		11.1		21.2		11.6		6.6		11.2		13.6			
Copper	mg/kg	34.5		22.6		34.5		23.3		12.6		14.5		25.8		8.4	
Iron	mg/kg	43700		18000		34500		22500		14300		21900		23800		14100	
Lead	mg/kg	14.3		8.6		13.2		10.4		12.3		7.8		12.2		9.3	
Magnesium	mg/kg	25300		2480		12500		13900		5150		2590		5650		1160	
Manganese	mg/kg	2270		321		2230		706		234		315		521		320	
Mercury	mg/kg	0.045								0.04		0.045					
Nickel	mg/kg	57.2		27.2		57.2		32.5		14.6		25.6		32.2		9.3	
Potassium	mg/kg	2730		777		2330		1790		1460		916		1630			
Selenium	mg/kg	1.1		0.84								0.69		0.82		0.59	
Sodium	mg/kg	4280		1240		1080		1050									
Vanadium	mg/kg	38.4		19.1		30		26.6		23.1		27.3		26.2		17.3	
Zinc	mg/kg	104		78.5		83.1		65.9		45.5		64.6		70.3		34.2	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8												0.081	J		
Dinitrotoluene, 2,6-	mg/kg	0.58	J														
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP03		PRRP-DP04		PRRP-DP04		PRRP-DP04		PRRP-DP05		PRRP-DP05		PRRP-DP05	
		SAMPLE_NO		7290		7320		7330		7340		7360R		7370		7380R	
		SAMPLE_DATE		8-Jun-98		9-Jun-98		9-Jun-98		9-Jun-98		25-Jun-98		14-Jun-98		25-Jun-98	
		FK_DEPTH		4 - 5 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3		9.3													
Dinitrotoluene, 2,4-	mg/kg	25		25													
Dinitrotoluene, 2,6-	mg/kg	1.7															
Trinitrobenzene, 1,3,5-	mg/kg	43		43													
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		20.8		17.1		20.7		20.6		11.6		20.8		20.4	
METALS																	
Aluminum	mg/kg	12700		9580		7030		6990		8040		6820		11300		9040	
Antimony	mg/kg	9.3												9.3			
Arsenic	mg/kg	42.8		9.7		6.6		5.4		5.2		2.9		42.8		17.6	
Barium	mg/kg	239		67.9		37.2		39.4		50.5		27.6		128		115	
Beryllium	mg/kg	0.83												0.67			
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		2600		2680		19800		61200		1490		58500		57800	
Chromium	mg/kg	20.8		15.7		15.5		12.4		14.1		9.3		18.4		14.4	
Cobalt	mg/kg	30.3		6.3				7.4		9.8				19		10.2	
Copper	mg/kg	34.5		18.7		7		13.3		23.6		4.9		24.6		19.7	
Iron	mg/kg	43700		23700		16700		13900		18200		9170		43700		22700	
Lead	mg/kg	14.3		11.6		4.3		9.8		10.3		5.5		10.6		8	
Magnesium	mg/kg	25300		2810		1290		10700		19500		1010		17400		17100	
Manganese	mg/kg	2270		338		144		292		327		127		797		731	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		22.9		12.2		16.6		25.9		7.4		40.1		23.8	
Potassium	mg/kg	2730		968				864		1580				2250		2190	
Selenium	mg/kg	1.1						0.64		1.1							
Sodium	mg/kg	4280		3760													
Vanadium	mg/kg	38.4		23.9		28.5		19.7		23.7		16.3		38.4		25.4	
Zinc	mg/kg	104		61.3		30.6		43.7		56.9		24.9		104		52.1	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8		8.8													
Dinitrotoluene, 2,6-	mg/kg	0.58	J	0.58	J												
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP06		PRRP-DP06		PRRP-DP06		PRRP-DP07		PRRP-DP07		PRRP-DP07		PRRP-DP08	
		SAMPLE_NO		7400		7410		7420		7440		7450		7460		7480	
		SAMPLE_DATE		8-Jun-98		8-Jun-98		8-Jun-98		9-Jun-98		9-Jun-98		9-Jun-98		10-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 5 FT		9 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3															
Dinitrotoluene, 2,4-	mg/kg	25						1.1									
Dinitrotoluene, 2,6-	mg/kg	1.7															
Trinitrobenzene, 1,3,5-	mg/kg	43						1.8									
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		15.8		18.4		20.3		6.1		18.6		18.9		13.6	
METALS																	
Aluminum	mg/kg	12700		6110		8710		7260		4120		8560		7960		4450	
Antimony	mg/kg	9.3															
Arsenic	mg/kg	42.8		3.6		9.1		5.3		2.5		6.3		6.5		4.2	
Barium	mg/kg	239				57.3		44.9				55.3		54.5			
Beryllium	mg/kg	0.83															
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		945		62300		43700		1420		62800		62000		1820	
Chromium	mg/kg	20.8		10.9		15.9		14.4		6.1		14.3		13		10.6	
Cobalt	mg/kg	30.3										13.1		9.8		6	
Copper	mg/kg	34.5		5.9		26.2		15.2		4.3		20.3		23.9		6.5	
Iron	mg/kg	43700		13700		24200		15300		8330		17500		20000		13400	
Lead	mg/kg	14.3		3.5		11.3		7.6		3.2		10.3		10.9		3.1	
Magnesium	mg/kg	25300		885		16000		12600		830		19100		19200		894	
Manganese	mg/kg	2270		166		430		321		116		536		520		207	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		9.4		22.9		17.6		7		29.7		26.1		7.9	
Potassium	mg/kg	2730				1380		1190				1720		1660			
Selenium	mg/kg	1.1															
Sodium	mg/kg	4280															
Vanadium	mg/kg	38.4		23.1		27.1		21.8		12.9		24.4		22.9		24.4	
Zinc	mg/kg	104		22.6		68.9		45.5		17.9		54.7		61.9		21.7	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8															
Dinitrotoluene, 2,6-	mg/kg	0.58	J														
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J									0.0082	J				
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP08		PRRP-DP08		PRRP-DP09		PRRP-DP09		PRRP-DP09		PRRP-DP10		PRRP-DP10	
		SAMPLE_NO		7490		7500		7520R		7530R		7540R		7560		7570	
		SAMPLE_DATE		10-Jun-98		10-Jun-98		25-Jun-98		25-Jun-98		25-Jun-98		10-Jun-98		10-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 1 FT		4 - 5 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3															
Dinitrotoluene, 2,4-	mg/kg	25															
Dinitrotoluene, 2,6-	mg/kg	1.7															
Trinitrobenzene, 1,3,5-	mg/kg	43										1.3					
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		18.5		18		11.2		19.6		23		10.5		22.4	
METALS																	
Aluminum	mg/kg	12700		8700		7140		7220		4410		4630		4620		9510	
Antimony	mg/kg	9.3															
Arsenic	mg/kg	42.8		12.9		4.2		2.4		2.6		6.3		3.4		5.6	
Barium	mg/kg	239		42.5		47.4		24.3				26.5				81.5	
Beryllium	mg/kg	0.83														0.83	
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		57000		52200		1750		63200		58500		2440		4620	
Chromium	mg/kg	20.8		14.6		12.6		8.8		9.2		8.7		10.9		12.6	
Cobalt	mg/kg	30.3		9.8		7.9											
Copper	mg/kg	34.5		21.7		16.5		4.9		11.2		15.1		5.9		17.5	
Iron	mg/kg	43700		19400		16000		8430		9480		10600		13700		16100	
Lead	mg/kg	14.3		9.2		7.6		5.1		4.9		6.3		3.2		11.3	
Magnesium	mg/kg	25300		16800		15700		1110		16800		16900		920		2090	
Manganese	mg/kg	2270		283		393		102		184		273		273		230	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		25.7		19.6		6.3		8.4		15.5		9.6		11.4	
Potassium	mg/kg	2730		1820		1580				1050		1200					
Selenium	mg/kg	1.1										0.87				0.71	
Sodium	mg/kg	4280														4130	
Vanadium	mg/kg	38.4		24.1		21.3		15.8		20.9		17.5		23.6		22.1	
Zinc	mg/kg	104		64.8		46.6		22.5		24.8		35.5		24.4		49.7	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8								0.056	J						
Dinitrotoluene, 2,6-	mg/kg	0.58	J														
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J							0.0017	J						

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP10		PRRP-DP11		PRRP-DP11		PRRP-DP11		PRRP-DP12		PRRP-DP12		PRRP-DP12	
		SAMPLE_NO		7580		7600		7610		7620		7640		7650		7660	
		SAMPLE_DATE		10-Jun-98		13-Jun-98		13-Jun-98		13-Jun-98		11-Jun-98		11-Jun-98		11-Jun-98	
		FK_DEPTH		9 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7				2.7											
Dinitrobenzene, 1,3-	mg/kg	9.3		5.2				0.43		5.8							
Dinitrotoluene, 2,4-	mg/kg	25		15		0.32		1.6		1.2							
Dinitrotoluene, 2,6-	mg/kg	1.7		1.7				0.29		0.3							
Trinitrobenzene, 1,3,5-	mg/kg	43		18				0.43		7							
Trinitrotoluene, 2,4,6-	mg/kg	0.38				0.27											
GENERAL CHEMISTRY																	
% moisture	Percent	25		20.4		13.5		17.1		20.4		12.4		19.9		19.6	
METALS																	
Aluminum	mg/kg	12700		11600		6200		8950		11200		9560		12000		12300	
Antimony	mg/kg	9.3														7.8	
Arsenic	mg/kg	42.8		14.9		7		25.3		5.3		7.3		5.7		7.4	
Barium	mg/kg	239		90.9		39.4		209		51.5		71.5		60.3		69.5	
Beryllium	mg/kg	0.83		0.77				0.66				0.68					
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		4510		17300		3380		61600		4310		37100		55600	
Chromium	mg/kg	20.8		20.1		11.2		11		19		14		19.7		20	
Cobalt	mg/kg	30.3		10.2		7.4		30.3		10.8		6.4		10.8		12	
Copper	mg/kg	34.5		22.1		10.1		13.1		23.3		10.4		26.7		25.4	
Iron	mg/kg	43700		28700		14700		36200		20800		16000		22300		23200	
Lead	mg/kg	14.3		14.3		7.9		9.8		9.9		9.6		10.7		10.6	
Magnesium	mg/kg	25300		3970		6390		2500		20500		1900		16600		19100	
Manganese	mg/kg	2270		484		365		1640		457		337		306		521	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		30		14.4		26.8		30.1		12.1		31.6		30.9	
Potassium	mg/kg	2730		1080		849		1060		2580		684		2430		2730	
Selenium	mg/kg	1.1															
Sodium	mg/kg	4280		4280		741		1200		1520							
Vanadium	mg/kg	38.4		31.6		20.1		34.2		31		23.7		26.8		29.9	
Zinc	mg/kg	104		72.7		39.1		68.5		62.2		38.5		71.9		65.3	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8				0.16	J										
Dinitrotoluene, 2,6-	mg/kg	0.58	J			0.05	J										
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP13		PRRP-DP13		PRRP-DP13		PRRP-DP14		PRRP-DP14		PRRP-DP14		PRRP-DP15	
		SAMPLE_NO		7680		7690		7700		7720		7730		7740		7760	
		SAMPLE_DATE		12-Jun-98		12-Jun-98		12-Jun-98		11-Jun-98		11-Jun-98		11-Jun-98		12-Jun-98	
		FK_DEPTH		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3															
Dinitrotoluene, 2,4-	mg/kg	25															
Dinitrotoluene, 2,6-	mg/kg	1.7															
Trinitrobenzene, 1,3,5-	mg/kg	43															
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		10		17		17.2		19.3		17.3		17.8		13.4	
METALS																	
Aluminum	mg/kg	12700		7760		6380		5930		12700		9640		8710		6680	
Antimony	mg/kg	9.3															
Arsenic	mg/kg	42.8		3.4		5.3		4.1		7.4		8.2		8.1		5.8	
Barium	mg/kg	239				29.2		42.4		49.6		39		64.8		34.9	
Beryllium	mg/kg	0.83								0.69							
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400				2100		67100		3010		4340		53400		2880	
Chromium	mg/kg	20.8		9.4		11.3		10.7		20.2		17.4		15.9		12.1	
Cobalt	mg/kg	30.3				7		7.2		8.3		8.4		10.3		5.8	
Copper	mg/kg	34.5		6.5		13.7		16.2		14.7		14.3		21.1		7	
Iron	mg/kg	43700		11200		15400		13000		22900		20100		18700		14700	
Lead	mg/kg	14.3		4.1		5.1		7.7		6.8		6.5		9.6		5.5	
Magnesium	mg/kg	25300		938		1560		25300		2310		2940		21100		1660	
Manganese	mg/kg	2270		74.5		313		472		173		275		506		93.2	
Mercury	mg/kg	0.045								0.043							
Nickel	mg/kg	57.2		8.4		20.2		19.4		20.5		19.4		26.5		13.9	
Potassium	mg/kg	2730						1330		771		713		1850			
Selenium	mg/kg	1.1															
Sodium	mg/kg	4280															
Vanadium	mg/kg	38.4		19.8		19.1		21		35.2		27		25.2		23	
Zinc	mg/kg	104		23.1		40.6		43.7		46.1		41.2		57.3		30.4	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8															
Dinitrotoluene, 2,6-	mg/kg	0.58	J														
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J														
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP15		PRRP-DP15		PRRP-DP16		PRRP-DP16		PRRP-DP16		PRRP-DP17		PRRP-DP17	
		SAMPLE_NO		7770		7780		7800		7810		7820		7840		7850	
		SAMPLE_DATE		12-Jun-98		12-Jun-98		12-Jun-98		12-Jun-98		12-Jun-98		10-Jun-98		10-Jun-98	
		FK_DEPTH		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT	
Parameter	*Units*	*MDC*	*Qual*	*Result*	*Qual*	*Result*	*Qual*	*Result*	*Qual*	*Result*	*Qual*	*Result*	*Qual*	*Result*	*Qual*	*Result*	*Qual*
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3										0.25					
Dinitrotoluene, 2,4-	mg/kg	25										0.5					
Dinitrotoluene, 2,6-	mg/kg	1.7										0.5					
Trinitrobenzene, 1,3,5-	mg/kg	43										1.9					
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		19.4		17.9		18.8		9.4		20.2		9.7		16.3	
METALS																	
Aluminum	mg/kg	12700		8870		6010		7300		9850		9430		7140		5570	
Antimony	mg/kg	9.3															
Arsenic	mg/kg	42.8		15.9		6.9		5.4		9.7		4.8		2.3		3.1	
Barium	mg/kg	239		176		41.5		30.4		59.5		47.5					
Beryllium	mg/kg	0.83								0.55							
Cadmium	mg/kg	0.63															
Calcium	mg/kg	70400		53300		67400		7980		3080		57600		817		1850	
Chromium	mg/kg	20.8		5.2		11.6		11		17.5		16.8		10.8		15.5	
Cobalt	mg/kg	30.3		26.7		9				14.4		9.1				7.3	
Copper	mg/kg	34.5		24.6		19.3		11.2		21.7		24.3		3.8		5.3	
Iron	mg/kg	43700		20500		18300		13300		22000		19300		13100		16400	
Lead	mg/kg	14.3		13.4		8.1		7.7		10.7		10.5		3.3		2.9	
Magnesium	mg/kg	25300		17200		20300		3100		4020		18100		791		917	
Manganese	mg/kg	2270		2270		467		147		437		303		104		323	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		56.1		22.2		12		31.1		27		6.4		8.1	
Potassium	mg/kg	2730		1380		1370				1210		1750					
Selenium	mg/kg	1.1															
Sodium	mg/kg	4280				1030				1160		1090					
Vanadium	mg/kg	38.4		26.7		19.3		21.4		23.3		26.1		23.4		29.3	
Zinc	mg/kg	104		59.7		52		37.4		67.2		64.2		21.3		22.7	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8				0.19	J					0.0004	J				
Dinitrotoluene, 2,6-	mg/kg	0.58	J									0.049	J				
Nitroaniline, 3-	mg/kg	0.053	J			0.053	J										
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J									0.0021	J				
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

		LOCATION_CODE		PRRP-DP17		PRRP-DP18		PRRP-DP18		PRRP-DP18		PRRP-DP19		PRRP-DP19		PRRP-DP19	
		SAMPLE_NO		7860		7880		7890		7900		7920		7930		7940	
		SAMPLE_DATE		10-Jun-98		11-Jun-98		11-Jun-98		11-Jun-98		12-Jun-98		12-Jun-98		12-Jun-98	
		FK_DEPTH		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 2 FT		4 - 6 FT		8 - 10 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES																	
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7															
Dinitrobenzene, 1,3-	mg/kg	9.3															
Dinitrotoluene, 2,4-	mg/kg	25															
Dinitrotoluene, 2,6-	mg/kg	1.7															
Trinitrobenzene, 1,3,5-	mg/kg	43															
Trinitrotoluene, 2,4,6-	mg/kg	0.38															
GENERAL CHEMISTRY																	
% moisture	Percent	25		18.1		12.9		21.7		19.9		8.9		17.1		17.6	
METALS																	
Aluminum	mg/kg	12700		3320		10700		7340		9140		2370		7060		9590	
Antimony	mg/kg	9.3															
Arsenic	mg/kg	42.8		4.5		4		27.3		5.8		14.1		4.7		4.9	
Barium	mg/kg	239				32.3		41.8		66.2		33.6		51.2		61	
Beryllium	mg/kg	0.83															
Cadmium	mg/kg	0.63								0.63							
Calcium	mg/kg	70400		61500		1040		38400		61600		54000		56900		68000	
Chromium	mg/kg	20.8		7.3		14.6		13.6		15.7		4.2		12.5		15.7	
Cobalt	mg/kg	30.3				6.2		8.7		10.6				8.7		9.4	
Copper	mg/kg	34.5		10.6		7.5		19		24.3		10.6		19.1		22.4	
Iron	mg/kg	43700		8940		17800		20000		20600		15900		16200		19900	
Lead	mg/kg	14.3		4.3		5.6		7.6		9.6		3.2		8.5		9.4	
Magnesium	mg/kg	25300		16200		1120		12800		19200		11500		22500		21300	
Manganese	mg/kg	2270		252		158		300		534		658		495		512	
Mercury	mg/kg	0.045															
Nickel	mg/kg	57.2		11		9.8		21.5		29		11.6		22.8		26.1	
Potassium	mg/kg	2730		726				1310		1990				1490		2330	
Selenium	mg/kg	1.1															
Sodium	mg/kg	4280															
Vanadium	mg/kg	38.4		15		30.3		25.7		24.6		13.2		21.4		26.2	
Zinc	mg/kg	104		31.6		27.9		56.2		64.5		26.8		52.8		60.5	
SEMIVOLATILES																	
Dinitrotoluene, 2,4-	mg/kg	8.8															
Dinitrotoluene, 2,6-	mg/kg	0.58	J														
Nitroaniline, 3-	mg/kg	0.053	J														
VOLATILES																	
Acetone	mg/kg	0.0082	J														
Methylene chloride	mg/kg	0.0021	J									0.0018	J				
Toluene	mg/kg	0.0017	J														

Table 3-19

PRRWP - Historical Soil Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

			LOCATION_CODE	PRRP-DP20		PRRP-DP20		PRRP-DP20		PRWP-SO001	
			SAMPLE_NO	7960		7970		7980		AC0001	
			SAMPLE_DATE	13-Jun-98		13-Jun-98		13-Jun-98		15-Sep-00	
			FK_DEPTH	0 - 2 FT		4 - 6 FT		8 - 10 FT		0 - 1 FT	
Parameter	Units	MDC	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
EXPLOSIVES											
Amino-2,6-dinitrotoluene, 4-	mg/kg	2.7									
Dinitrobenzene, 1,3-	mg/kg	9.3									
Dinitrotoluene, 2,4-	mg/kg	25								1.2	
Dinitrotoluene, 2,6-	mg/kg	1.7									
Trinitrobenzene, 1,3,5-	mg/kg	43									
Trinitrotoluene, 2,4,6-	mg/kg	0.38									
GENERAL CHEMISTRY											
% moisture	Percent	25		13.5		18.1		18.7			
METALS											
Aluminum	mg/kg	12700		5360		7580		10800			
Antimony	mg/kg	9.3						7.7			
Arsenic	mg/kg	42.8		3.6		4.7		5.5			
Barium	mg/kg	239				58.2		69.3			
Beryllium	mg/kg	0.83									
Cadmium	mg/kg	0.63									
Calcium	mg/kg	70400		2160		61900		70400			
Chromium	mg/kg	20.8		11.4		13.1		17			
Cobalt	mg/kg	30.3		5.8		9.3		11.3			
Copper	mg/kg	34.5		7.2		18.3		20.1			
Iron	mg/kg	43700		16000		18000		22500			
Lead	mg/kg	14.3		3.2		9		9.7			
Magnesium	mg/kg	25300		999		24600		20200			
Manganese	mg/kg	2270		262		527		513			
Mercury	mg/kg	0.045									
Nickel	mg/kg	57.2		9.3		24		29.6			
Potassium	mg/kg	2730				1610		2640			
Selenium	mg/kg	1.1									
Sodium	mg/kg	4280									
Vanadium	mg/kg	38.4		27.6		23.8		28.6			
Zinc	mg/kg	104		26		50.6		69.5			
SEMIVOLATILES											
Dinitrotoluene, 2,4-	mg/kg	8.8									
Dinitrotoluene, 2,6-	mg/kg	0.58	J								
Nitroaniline, 3-	mg/kg	0.053	J								
VOLATILES											
Acetone	mg/kg	0.0082	J								
Methylene chloride	mg/kg	0.0021	J								
Toluene	mg/kg	0.0017	J								

MDC - Maximum detected concentration for the Area of Concern ("B" qualified data not included).
µg/L - Micrograms per liter.
Qual - Laboratory qualifier.

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		IT-MW05			IT-MW05			IT-MW05			IT-MW05			PB-BED-MW15		
				Sample No:		PB-PR-IT-MW5			5320			5550			5555			PB-BED-MW15		
				Sample Date:		08-DEC-94			20-OCT-96			19-NOV-97			28-MAY-98			13-DEC-94		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		-			-			-			-			-		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		-			-			-			-			0.7		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			-			-			0.6		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			2.7		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			-			-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			-			-			-			2.1		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-			-			1.2		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		-			-			350000			680000			-		
Chloride		µg/L	NE	9500000		-			-			3000			11000			-		
Cyanide, total		µg/L	73	1700		-			-			-			-			-		
Hardness		µg/L	NE	13000000		-			-			760000			570000			-		
Nitrate		µg/L	1000	1600000	J	-			-			-			-			-		
Nitrate		µg/L	1000	1500000		0.1			-			-			-			0.5		
Sulfate		µg/L	NE	12000000		-			-			48000			61000			-		
Total dissolved solids		µg/L	NE	50000000		-			-			420000			650000			-		
Total organic carbon		µg/L	NE	14000000		-			-			4700			6000			-		
Total suspended solids		µg/L	NE	110000		-			-			6000			15000			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		IT-MW05			IT-MW05			IT-MW05			IT-MW05			PB-BED-MW15		
				Sample No:		PB-PR-IT-MW5			5320			5550			5555			PB-BED-MW15		
				Sample Date:		08-DEC-94			20-OCT-96			19-NOV-97			28-MAY-98			13-DEC-94		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			248			-			-			-		
Aluminum		µg/L	3650	280000		-			1520		J	**3970**		J	**15800**		J	-		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			**18**		
Antimony		µg/L	1.5	118	J	-			-			-			-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			**12.5**			-			-		
Arsenic		µg/L	0.045	584	J	-			**13.6**			**11.5**			**14.3**			-		
Barium	Y	µg/L	255	2390		-			236			-			-			-		
Barium		µg/L	255	1850		-			**277**			-			**312**			-		
Beryllium		µg/L	7.3	8.8		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		-			132000			99500			113000		J	-		
Calcium		µg/L	NE	1530000		-			156000			116000			145000		J	-		
Chromium	Y	µg/L	11	495		-			-			-			-			-		
Chromium		µg/L	11	561		-			**11.6**			10.6			**22.7**			-		
Cobalt	Y	µg/L	73	7450		-			-			-			-			-		
Cobalt		µg/L	73	7270		-			-			-			-			-		
Copper	Y	µg/L	146	4710	J	-			-			-			-			-		
Copper		µg/L	146	4680		-			-			-			43.7			40		
Iron	Y	µg/L	1095	15300		-			-			**3050**			185			-		
Iron		µg/L	1095	679000		-			**7840**			**14700**			**26500**			-		
Lead	Y	µg/L	15	31.5		-			5.2			-			-			-		
Lead		µg/L	15	323	J	-			5.7		U	6.6			9.4			-		
Magnesium	Y	µg/L	NE	584000		-			45600			36500			38300		J	-		
Magnesium		µg/L	NE	616000		-			48500		J	38400			47200			-		
Manganese	Y	µg/L	88	62400		**100**			**195**			**114**			**223**			-		
Manganese		µg/L	88	55100		**100**			**459**			**302**			**592**			-		
Mercury		µg/L	1.1	0.55		-			-			0.30			-			-		
Nickel	Y	µg/L	73	7310		-			-			-			-			-		
Nickel		µg/L	73	7600		-			-			-			-			-		
Potassium	Y	µg/L	NE	104000		-			-			-			-			-		
Potassium		µg/L	NE	78000		-			-			-			7710			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		IT-MW05			IT-MW05			IT-MW05			IT-MW05			PB-BED-MW15		
				Sample No:		PB-PR-IT-MW5			5320			5550			5555			PB-BED-MW15		
				Sample Date:		08-DEC-94			20-OCT-96			19-NOV-97			28-MAY-98			13-DEC-94		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		-			23600			19100			22800			-		
Sodium		µg/L	NE	11900000		-			23600			18100			22100			-		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			0.6		
Vanadium	Y	µg/L	26	68.3		-			-			-			-			-		
Vanadium		µg/L	26	1000		-			-			-			-			-		
Zinc	Y	µg/L	1095	1100		-			-			-			-			-		
Zinc		µg/L	1095	2010		27			36.2		U	47.6			103		B	22		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			-			-			-		
Fluorene		µg/L	24	44	NJ	-			-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			70		J
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			60		J
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		IT-MW05			IT-MW05			IT-MW05			IT-MW05			PB-BED-MW15		
				Sample No:		PB-PR-IT-MW5			5320			5550			5555			PB-BED-MW15		
				Sample Date:		08-DEC-94			20-OCT-96			19-NOV-97			28-MAY-98			13-DEC-94		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	-			-			22		J	45		J	660		J
Benzene		µg/L	0.34	1300		-			-			-			0.21	J	J	530		J
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			0.21	J	J	-			1500		J
Chlorobenzene		µg/L	11	5.5	J	-			1.3	J	J	-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-			-			180		J
Hexanone, 2-		µg/L	150	2	J	-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			0.27	J B	B	2.4	B	B	-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-			-			-		
Toluene		µg/L	72	800		-			1.1	J	J	-			0.36	J B	B	540		J
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	-			-			-			-			1300		J

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-BED-MW15			PB-BED-MW15			PB-BED-MW15			PB-PR-MW7			PB-PR-MW7		
				Sample No:		5180			5910			5915			PB-PR-DM-MW7			5130		
				Sample Date:		21-OCT-96			18-NOV-97			28-MAY-98			08-DEC-94			21-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-			66			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	0.66			-			-			-			1600		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		0.44			-			-			3000			1100		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			1300		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		-			-			0.89			980			1100		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			300		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			0.89			17			310		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-			11			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			1.9			-		
RDX	Y	µg/L	0.61	630	J	6.3			-			-			-			310		
RDX		µg/L	0.61	3.7		3.7			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		2.3			-			-			-			-		
Tetryl		µg/L	36	1.7		1.7			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		0.80			-			-			-			2400		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		0.52			-			-			5700			2000		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-			30			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		-			85000			500000			-			-		
Chloride		µg/L	NE	9500000		-			1400000			2200000			-			-		
Cyanide, total		µg/L	73	1700		-			-			-			-			190		
Hardness		µg/L	NE	13000000		-			1500000			1800000			-			-		
Nitrate		µg/L	1000	1600000	J	-			-			-			-			-		
Nitrate		µg/L	1000	1500000		-			-			-			80			-		
Sulfate		µg/L	NE	12000000		-			-			82000			-			-		
Total dissolved solids		µg/L	NE	50000000		-			3200000			3800000			-			-		
Total organic carbon		µg/L	NE	14000000		-			11000			13000			-			-		
Total suspended solids		µg/L	NE	110000		-			7000			13000			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-BED-MW15			PB-BED-MW15			PB-BED-MW15			PB-PR-MW7			PB-PR-MW7		
				Sample No:		5180			5910			5915			PB-PR-DM-MW7			5130		
				Sample Date:		21-OCT-96			18-NOV-97			28-MAY-98			08-DEC-94			21-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			-			-		
Aluminum		µg/L	3650	280000		-			-			513		J	-			2550		J
Antimony	Y	µg/L	1.5	69.6		69.6			-			-			-			-		
Antimony		µg/L	1.5	118	J	77.6			-			-			-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			-			-			-		
Barium	Y	µg/L	255	2390		2390			555			1390			-			-		
Barium		µg/L	255	1850		1850			605			1710			-			-		
Beryllium		µg/L	7.3	8.8		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		556000			245000		J	390000		J	-			562000		
Calcium		µg/L	NE	1530000		459000			280000			662000		J	-			540000		
Chromium	Y	µg/L	11	495		-			-			-			21			33.1		
Chromium		µg/L	11	561		-			-			20.6			36			35.5		
Cobalt	Y	µg/L	73	7450		-			-			-			-			2240		
Cobalt		µg/L	73	7270		-			-			-			-			2250		
Copper	Y	µg/L	146	4710	J	-			-			-			1100			931		J
Copper		µg/L	146	4680		-			-			39.5			1400			984		
Iron	Y	µg/L	1095	15300		-			-			-			-			1150		
Iron		µg/L	1095	679000		-			930			4810			-			6010		
Lead	Y	µg/L	15	31.5		-			-			-			-			-		
Lead		µg/L	15	323	J	-			-			-			-			-		
Magnesium	Y	µg/L	NE	584000		443000			182000			299000		J	-			165000		
Magnesium		µg/L	NE	616000		358000			177000			259000			-			180000		J
Manganese	Y	µg/L	88	62400		27.2			-			-			10000			15200		
Manganese		µg/L	88	55100		16.9			26.3			139			12000			13600		
Mercury		µg/L	1.1	0.55		-			-			-			-			-		
Nickel	Y	µg/L	73	7310		-			-			-			1800			1630		J
Nickel		µg/L	73	7600		-			-			-			2000			1690		
Potassium	Y	µg/L	NE	104000		104000			61100			74800			-			8310		
Potassium		µg/L	NE	78000		78000			58800			62500			-			11800		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-BED-MW15			PB-BED-MW15			PB-BED-MW15			PB-PR-MW7			PB-PR-MW7		
				Sample No:		5180			5910			5915			PB-PR-DM-MW7			5130		
				Sample Date:		21-OCT-96			18-NOV-97			28-MAY-98			08-DEC-94			21-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		1320000		R	582000			1010000			-			3380000		
Sodium		µg/L	NE	11900000		945000		R	559000			811000			-			3200000		
Thallium	Y	µg/L	0.24	62.2		-			-			62.2			0.7			-		
Thallium		µg/L	0.24	50.8		-			-			50.8			0.9			-		
Vanadium	Y	µg/L	26	68.3		-			-			-			-			68.3		
Vanadium		µg/L	26	1000		-			-			-			-			62.8		
Zinc	Y	µg/L	1095	1100		22.8			30.9			47.3		B	44			85.9		
Zinc		µg/L	1095	2010		22.8			30.6			105		B	94			119		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		14	J	J	37			28		B	-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	16	J	J	6.7	J	J	10			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			-			-			70		
Fluorene		µg/L	24	44	NJ	-			1.7	J	J	-			-			-		
Isophorone		µg/L	71	4.2	J	-			4.2	J	J	3.8	J	J	-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	72	J	J	31			37			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			3.0	J	J	6.7	J	J	-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			3.9	J	J	7.7	J	J	-			-		
Naphthalene		µg/L	0.62	60	J	52	J	J	22			31			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-			-			6.9	J	J
Nitrophenol, 2-		µg/L	4.9	15		-			-			-			-			5.2	J	J
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			2.2	J	J	2.0	J	J	-			-		
Phenol		µg/L	2190	40	J	40	J	J	18			32			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-BED-MW15			PB-BED-MW15			PB-BED-MW15			PB-PR-MW7			PB-PR-MW7		
				Sample No:		5180			5910			5915			PB-PR-DM-MW7			5130		
				Sample Date:		21-OCT-96			18-NOV-97			28-MAY-98			08-DEC-94			21-OCT-96		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	-			-			-			-			-		
Benzene		µg/L	0.34	1300		1300			570			780			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-			-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			5.5	J	J	-			-		
Chloroform		µg/L	0.063	8.6	J	8.6	J B	J	8.4	J	B	-			-			-		
Ethylbenzene		µg/L	130	180	J	180			130			140			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			31	J B	B	83	B	B	-			-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-			-			-		
Toluene		µg/L	72	800		800			490			550	B		-			-		
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			4.9	J	J	-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	1100			920			880			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW7			PB-PR-MW7			PB-PR-MW8			PB-PR-MW8			PB-PR-MW8		
				Sample No:		5690			5695			PB-PR-DM-MW8			5140			5700		
				Sample Date:		17-NOV-97			20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			10			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			37			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			11			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			1700		J	-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		1500			2000			790			1400			1500		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			1400		J	-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		1200			1600			440			1400			1300		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			33			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			41			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			2.2			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			630		J	-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			2100		J	-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		2000			2800			1300			1700			1500		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			160		J	-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			64			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		820000			840000			-			-			990000		
Chloride		µg/L	NE	9500000		-			9500000			-			-			6500000		
Cyanide, total		µg/L	73	1700		120			200			-			430			240		
Hardness		µg/L	NE	13000000		5000000			2300000			-			-			13000000		
Nitrate		µg/L	1000	1600000	J	400		J	-			-			-			1600000		J
Nitrate		µg/L	1000	1500000		-			190000			650			-			-		
Sulfate		µg/L	NE	12000000		8000000			5400000			-			-			12000000		
Total dissolved solids		µg/L	NE	50000000		17000000			18000000			-			-			50000000		
Total organic carbon		µg/L	NE	14000000		2700000			2900000			-			-			14000000		
Total suspended solids		µg/L	NE	110000		25000			17000			-			-			73000		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW7			PB-PR-MW7			PB-PR-MW8			PB-PR-MW8			PB-PR-MW8		
				Sample No:		5690			5695			PB-PR-DM-MW8			5140			5700		
				Sample Date:		17-NOV-97			20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			859			-		
Aluminum		µg/L	3650	280000		8960		J	10500		J	-			965		J	-		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			-		
Antimony		µg/L	1.5	118	J	-			-			-			76.0			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			-			-			-		
Barium	Y	µg/L	255	2390		-			-			-			-			-		
Barium		µg/L	255	1850		-			-			-			-			-		
Beryllium		µg/L	7.3	8.8		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			7.2			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		582000			597000			-			967000			753000		J
Calcium		µg/L	NE	1530000		625000			526000			-			994000			749000		
Chromium	Y	µg/L	11	495		-			-			38			150			-		
Chromium		µg/L	11	561		-			-			52			[illegible]			-		
Cobalt	Y	µg/L	73	7450		2330			2610			-			[illegible]			6270		
Cobalt		µg/L	73	7270		2320			2350			-			[illegible]			7270		
Copper	Y	µg/L	146	4710	J	911			1060			1400			[illegible]		J	3390		
Copper		µg/L	146	4680		887			1060			1600			[illegible]			3790		
Iron	Y	µg/L	1095	15300		1360			2110			-			[illegible]			12200		
Iron		µg/L	1095	679000		21700			32600			-			13300			22000		
Lead	Y	µg/L	15	31.5		-			-			-			-			-		
Lead		µg/L	15	323	J	-			-			-			-			-		
Magnesium	Y	µg/L	NE	584000		184000			180000			-			422000			-		
Magnesium		µg/L	NE	616000		189000			184000			-			424000		J	541000		
Manganese	Y	µg/L	88	62400		17000			17600			7000			30900			29700		
Manganese		µg/L	88	55100		17000			13700			8000			30700			34100		
Mercury		µg/L	1.1	0.55		-			-			-			-			-		
Nickel	Y	µg/L	73	7310		1710			1900			2100			6230		J	6820		
Nickel		µg/L	73	7600		1710			1790			2500			6060			7600		
Potassium	Y	µg/L	NE	104000		-			-			-			35100			-		
Potassium		µg/L	NE	78000		-			-			-			35400			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW7			PB-PR-MW7			PB-PR-MW8			PB-PR-MW8			PB-PR-MW8		
				Sample No:		5690			5695			PB-PR-DM-MW8			5140			5700		
				Sample Date:		17-NOV-97			20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		3850000			3970000			-			11500000			9230000		
Sodium		µg/L	NE	11900000		3540000			3680000			-			11200000			10800000		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-			67.3			-		
Vanadium		µg/L	26	1000		-			-			-			65.2			-		
Zinc	Y	µg/L	1095	1100		-			-			50			183			-		
Zinc		µg/L	1095	2010		-			-			52			155		U	-		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			20		B	-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	660	J	J	12000	E	NJ	-			870	J D	J	2300	J	J
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-			190	J D	J	6000	J	J
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	1800			1800	E	NJ	-			630	J D	J	1500	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	550		140	J	J	-			-			52	J	J	190	J	J
Fluorene		µg/L	24	44	NJ	-			-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			-			160	J	J
Nitrobenzene		µg/L	0.34	14		-			13		NJ	-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			6.6	J	NJ	-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW7			PB-PR-MW7			PB-PR-MW8			PB-PR-MW8			PB-PR-MW8		
				Sample No:		5690			5695			PB-PR-DM-MW8			5140			5700		
				Sample Date:		17-NOV-97			20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	-			-			-			-			-		
Benzene		µg/L	0.34	1300		-			-			-			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-			-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			0.17	J	J	-			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		3.0	J B	B	0.37	J B	B	-			-			57	B	B
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-			-			-		
Toluene		µg/L	72	800		-			0.31	J	B	-			-			-		
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	-			0.82	J	J	-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW8			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9		
				Sample No:		5705			PB-PR-DM-MW9			5150			5710			5715		
				Sample Date:		20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97			20-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			1.4			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			0.2			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		2100			49			57			35			170		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		2400			9.5			36			28			110		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			1			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			0.6			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			-			-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		2400			4			27			-			71		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			1.1			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		1500000			-			-			860000			810000		
Chloride		µg/L	NE	9500000		4700000			-			-			7200000			3600000		
Cyanide, total		µg/L	73	1700		1700			-			62			36			72		
Hardness		µg/L	NE	13000000		3100000			-			-			2200000			1200000		
Nitrate		µg/L	1000	1600000	J	-			-			-			200		J	-		
Nitrate		µg/L	1000	1500000		1500000			50			-			-			110000		
Sulfate		µg/L	NE	12000000		12000000			-			-			3000000			1600000		
Total dissolved solids		µg/L	NE	50000000		49000000			-			-			8700000			6400000		
Total organic carbon		µg/L	NE	14000000		11000000			-			-			1300000			930000		
Total suspended solids		µg/L	NE	110000		79000			-			-			8000			7000		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW8			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9		
				Sample No:		5705			PB-PR-DM-MW9			5150			5710			5715		
				Sample Date:		20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97			20-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			-			-		
Aluminum		µg/L	3650	280000		-			-			-			-			-		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			-		
Antimony		µg/L	1.5	118	J	-			-			78.3			-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			-			-			-		
Barium	Y	µg/L	255	2390		-			-			-			-			-		
Barium		µg/L	255	1850		-			-			-			-			-		
Beryllium		µg/L	7.3	8.8		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		998000			-			410000			-			198000		
Calcium		µg/L	NE	1530000		998000			-			428000			-			171000		
Chromium	Y	µg/L	11	495		-			-			26.6			-			-		
Chromium		µg/L	11	561		-			-			27.9			-			-		
Cobalt	Y	µg/L	73	7450		7450			-			692			-			522		
Cobalt		µg/L	73	7270		7150			-			762			-			480		
Copper	Y	µg/L	146	4710	J	3900			760			414		J	-			264		
Copper		µg/L	146	4680		3740			770			445			-			430		
Iron	Y	µg/L	1095	15300		9560			-			1190			-			-		
Iron		µg/L	1095	679000		12100			-			1750			-			2070		
Lead	Y	µg/L	15	31.5		-			-			-			-			-		
Lead		µg/L	15	323	J	-			-			-			-			-		
Magnesium	Y	µg/L	NE	584000		584000			-			171000			-			70100		
Magnesium		µg/L	NE	616000		574000			-			178000		J	-			62900		
Manganese	Y	µg/L	88	62400		45500			1800			2140			1890			2500		
Manganese		µg/L	88	55100		43900			1800			2280			1900			2300		
Mercury		µg/L	1.1	0.55		-			-			-			-			-		
Nickel	Y	µg/L	73	7310		7310			1600			963		J	-			460		
Nickel		µg/L	73	7600		6950			1500			1080			-			468		
Potassium	Y	µg/L	NE	104000		-			-			16700			-			-		
Potassium		µg/L	NE	78000		-			-			17100			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW8			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9		
				Sample No:		5705			PB-PR-DM-MW9			5150			5710			5715		
				Sample Date:		20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97			20-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		11900000			-			1710000			1450000			1270000		
Sodium		µg/L	NE	11900000		11900000			-			1960000			1360000			1210000		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			56.6			-			-		
Vanadium		µg/L	26	1000		-			-			58.9			-			-		
Zinc	Y	µg/L	1095	1100		-			70			674			-			-		
Zinc		µg/L	1095	2010		-			60			201		U	-			-		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	620	E	NJ	-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	20000	E	NJ	-			-			-			280	E	NJ
Dinitrophenol, 2,4-		µg/L	7.3	6000		3800	E	NJ	-			-			49	J	J	-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	1700	E	NJ	-			30			110			120		
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			6.8	J	J	-			-		
Fluorene		µg/L	24	44	NJ	44		NJ	-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			2.0	J	J	-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			450	J	J	-		
Nitrobenzene		µg/L	0.34	14		14			-			-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		15			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	42	J	NJ	-			-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PB-PR-MW8			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9			PB-PR-MW9		
				Sample No:		5705			PB-PR-DM-MW9			5150			5710			5715		
				Sample Date:		20-MAY-98			08-DEC-94			20-OCT-96			17-NOV-97			20-MAY-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	15		B	-			-			-			-		
Benzene		µg/L	0.34	1300		-			-			-			-			0.47	J	J
Bromodichloromethane		µg/L	0.18	0.23	J	0.23	J	J	-			-			-			-		
Butanone, 2-		µg/L	190	24	J	14		J	-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-			-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-			-			-		
Chloroform		µg/L	0.063	8.6	J	0.74	J	B	-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-			-			1.5		
Hexanone, 2-		µg/L	150	2	J	2.0	J	J	-			-			-			-		
Methylene chloride		µg/L	4.3	ND		0.31	J B	B	-			-			0.54	J B	B	0.35	J B	B
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-			-			-		
Toluene		µg/L	72	800		0.38	J	B	-			-			-			1.5		
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	0.44	J	J	-			-			-			8.0		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP01			PRRP-DP02			PRRP-DP03			PRRP-DP04			PRRP-DP05		
				Sample No:		7230			7270			7310			7350			7390		
				Sample Date:		12-JUN-98			14-JUN-98			08-JUN-98			09-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			8 to 12			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		-			-			4800			0.28			-		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		10			-			6800			0.47			-		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			-			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			-			-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			-			-			-			-		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		-			450000			1500000			263000			-		
Chloride		µg/L	NE	9500000		-			9800			-			2300			-		
Cyanide, total		µg/L	73	1700		-			-			780			-			-		
Hardness		µg/L	NE	13000000		-			780000			3400000			940000			-		
Nitrate		µg/L	1000	1600000	J	-			-			-			-			-		
Nitrate		µg/L	1000	1500000		-			-			465000			-			-		
Sulfate		µg/L	NE	12000000		-			574000			10000000			22700			-		
Total dissolved solids		µg/L	NE	50000000		-			1410000			15000000			401000			-		
Total organic carbon		µg/L	NE	14000000		-			19300			6600000			-			-		
Total suspended solids		µg/L	NE	110000		-			-			110000			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP01			PRRP-DP02			PRRP-DP03			PRRP-DP04			PRRP-DP05		
				Sample No:		7230			7270			7310			7350			7390		
				Sample Date:		12-JUN-98			14-JUN-98			08-JUN-98			09-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			8 to 12			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			-			-		
Aluminum		µg/L	3650	280000		52900			52200			88400			280000			32700		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			-		
Antimony		µg/L	1.5	118	J	-			-			-			-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-			13.4			-		
Arsenic		µg/L	0.045	584	J	-			63.3			-			900		J	53.9		
Barium	Y	µg/L	255	2390		-			-			-			-			-		
Barium		µg/L	255	1850		-			-			-			1680			-		
Beryllium		µg/L	7.3	8.8		-			-			-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		207000			193000			542000			90900			274000		
Calcium		µg/L	NE	1530000		432000			221000			683000			1530000			606000		
Chromium	Y	µg/L	11	495		-			-			-			-			-		
Chromium		µg/L	11	561		112			113			208			561			82.6		
Cobalt	Y	µg/L	73	7450		-			-			3090			-			-		
Cobalt		µg/L	73	7270		-			-			2610			-			-		
Copper	Y	µg/L	146	4710	J	-			-			1600			-			-		
Copper		µg/L	146	4680		277			-			1410			669			-		
Iron	Y	µg/L	1095	15300		-			150			7480			166			-		
Iron		µg/L	1095	679000		125000			100000			200000			679000			98200		
Lead	Y	µg/L	15	31.5		-			-			-			-			-		
Lead		µg/L	15	323	J	58.3		J	42.6			96.7		J	292		J	48.4		
Magnesium	Y	µg/L	NE	584000		52800			44400			139000			25300			96100		
Magnesium		µg/L	NE	616000		101000			66300			172000			616000			204000		
Manganese	Y	µg/L	88	62400		1680			257			42700			39.3			818		
Manganese		µg/L	88	55100		4040			1120			39600			12400			3240		
Mercury		µg/L	1.1	0.55		-			0.23			-			0.55			-		
Nickel	Y	µg/L	73	7310		-			-			2760			-			-		
Nickel		µg/L	73	7600		-			-			2380			740			-		
Potassium	Y	µg/L	NE	104000		-			-			-			-			-		
Potassium		µg/L	NE	78000		-			-			-			31500			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP01			PRRP-DP02			PRRP-DP03			PRRP-DP04			PRRP-DP05		
				Sample No:		7230			7270			7310			7350			7390		
				Sample Date:		12-JUN-98			14-JUN-98			08-JUN-98			09-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			8 to 12			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		1130000			288000			7260000			-			119000		
Sodium		µg/L	NE	11900000		788000			266000			5930000			-			107000		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-			-			-		
Vanadium		µg/L	26	1000		-			-			-			821			-		
Zinc	Y	µg/L	1095	1100		-			-			-			21.6			-		
Zinc		µg/L	1095	2010		374			299			597			2010			279		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			2300			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		8.3	J	J	-			5800	D	D	-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	20			-			9200	D	D	-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	550		3.3	J	J	-			550			-			-		
Fluorene		µg/L	24	44	NJ	-			-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			1.9	J	J
Nitroaniline, 2-		µg/L	0.1	3.2	J	3.2	J	J	-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	88			-			-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			290	J	J	-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP01			PRRP-DP02			PRRP-DP03			PRRP-DP04			PRRP-DP05		
				Sample No:		7230			7270			7310			7350			7390		
				Sample Date:		12-JUN-98			14-JUN-98			08-JUN-98			09-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			8 to 12			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	4.3	J	B	-			20		J	4.0	J B	B	3.1	J	B
Benzene		µg/L	0.34	1300		-			-			0.14	J	J	-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			24		J	-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-			0.26	J	J	-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			0.19	J	J	-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			1.8	J	J	-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-			-			-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			0.14	J	J	0.22	J	J	-			0.26	J	J
Toluene		µg/L	72	800		-			0.22	J	B	0.51	J	B	0.63	J	B	0.30	J	B
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	-			-			0.88	J	J	-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP06			PRRP-DP07			PRRP-DP08			PRRP-DP09			PRRP-DP10		
				Sample No:		7430			7470			7510			7550			7590		
				Sample Date:		09-JUN-98			10-JUN-98			10-JUN-98			14-JUN-98			10-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		10			0.42			1.2			-			2100		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		31			0.82			1.4			-			2200		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		5.1			-			0.28			-			400		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			-			-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			-			-			-			-		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		-			-			-			476000			-		
Chloride		µg/L	NE	9500000		-			-			-			-			-		
Cyanide, total		µg/L	73	1700		-			-			-			23			-		
Hardness		µg/L	NE	13000000		-			-			-			1640000			-		
Nitrate		µg/L	1000	1600000	J	-			-			-			-			-		
Nitrate		µg/L	1000	1500000		-			-			-			16900			-		
Sulfate		µg/L	NE	12000000		-			-			-			1150000			-		
Total dissolved solids		µg/L	NE	50000000		-			-			-			4370000			-		
Total organic carbon		µg/L	NE	14000000		-			-			-			671000			-		
Total suspended solids		µg/L	NE	110000		-			-			-			12000			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP06			PRRP-DP07			PRRP-DP08			PRRP-DP09			PRRP-DP10		
				Sample No:		7430			7470			7510			7550			7590		
				Sample Date:		09-JUN-98			10-JUN-98			10-JUN-98			14-JUN-98			10-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			-			-		
Aluminum		µg/L	3650	280000		-			69000			178000			56800			76300		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			-		
Antimony		µg/L	1.5	118	J	-			-			118		J	-			-		
Arsenic	Y	µg/L	0.045	22.9		-			11.0			-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			259		J	-			-		
Barium	Y	µg/L	255	2390		-			-			-			-			-		
Barium		µg/L	255	1850		-			556			1210			-			-		
Beryllium		µg/L	7.3	8.8		-			-			8.8			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			6.5			-			-		
Calcium	Y	µg/L	NE	998000		-			66500			58000			269000			681000		
Calcium		µg/L	NE	1530000		-			650000			863000			873000			662000		
Chromium	Y	µg/L	11	495		-			-			-			-			-		
Chromium		µg/L	11	561		-			114			273			141			223		
Cobalt	Y	µg/L	73	7450		-			-			-			-			9680		
Cobalt		µg/L	73	7270		-			77.6			208			-			5610		
Copper	Y	µg/L	146	4710	J	-			-			-			311			3280		
Copper		µg/L	146	4680		-			194			472			436			2900		
Iron	Y	µg/L	1095	15300		-			190			116			-			15300		
Iron		µg/L	1095	679000		-			176000			468000			134000			202000		
Lead	Y	µg/L	15	31.5		-			-			-			31.5			-		
Lead		µg/L	15	323	J	-			86.2		J	323		J	67.1			-		
Magnesium	Y	µg/L	NE	584000		-			15800			12900			73600			348000		
Magnesium		µg/L	NE	616000		-			217000			253000			195000			326000		
Manganese	Y	µg/L	88	62400		-			71.4			-			1120			62400		
Manganese		µg/L	88	55100		-			4310			11800			4050			55100		
Mercury		µg/L	1.1	0.55		-			-			0.20			0.29			-		
Nickel	Y	µg/L	73	7310		-			-			-			-			5820		
Nickel		µg/L	73	7600		-			191			521			407			5040		
Potassium	Y	µg/L	NE	104000		-			-			-			-			-		
Potassium		µg/L	NE	78000		-			12300			22700			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP06			PRRP-DP07			PRRP-DP08			PRRP-DP09			PRRP-DP10		
				Sample No:		7430			7470			7510			7550			7590		
				Sample Date:		09-JUN-98			10-JUN-98			10-JUN-98			14-JUN-98			10-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		-			5490			-			754000			12600000		
Sodium		µg/L	NE	11900000		-			7060			-			707000			9410000		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-			-			-		
Vanadium		µg/L	26	1000		-			212			438			-			-		
Zinc	Y	µg/L	1095	1100		-			77.7			26.5			-			225		
Zinc		µg/L	1095	2010		-			525			1550			441			736		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			-			-			1700		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-			-			5900	D	D
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	-			-			2.8	J	J	-			4100	D	D
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			-			-			390		
Fluorene		µg/L	24	44	NJ	-			-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-			-			210	J	J
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP06			PRRP-DP07			PRRP-DP08			PRRP-DP09			PRRP-DP10		
				Sample No:		7430			7470			7510			7550			7590		
				Sample Date:		09-JUN-98			10-JUN-98			10-JUN-98			14-JUN-98			10-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	-			4.3	J B	B	2.1	J B	B	2.8	J	B	17	J B	B
Benzene		µg/L	0.34	1300		-			-			-			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			0.16	J	J	-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-			0.59	J B	B	-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			0.17	J	J	-			-			-		
Toluene		µg/L	72	800		-			0.30	J	B	0.51	J	B	-			-		
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			0.43	J	J	0.16	J	J	-			-		
Xylenes, total		µg/L	21	1300	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP11			PRRP-DP11			PRRP-DP12			PRRP-DP13			PRRP-DP14		
				Sample No:		7630			7630R			7670			7710			7750		
				Sample Date:		14-JUN-98			25-JUN-98			11-JUN-98			12-JUN-98			12-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES																				
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		-			840			1.3			1.6			-		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		-			150			2.3			2.4			-		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			0.35			0.36			-		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-			-			-		
RDX		µg/L	0.61	3.7		-			-			-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-			-			-		
Tetryl		µg/L	36	1.7		-			-			-			0.20			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			600			-			-			-		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-			-			-		
GENERAL CHEMISTRY																				
Alkalinity		µg/L	NE	1500000		864000			-			-			-			-		
Chloride		µg/L	NE	9500000		-			-			-			-			-		
Cyanide, total		µg/L	73	1700		400			-			-			-			-		
Hardness		µg/L	NE	13000000		2440000			-			-			-			-		
Nitrate		µg/L	1000	1600000	J	-			-			-			-			-		
Nitrate		µg/L	1000	1500000		350000		J	-			-			-			-		
Sulfate		µg/L	NE	12000000		3730000			-			-			-			-		
Total dissolved solids		µg/L	NE	50000000		22100000			-			-			-			-		
Total organic carbon		µg/L	NE	14000000		3060000			-			-			-			-		
Total suspended solids		µg/L	NE	110000		34000			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP11			PRRP-DP11			PRRP-DP12			PRRP-DP13			PRRP-DP14		
				Sample No:		7630			7630R			7670			7710			7750		
				Sample Date:		14-JUN-98			25-JUN-98			11-JUN-98			12-JUN-98			12-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS																				
Aluminum	Y	µg/L	3650	859		-			-			-			-			-		
Aluminum		µg/L	3650	280000		4820			-			170000			7220			7970		
Antimony	Y	µg/L	1.5	69.6		-			-			-			-			-		
Antimony		µg/L	1.5	118	J	-			-			105		J	-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			238		J	11.1		J	-		
Barium	Y	µg/L	255	2390		-			-			-			-			-		
Barium		µg/L	255	1850		-			-			898			-			-		
Beryllium		µg/L	7.3	8.8		-			-			8.5			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-			-			-		
Calcium	Y	µg/L	NE	998000		745000			-			98800			189000			405000		
Calcium		µg/L	NE	1530000		848000			-			926000			249000			281000		
Chromium	Y	µg/L	11	495		495			-			-			-			-		
Chromium		µg/L	11	561		-			-			277			16.0			105		
Cobalt	Y	µg/L	73	7450		3030			-			-			-			-		
Cobalt		µg/L	73	7270		3360			-			172			-			-		
Copper	Y	µg/L	146	4710	J	2000			-			-			-			-		
Copper		µg/L	146	4680		1530			-			515			27.7			-		
Iron	Y	µg/L	1095	15300		5870			-			125			237			2400		
Iron		µg/L	1095	679000		15500			-			426000			18800			27500		
Lead	Y	µg/L	15	31.5		-			-			-			-			-		
Lead		µg/L	15	323	J	-			-			202		J	9.5		J	38.1		J
Magnesium	Y	µg/L	NE	584000		218000			-			25100			53800			143000		
Magnesium		µg/L	NE	616000		249000			-			313000			71900			83800		
Manganese	Y	µg/L	88	62400		31300			-			150			108			454		
Manganese		µg/L	88	55100		35300			-			6460			496			927		
Mercury		µg/L	1.1	0.55		-			-			0.32			-			-		
Nickel	Y	µg/L	73	7310		1970			-			-			-			-		
Nickel		µg/L	73	7600		1950			-			490			-			-		
Potassium	Y	µg/L	NE	104000		-			-			-			-			-		
Potassium		µg/L	NE	78000		-			-			21600			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP11			PRRP-DP11			PRRP-DP12			PRRP-DP13			PRRP-DP14		
				Sample No:		7630			7630R			7670			7710			7750		
				Sample Date:		14-JUN-98			25-JUN-98			11-JUN-98			12-JUN-98			12-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		3210000			-			-			33500			256000		
Sodium		µg/L	NE	11900000		3640000			-			5960			29700			79400		
Thallium	Y	µg/L	0.24	62.2		-			-			-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-			-			-		
Vanadium		µg/L	26	1000		-			-			391			52.3			877		
Zinc	Y	µg/L	1095	1100		1100			-			-			-			-		
Zinc		µg/L	1095	2010		-			-			1350			76.0			-		
SEMIVOLATILES																				
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			10			-			3.2	J	J
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	380	J	J	-			-			-			2.5	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			-			-			-		
Fluorene		µg/L	24	44	NJ	-			-			-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			-			-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-			-			-		
Phenol		µg/L	2190	40	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP11			PRRP-DP11			PRRP-DP12			PRRP-DP13			PRRP-DP14		
				Sample No:		7630			7630R			7670			7710			7750		
				Sample Date:		14-JUN-98			25-JUN-98			11-JUN-98			12-JUN-98			12-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES																				
Acetone		µg/L	61	660	J	-			-			5.9	J	B	1.5	J	B	5.7	J	B
Benzene		µg/L	0.34	1300		-			-			-			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			0.16	J	J	-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-			-			-		
Methylene chloride		µg/L	4.3	ND		2.2	J B	B	-			-			-			-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-			-			-		
Toluene		µg/L	72	800		-			-			1.9		J	0.26	J	B	1.1		B
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-			-			-		
Xylenes, total		µg/L	21	1300	J	-			-			-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP15			PRRP-DP16			PRRP-DP17		
				Sample No:		7790			7830			7870		
				Sample Date:		12-JUN-98			13-JUN-98			11-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		-			-			6.4		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		-			-			8.9		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		-			-			1.7		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-		
RDX		µg/L	0.61	3.7		-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-		
Tetryl		µg/L	36	1.7		-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			-			-		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-		
GENERAL CHEMISTRY														
Alkalinity		µg/L	NE	1500000		-			-			-		
Chloride		µg/L	NE	9500000		-			-			-		
Cyanide, total		µg/L	73	1700		-			-			-		
Hardness		µg/L	NE	13000000		-			-			-		
Nitrate		µg/L	1000	1600000	J	-			-			-		
Nitrate		µg/L	1000	1500000		-			-			-		
Sulfate		µg/L	NE	12000000		-			-			-		
Total dissolved solids		µg/L	NE	50000000		-			-			-		
Total organic carbon		µg/L	NE	14000000		-			-			-		
Total suspended solids		µg/L	NE	110000		-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP15			PRRP-DP16			PRRP-DP17		
				Sample No:		7790			7830			7870		
				Sample Date:		12-JUN-98			13-JUN-98			11-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS														
Aluminum	Y	µg/L	3650	859		-			-			-		
Aluminum		µg/L	3650	280000		-			15500			38600		
Antimony	Y	µg/L	1.5	69.6		-			-			-		
Antimony		µg/L	1.5	118	J	-			-			-		
Arsenic	Y	µg/L	0.045	22.9		-			-			-		
Arsenic		µg/L	0.045	584	J	-			-			-		
Barium	Y	µg/L	255	2390		-			-			-		
Barium		µg/L	255	1850		-			-			218		
Beryllium		µg/L	7.3	8.8		-			-			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-		
Calcium	Y	µg/L	NE	998000		780000			212000			55000		
Calcium		µg/L	NE	1530000		-			283000			1270000		
Chromium	Y	µg/L	11	495		-			-			-		
Chromium		µg/L	11	561		-			-			65.8		
Cobalt	Y	µg/L	73	7450		1290			784			-		
Cobalt		µg/L	73	7270		-			668			-		
Copper	Y	µg/L	146	4710	J	531			568			-		
Copper		µg/L	146	4680		-			510			106		
Iron	Y	µg/L	1095	15300		3240			1950			-		
Iron		µg/L	1095	679000		-			40200			87000		
Lead	Y	µg/L	15	31.5		-			-			-		
Lead		µg/L	15	323	J	33.0		J	-			-		
Magnesium	Y	µg/L	NE	584000		260000			67700			13200		
Magnesium		µg/L	NE	616000		-			88000			286000		
Manganese	Y	µg/L	88	62400		1460			1700			22.4		
Manganese		µg/L	88	55100		-			2080			3280		
Mercury		µg/L	1.1	0.55		-			-			-		
Nickel	Y	µg/L	73	7310		2370			441			-		
Nickel		µg/L	73	7600		-			468			113		
Potassium	Y	µg/L	NE	104000		-			-			-		
Potassium		µg/L	NE	78000		-			-			6430		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP15			PRRP-DP16			PRRP-DP17		
				Sample No:		7790			7830			7870		
				Sample Date:		12-JUN-98			13-JUN-98			11-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		2560000			1450000			-		
Sodium		µg/L	NE	11900000		-			1180000			6010		
Thallium	Y	µg/L	0.24	62.2		-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-		
Vanadium		µg/L	26	1000		1000			-			163		
Zinc	Y	µg/L	1095	1100		-			-			28.7		
Zinc		µg/L	1095	2010		-			-			341		
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	830	J	J	-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			22	J	J	-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	80	J	J	35	J	J	1.5	J	J
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			6.2	J	J	-		
Fluorene		µg/L	24	44	NJ	-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			1.3	J	J	-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			2.1	J	J	-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			5.0	J	J	-		
Phenanthrene		µg/L	18	2.2	J	-			-			-		
Phenol		µg/L	2190	40	J	-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP15			PRRP-DP16			PRRP-DP17		
				Sample No:		7790			7830			7870		
				Sample Date:		12-JUN-98			13-JUN-98			11-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES														
Acetone		µg/L	61	660	J	4.3	J	B	4.6	J	B	1.5	J	B
Benzene		µg/L	0.34	1300		-			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-		
Methylene chloride		µg/L	4.3	ND		-			0.63	J B	B	-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			-			-		
Toluene		µg/L	72	800		-			-			0.56	J	B
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-		
Xylenes, total		µg/L	21	1300	J	-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP18			PRRP-DP19			PRRP-DP20		
				Sample No:		7910			7950			7990		
				Sample Date:		12-JUN-98			13-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	FI	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		µg/L	0.22	10		-			-			-		
Amino-2-nitrotoluene, 4-		µg/L	2.0	66		-			-			-		
Amino-4,6-dinitrotoluene, 2-		µg/L	0.22	11		-			-			-		
Dinitrobenzene, 1,3-	Y	µg/L	0.36	1700	J	-			-			-		
Dinitrobenzene, 1,3-		µg/L	0.36	4800		1.1			-			-		
Dinitrotoluene, 2,4-	Y	µg/L	0.099	1400		-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	6800		2.4			-			-		
Dinitrotoluene, 2,6-	Y	µg/L	0.099	300		-			-			-		
Dinitrotoluene, 2,6-		µg/L	0.099	400		0.36			-			-		
Dinitrotoluene, 3,4-		µg/L	0.1	41		-			-			-		
Nitrotoluene, 3-		µg/L	6.1	2.7		-			-			-		
Nitrotoluene, 4-		µg/L	6.1	1.9		-			-			-		
RDX	Y	µg/L	0.61	630	J	-			-			-		
RDX		µg/L	0.61	3.7		-			-			-		
Tetryl	Y	µg/L	36	2.3		-			-			-		
Tetryl		µg/L	36	1.7		-			-			-		
Trinitrobenzene, 1,3,5-	Y	µg/L	109	2400		-			-			-		
Trinitrobenzene, 1,3,5-		µg/L	109	5700		-			-			-		
Trinitrotoluene, 2,4,6-	Y	µg/L	1.8	160	J	-			-			-		
Trinitrotoluene, 2,4,6-		µg/L	1.8	64		-			-			-		
GENERAL CHEMISTRY														
Alkalinity		µg/L	NE	1500000		-			-			155000		
Chloride		µg/L	NE	9500000		-			-			2300		
Cyanide, total		µg/L	73	1700		-			-			-		
Hardness		µg/L	NE	13000000		-			-			670000		
Nitrate		µg/L	1000	1600000	J	-			-			-		
Nitrate		µg/L	1000	1500000		-			-			-		
Sulfate		µg/L	NE	12000000		-			-			24700		
Total dissolved solids		µg/L	NE	50000000		-			-			276000		
Total organic carbon		µg/L	NE	14000000		-			-			1800		
Total suspended solids		µg/L	NE	110000		-			-			6000		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP18			PRRP-DP19			PRRP-DP20		
				Sample No:		7910			7950			7990		
				Sample Date:		12-JUN-98			13-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
METALS														
Aluminum	Y	µg/L	3650	859		-			-			-		
Aluminum		µg/L	3650	280000		-			118000			13400		
Antimony	Y	µg/L	1.5	69.6		-			-			-		
Antimony		µg/L	1.5	118	J	-			77.8		J	-		
Arsenic	Y	µg/L	0.045	22.9		-			22.9			16.9		
Arsenic		µg/L	0.045	584	J	584		J	122		J	31.3		
Barium	Y	µg/L	255	2390		-			237			-		
Barium		µg/L	255	1850		-			1020			-		
Beryllium		µg/L	7.3	8.8		-			5.5			-		
Cadmium	Y	µg/L	1.8	7.2		-			-			-		
Cadmium		µg/L	1.8	6.5		-			-			-		
Calcium	Y	µg/L	NE	998000		244000			63400			58800		
Calcium		µg/L	NE	1530000		-			787000			300000		
Chromium	Y	µg/L	11	495		-			-			-		
Chromium		µg/L	11	561		-			176			26.9		
Cobalt	Y	µg/L	73	7450		-			-			-		
Cobalt		µg/L	73	7270		-			140			-		
Copper	Y	µg/L	146	4710	J	-			-			-		
Copper		µg/L	146	4680		-			334			33.2		
Iron	Y	µg/L	1095	15300		1260			119			456		
Iron		µg/L	1095	679000		-			266000			31500		
Lead	Y	µg/L	15	31.5		-			-			-		
Lead		µg/L	15	323	J	320		J	142		J	21.5		
Magnesium	Y	µg/L	NE	584000		80300			16400			14300		
Magnesium		µg/L	NE	616000		-			240000			75900		
Manganese	Y	µg/L	88	62400		252			28.4			78.4		
Manganese		µg/L	88	55100		-			5940			1220		
Mercury		µg/L	1.1	0.55		0.25			-			-		
Nickel	Y	µg/L	73	7310		-			-			-		
Nickel		µg/L	73	7600		-			338			-		
Potassium	Y	µg/L	NE	104000		-			-			-		
Potassium		µg/L	NE	78000		-			20800			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP18			PRRP-DP19			PRRP-DP20		
				Sample No:		7910			7950			7990		
				Sample Date:		12-JUN-98			13-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
Sodium	Y	µg/L	NE	12600000		140000			11500			6810		
Sodium		µg/L	NE	11900000		-			14500			6480		
Thallium	Y	µg/L	0.24	62.2		-			-			-		
Thallium		µg/L	0.24	50.8		-			-			-		
Vanadium	Y	µg/L	26	68.3		-			-			-		
Vanadium		µg/L	26	1000		101			288			76.5		
Zinc	Y	µg/L	1095	1100		-			-			-		
Zinc		µg/L	1095	2010		-			799			151		
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		µg/L	4.8	37		-			-			-		
Dibenzofuran		µg/L	2.4	620	NJ	-			-			-		
Dimethylphenol, 2,4-		µg/L	73	16	J	-			-			-		
Dinitro-2-methylphenol, 4,6-		µg/L	0.36	20000	NJ	-			-			-		
Dinitrophenol, 2,4-		µg/L	7.3	6000		-			-			-		
Dinitrotoluene, 2,4-		µg/L	0.099	9200	D	-			2.3	J	J	-		
Dinitrotoluene, 2,6-		µg/L	0.099	550		-			-			-		
Fluorene		µg/L	24	44	NJ	-			-			-		
Isophorone		µg/L	71	4.2	J	-			-			-		
Methylnaphthalene, 2-		µg/L	12	72	J	-			-			-		
Methylphenol, 2-		µg/L	182	6.7	J	-			-			-		
Methylphenol, 4-		µg/L	18	7.7	J	-			-			-		
Naphthalene		µg/L	0.62	60	J	-			-			-		
Nitroaniline, 2-		µg/L	0.1	3.2	J	-			-			-		
Nitroaniline, 3-		µg/L	0.1	450	J	-			-			-		
Nitrobenzene		µg/L	0.34	14		-			-			-		
Nitrophenol, 2-		µg/L	4.9	15		-			-			-		
Nitrophenol, 4-		µg/L	4.9	290	J	-			-			-		
Phenanthrene		µg/L	18	2.2	J	-			-			-		
Phenol		µg/L	2190	40	J	-			-			-		

Table 3-20

PRRWP - Historical Groundwater Analytical Results
Former Plum Brook Ordnance Works
Sandusky, Ohio

				Associated Site:		PRRP			PRRP			PRRP		
				Location Code:		PRRP-DP18			PRRP-DP19			PRRP-DP20		
				Sample No:		7910			7950			7990		
				Sample Date:		12-JUN-98			13-JUN-98			14-JUN-98		
				Sample Depth:		0 to 0			0 to 0			0 to 0		
Parameter	Fl	Units	RBSC	MDC	VQ	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ
VOLATILES														
Acetone		µg/L	61	660	J	4.4	J	B	5.4	J	B	-		
Benzene		µg/L	0.34	1300		-			-			-		
Bromodichloromethane		µg/L	0.18	0.23	J	-			-			-		
Butanone, 2-		µg/L	190	24	J	-			-			-		
Carbon disulfide		µg/L	104	1500	J	-			-			-		
Chlorobenzene		µg/L	11	5.5	J	-			-			-		
Chloroform		µg/L	0.063	8.6	J	-			-			-		
Ethylbenzene		µg/L	130	180	J	-			-			-		
Hexanone, 2-		µg/L	150	2	J	-			-			-		
Methylene chloride		µg/L	4.3	ND		-			-			-		
Tetrachloroethene		µg/L	0.66	0.26	J	-			0.13	J	J	-		
Toluene		µg/L	72	800		0.37	J	B	0.15	J	B	0.14	J	B
Trichloroethane, 1,1,2-		µg/L	0.2	4.9	J	-			-			-		
Trichloroethene		µg/L	0.028	0.43	J	-			-			-		
Xylenes, total		µg/L	21	1300	J	-			-			-		

"-" - Indicates the parameter was not detected.
Bold text and shaded cell indicates value above RBSC value.
Fl - Filtered ("Y" = Yes).
RBSC - Risk-based screening criteria. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the Area of Concern ("B" qualified date not included).
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established.
Qual - Laboratory qualifier.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method or field blank(s).
N - Tentative identification. Consider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 4-1

Summary of Groundwater Samples Collected
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Sample Identification	Sample Date	Number
Possible Free-Phase Identification (Upper Toluene Tank Area)			
MK-MW20	MK-MW20-GW-CC3002	11-JUL-02	CC3002
Background Monitoring Wells (Fourth Quarter - Dry Season)			
Overburden			
IT-MW01	IT-MW01-GW-CC3009	10-JUL-02	CC3009
Bedrock			
IT-BG8-BEDGW-001	IT-BG8-BEDGW-001-GW-CC3001	12-JUL-02	CC3001
PB-BED-MW20	PB-BED-MW20-GW-CC3003	10-JUL-02	CC3003
PB-BED-MW24	PB-BED-MW24-GW-CC3004	12-JUL-02	CC3004
PB-BED-MW25	PB-BED-MW25-GW-CC3005	11-JUL-02	CC3005
Monitoring Wells (Non Background - Wet Season)			
Overburden			
MK-MW16	PBOW-02-GW-MK-MW16-CB3017-5-5	08-APR-02	CB3017
MK-MW17	PBOW-02-GW-MK-MW17-CB3038-8-8	12-APR-02	CB3038
PB-TNTA-MW10	PBOW-02-GW-PB-TNTA-MW10-CB3042-11-12	15-APR-02	CB3042
PB-TNTA-MW11	PBOW-02-GW-PB-TNTA-MW11-CB3043-4-8	15-APR-02	CB3043
PB-TNTC-MW3	PBOW-02-GW-PB-TNTC-MW3-CB3027-4-4	10-APR-02	CB3027
PB-TNTC-MW4	PBOW-02-GW-PB-TNTC-MW4-CB3028-7-11	10-APR-02	CB3028
PB-TNTC-MW5	PBOW-02-GW-PB-TNTC-MW5-CB3029-4-4	08-APR-02	CB3029
Bedrock			
IT-AA2-BEDGW-001	PBOW-02-GW-IT-AA2-BEDGW-001-CB3030-19-24	10-APR-02	CB3030
IT-AA3-BEDGW-001	PBOW-02-GW-IT-AA3-BEDGW-001-CB3033-48-48	10-APR-02	CB3033
IT-ABG-BEDGW-001	PBOW-02-GW-IT-ABG-BEDGW-01-CB3016-15-15	05-APR-02	CB3016
IT-MNTA-BEDGW-001	PBOW-02-GW-IT-MNTA-BEDGW-001-CB3039-54-54	12-APR-02	CB3039
IT-TNTB-BEDGW-001	PBOW-02-GW-IT-TNTB-BEDGW-001-CB3019-19-19	05-APR-02	CB3019
IT-TNTB-BEDGW-002	PBOW-02-GW-IT-TNTB-BEDGW-002-CB3018-19-19	05-APR-02	CB3018
PB-BED-MW13	PBOW-02-GW-PB-BED-MW13-CB3025-71-75	10-APR-02	CB3025
PB-BED-MW14	PBOW-02-GW-PB-BED-MW14-CB3022-35-37	08-APR-02	CB3022
PB-BED-MW15	PBOW-02-GW-PB-BED-MW15-CB3041-33-34	15-APR-02	CB3041
PB-BED-MW16	PBOW-02-GW-PB-BED-MW16-CB3037-23-25	11-APR-02	CB3037
PB-BED-MW17	PBOW-02-GW-PB-BED-MW17-CB3014-39-42	11-APR-02	CB3014
PB-BED-MW18	PBOW-02-GW-PB-BED-MW18-CB3015-65-65	05-APR-02	CB3015
PB-BED-MW19	PBOW-02-GW-PB-BED-MW19-CB3013-34-34	04-APR-02	CB3013
PB-BED-MW22	PBOW-02-GW-PB-BED-MW22-CB3009-35-37	04-APR-02	CB3009
PB-BED-MW23	PBOW-02-GW-PB-BED-MW23-CB3040-71-71	11-APR-02	CB3040
PB-BED-MW27	PBOW-02-GW-PB-BED-MW27-CB3012-85-88	09-APR-02	CB3012
TNTA-BEDGW-001	PBOW-02-GW-TNTA-BEDGW-001-CB3044-71-81	15-APR-02	CB3044
TNTB-BEDGW-003	PBOW-02-GW-TNTB-BEDGW-003-CB3024-38-38	10-APR-02	CB3024
TNTB-BEDGW-004	PBOW-02-GW-TNTB-BEDGW-004-CB3023-23-23	08-APR-02	CB3023
TNTC-BEDGW-001	PBOW-02-GW-TNTC-BEDGW-001-CB3026-83-83	09-APR-02	CB3026

Table 4-2

Final Field Measurements of Groundwater Samples
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Date	Time	Low-Flow Sampled	PID (ppm)	H_2S (ppm)	Eh (mV)	pH	Conductivity (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 (ppm)	Temperature (°C)	Volume Purged (gal)
Direct-Push Temporary Piezometers												
TNTA-DP14	8/2/01	1025	No	NM	NM	-131	6.66	0.901	999	2.46	18.36	None
TNTA-DP21	8/1/01	1712	No	NM	NM	162	7.19	1.39	723	3.34	19.5	None
TNTB-DP02	8/6/01	1145	No	NM	NM	No readings recorded due to insufficient water volume.						None
TNTB-DP03	8/1/01	1533	No	NM	NM	50	6.23	0.635	999	2.01	18.49	None
TNTC-DP13	8/1/01	1620	No	NM	NM	-10	6.84	0.79	999	2.49	20.5	None
TNTC-DP19	8/6/01	1210	No	NM	NM	281	6.73	2.29	523	6.32	17.73	None
Background Wells (1997, 1998, First through Fourth Quarterly Sampling)												
IT-MW01	11/19/97	NA	No	0	NM	-58.2	6.7	0.512	1	10.57	9.6	6.5
	5/16/98	NA	No	0	NM	57.3	6.23	0.447	0	13.13	14.2	8
	9/27/01	1040	NA	NM	NM	Not sampled. Riser section dented and prohibited bailer from entering well.						
	1/16/02	NA	NA	NM	NM	Not sampled. Riser section dented and prohibited bailer from entering well.						
	4/2/02	NA	NA	NM	NM	Not sampled. Riser section dented and prohibited bailer from entering well.						
	7/10/02	0900	No	0	0	-8	6.28	0.590	3.7	5.08	17.76	4
BED-MW20	11/17/97	NA	No	0	NM	-24.7	6.74	48.5	563	4.14	9.4	27
	5/28/98	NA	No	0.1	NM	NM	6.65	38.1	999	12.80	13.0	58
	9/26/01	1415	No	0	NM	-73	8.95	53.6	53.5	0	10.54	10.33
	1/15/02	1415	Yes	1.6	0	-55	6.83	52.60	15.0	0.00	7.22	1
	4/4/02	1013	Yes	0.0	NM	51	7.07	53	0.0	0.00	10.37	1.8
	7/10/02	1600	Yes	0	0	-57	6.73	52.9	NR	0	13.85	3.5
BG8-BEDGW-001	11/17/97	NA	No	0	NM	-245.3	7.21	3.31	321	6.83	10.5	30
	5/15/98	NA	No	0.1	NM	-36.2	7.80	151	10	8.00	13.0	27.73
	9/27/01	1220	Yes	0	NM	-339	13.03	3.75	0	0	12.65	2.97
	1/16/02	1450	Yes	0	0	-79	7.38	0.856	2.8	0.00	10.69	2.22
	4/3/02	1127	Yes	0	0	220	7.25	0.43	4.7	NR	6.70	3
	7/12/02	0920	Yes	0	0	-258	7.21	3.68	10.3	0.41	13.45	5
PB-BED-MW24	10/9/01	0935	Yes	NR	NM	-144	9.38	1.81	73.3	5.32	11.2	2.99
	1/17/02	1005	Yes	114	0	-333	6.82	1.99	2.5	0.00	9.69	2.11
	4/3/02	1730	Yes	76	0	-318	7.06	1.98	0.0	NR	10.71	1.9
	7/12/02	1405	Yes	84.1	>500	-358	6.66	1.88	350	0	12.93	4.5
PB-BED-MW25	10/5/01	0920	Yes	0	NM	-237	10.58	1.89	5.7	2.41	11.9	3.67
	1/16/02	1030	Yes	0.0	0	-291	7.23	2.42	5.8	0.00	10.54	4.44
	4/3/02	1120	Yes	NR	NM	-333	8.46	2.62	3.0	0.01	10.9	8.0
	7/11/02	1115	Yes	0	0	-302	7.19	1.86	1.9	0	12.92	8
PB-BED-MW26	10/10/01	NA	No	3.6	NM	No sample collected due to insufficient water volume.						
	1/15/02	1030	No	2.2	0.21	-59	6.87	31.0	999	8.04	8.69	0.5
	4/2/02	NA	No	NR	NM	No sample collected due to insufficient water volume.						
	7/12/02	NA	NA	3.1	0	No sample collected due to insufficient water volume.						

Table 4-2

Final Field Measurements of Groundwater Samples
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Date	Time	Low-Flow Sampled	PID (ppm)	H_2S (ppm)	Eh (mV)	pH	Conductivity (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 (ppm)	Temperature (°C)	Volume Purged (gal)
Non-Background Overburden Wells (1997, 1998, and Dry/Wet Season Sampling)												
MK-MW16	11/21/97	NA	No	NR	NM	NM	NM	NM	NM	NM	NM	1
	5/18/98	NA	No	0.1	NM	NM	7.40	1.1	1	5.40	18.0	34.86
	9/26/01	NA	NA	NM	NM	No sample collected, well dry.						
	4/8/02	1238	No	0	0	390	4.77	0.543	14.9	7.45	8.78	>3
MK-MW17	11/21/97	NA	No	NR	NM	NM	NM	NM	NM	NM	NM	6
	5/27/98	NA	No	0.0	NM	NM	6.00	0.74	14	4.90	17.0	15
	10/1/01	1235	Yes	0	NM	79	5.13	0.96	6.8	0	16.53	2.37
	4/12/02	1305	Yes	NR	NM	-147	4.92	0.361	0	0	10.01	3.5
TNTA-MW10	11/18/97	NA	No	NR	NM	-170.5	7.29	1.18	246	-0.38	11.2	6
	5/29/98	NA	No	1.1	NM	-109.7	7.36	1.23	260	7.17	14.8	11
	10/1/01	NA	NA	NM	NM	No sample collected, well dry.						
	4/15/02	0945	No	0	0	-125	7.44	1.24	56.4	0	8.3	4
TNTA-MW11	11/18/97	NA	No	NR	NM	-67.2	6.49	1.54	77	4.53	12.4	5
	5/29/98	NA	No	0	NM	118.1	7.16	1.38	536	7.41	14.3	14
	10/3/01	1645	NA	NM	NM	No readings recorded due to insufficient water volume.						
	4/15/02	1030	No	0	0	23	6.62	1.31	56.4	8.81	9.6	>6
TNTC-MW03	11/21/97	NA	No	0	NM	41.0	7.31	3.04	9	9.70	11.3	6
	5/18/98	NA	No	0	NM	NM	6.56	3.35	999	15.78	13.6	NR
	10/2/01	0800	NA	NM	NM	No sample collected due to insufficient water volume.						
TNTC-MW04	11/20/97	NA	No	NA	NM	109.6	6.58	2.24	22	10.27	12.0	NM
	5/18/98	NA	No	0	NM	282.6	6.80	2.22	999	14.72	14.6	11
	10/4/01	1045	No	0	NM	-7	7.38	2.76	18.8	0.76	14.27	1.59
TNTC-MW05	11/21/97	NA	No	0	NM	22.9	6.97	1.52	25	11.45	10.0	24
	5/18/98	NA	No	0	NM	NM	NM	NM	NM	NM	NM	11
	10/3/01	0915	No	0	NM	59	6.11	1.60	688	11.8	13	0
	4/8/02	1435	No	0	0	156	5.87	0.422	35	10.35	7.73	>22
Non-Background Bedrock Wells (1997, 1998, and Dry/Wet Season Sampling)												
AA1-BEDGW-001	11/16/97	NA	No	40	NM	-340.1	6.99	5.37	-10	2.62	8.7	49
	5/12/98	NA	No	11	NM	NM	6.91	7.33	107	4.80	12.4	20
	10/10/01	NA	NA	269	NM	No sample collected due to extremely high H_2S vapors.						
	4/14/02	NA	NA	1.7	>50	No sample collected due to extremely high H_2S vapors.						
AA2-BEDGW-001	11/20/97	NA	No	9	0	-160	7.08	1.28	>1000	6.31	8.7	25
	5/12/98	NA	No	0.2	NM	NM	7.06	1.21	999	8.02	13.5	20
	10/8/01	1145	Yes	60	NM	-144	9.49	1.24	76.4	0	10.65	1
	4/10/02	0940	No	19.5	0	-267	8.55	1.33	338.0	4.31	10.4	>17
AA3-BEDGW-001	11/19/97	NA	No	11	0	-297.2	6.82	2.93	595	6.51	10.6	42
	5/14/98	NA	No	0.4	NM	8.7	6.81	2.79	26	NM	13.7	30.6
	9/27/01	1615	Yes	10.2	16	-343	13.15	2.74	20.1	0	11.3	3.17
	4/10/02	1700	Yes	30.7	340	-358	8.31	2.31	56.7	0	11.97	>8

Table 4-2

Final Field Measurements of Groundwater Samples
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Date	Time	Low-Flow Sampled	PID (ppm)	H_2S (ppm)	Eh (mV)	pH	Conductivity (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 (ppm)	Temperature (°C)	Volume Purged (gal)
ABG-BEDGW-001	11/13/97	NA	No	0	NM	15.9	6.94	1.09	-10	7.35	12.9	25.5
	5/13/98	NA	No	0.1	NM	nm	7.18	0.85	23	5.37	12.0	30
	9/28/01	0920	Yes	0	NM	-100	8.57	0.617	27.9	0	13.83	4.76
	4/5/02	1510	Yes	0.7	0	-188	6.95	1.17	46.6	0	8.2	4.5
ABG-BEDGW-001R	10/5/01	1545	Yes	0	NM	-51	8.8	0.9	6.6	0.66	13.5	5.81
BED-MW13	11/13/97	NA	No	8	NM	-317.9	6.90	8.08	284	4.93	9.6	24.5
	5/28/98	NA	No	0.3	NM	NM	6.98	0.755	173	2.76	15.2	15.32
	10/3/01	1515	No	0	NM	-368	12.33	11.3	49.7	0	15.77	23
	4/10/02	0840	No	3.2	0	No sample collected due to insufficient water volume.						
BED-MW14	11/18/97	NA	No	2.5	0	-85.3	7.29	2.33	269	4.66	8.7	13.5
	5/16/98	NA	No	0.1	NM	-10.8	7.70	2.4	36	5.50	13.0	81.6
	9/28/01	1140	Yes	75.6	NM	-14	7.28	4.28	5	0	10.38	1.98
	4/8/02	1045	Yes	0.4	0.11	10	6.79	6.42	9.4	0	10.0	3
BED-MW14R	10/5/01	1530	Yes	7.7	NM	5	6.76	4.19	282	0	10.17	2.5
BED-MW15	11/18/97	NA	No	20	14	-298.3	6.81	5.08	71	3.17	8.9	15
	5/28/98	NA	No	0.1	NM	-20	6.91	6.94	79	1.65	13.0	23.2
	10/9/01	0850	No	>2000	NM	-325	12.56	5.37	29.7	0	9.97	13.5
	4/15/02	1240	No	57.4	0	-315	9.48	7.34	67.0	3.8	14.5	7.5
BED-MW16	11/24/97	NA	No	NR	NM	NM	NM	NM	NM	NM	NM	35
	6/1/98	NA	No	130	NM	NM	NM	NM	NM	NM	NM	NR
	10/10/01	1135	No	NM	NM	Water quality readings not recorded due to oily film on groundwater.						20
	4/11/02	1450	No	171	0	-103	7.53	1.84	22.87	NM	14.0	>11.5
BED-MW17	11/20/97	NA	No	2	0	322.2	7.00	4.70	318	7.46	8.9	23
	5/29/98	NA	No	3	NM	NM	6.70	4.21	213	1.30	15.3	60
	10/3/01	1500	Yes	>2000	NM	-386	15.18	5.79	134	0	16.5	2
	4/11/02	1100	Yes	84	>50	-411	8.51	5.78	412	0	11.2	3.5
BED-MW18	11/19/97	NA	No	7	0	-311.6	7.40	22.3	109	5.22	9.2	27
	5/19/98	NA	No	0.1	NM	-297.6	7.20	2.8	28	5.40	18.0	127.01
	10/2/01	1435	Yes	64.1	NM	-363	12.37	23.1	17.6	0	12.58	2.38
	4/5/02	1040	Yes	1.7	0	-365	7.69	28.7	27	0	9.4	6.5
BED-MW19	11/14/97	NA	No	0	NM	-318.1	6.91	1.30	108	5.58	9.4	14
	5/16/98	NA	No	0.1	NM	17.8	6.70	1.80	17	6.00	16.0	82.5
	10/4/01	1315	Yes	873	NM	-1416	14.29	1.43	307	0	18.4	2.85
	4/4/02	1520	Yes	11.6	NM	-367	7.48	1.43	0	0	11.15	5

Table 4-2

Final Field Measurements of Groundwater Samples
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Date	Time	Low-Flow Sampled	PID (ppm)	H_2S (ppm)	Eh (mV)	pH	Conductivity (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 (ppm)	Temperature (°C)	Volume Purged (gal)
MNTA-BEDGW-001	11/20/97	NA	No	0	376	-329.4	6.78	9.50	38	5.38	9.8	45
	5/28/98	NA	No	100	NM	NM	4.66	9.63	79	0.74	17.2	37.5
	10/3/01	1020	Yes	1257	NM	-328	14.36	8.94	145	0	18.5	5.15
	4/12/02	0950	No	102	278	-378	5.97	9.12	4.9	0	12.11	18
PB-BED-MW22	10/8/01	1020	Yes	18.3	NM	-263	10.25	0.777	5.2	0	11.4	3
	4/4/02	1025	Yes	35.6	>50	-347	7.74	0.94	15.3	0.00	9.8	3.5
PB-BED-MW23	10/9/01	1145	No	215	NM	Water quality readings not recorded due to potential insufficient water volume.						
	4/10/02	0825	Yes	66.5	2.12	Water quality readings not recorded due to potential insufficient water volume.						
PB-BED-MW27	10/9/01	1115	No	197	NM	Water quality readings not recorded due to oily film on groundwater						1.75
	4/9/02	0900	No	137	NM	Water quality readings not recorded due to oily film on groundwater						62
TNTA-BEDGW-001	10/9/01	1450	No	268	>500	Due to insufficient water volume and LNAPL, water quality readings were not recorded.						
	4/15/02	1125	No	NM	>50	Due to insufficient water volume and LNAPL, water quality readings were not recorded.						
TNTB-BEDGW-001	11/17/97	NA	No	1	NM	-190.4	7.07	0.92	99	4.48	9.8	33
	5/18/98	NA	No	0.1	NM	NM	7.20	3.2	21	6.50	14.0	30.12
	9/28/01	1635	Yes	32	NM	-297	11.86	2.23	0	0	12.54	5.28
	4/5/02	1520	Yes	18.9	87	-340	7.16	3.18	22	0	10.52	7.6
TNTB-BEDGW-001R	10/5/01	1200	Yes	NM	NM	-335	12.22	3.79	3.9	0	12.44	2.5
TNTB-BEDGW-002	11/16/97	NA	No	0	NM	-294.5	7.58	1.20	-10	3.75	10.2	27
	5/18/98	NA	No	0.1	NM	-327.2	7.40	1.20	1	6.20	13.0	34.59
	9/27/01	0830	Yes	0	NM	-364	13.72	0.83	0	0	11.49	1.06
	4/5/02	1030	Yes	0	NM	-355	7.41	0.696	0	0	10.94	2.5
TNTB-BEDGW-003	10/8/01	0940	No	0	NM	No sample collected due to insufficient water volume.						
	4/10/02	1150	No	1.4	0	Water quality readings not recorded due to potential insufficient water volume.						
TNTB-BEDGW-004	10/5/01	0900	Yes	0.8	NM	-43	7.54	0.349	182	2.89	12.07	4.5
	4/8/02	1050	Yes	0	NM	-84	6.68	0.335	46.7	0	10.47	3.5
TNTC-BEDGW-001	10/4/01	1315	Yes	129	NM	-357	12.87	2.98	44	0	12.26	11.89
	4/9/02	1248	Yes	87.4	>500	-343	6.94	3.06	12.4	0	11.70	>9.8

"R" at the end of the well identification number indicates the sample was recollected and certain parameters reanalyzed.
°C - Degrees Celsius.
Eh - Oxidation-reduction potential.
gal - Gallon.
H_2S - Hydrogen sulfide.
µmhos/cm - Micromhos per centimeter.
mV - Millivolts.
NA - Not Applicable.
NM - Not Measured.
NTU - Nephelometric turbidity unit.
O_2 - Oxygen.
pH -Hydrogen ion concentration.
PID - Photoionization detector.
ppm - Parts per million.

Table 4-3

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Well ID	Well Depth (feet bgs)	Date Installed	Installed By	Casing Type	Casing Diameter (inches)	Borehole Diameter (inches)	Screen Interval (feet bgs)	Top of Filter Pack (feet bgs)	TOC Elevation (feet msl)	Ground Elevation (feet msl)	Well Location
AA1-GW-02	[illegible]	[illegible]	IT	PVC (40)	2"	8.25"	6.75-21.75	[illegible]	[illegible]	[illegible]	[illegible]
AA2-GW-02	19.00	6/22/97	IT	PVC (40)	2"	8.25"	8.25-18.25	5.5	[illegible]	641.50	[illegible]
AA3-GW-02	16.00	6/1/97	IT	PVC (40)	2"	8.25"	5.75-15.75	3.0	636.11	634.10	[illegible]
ABG-GW-02	[illegible]	6/11/97	IT	PVC (40)	2"	8.25"	2.50-6.50	2.0	661.06	[illegible]	[illegible] Snake/Fox Rd intersection
EB-GM-01	27.00	1990	EBASCO	NA	NA	NA	NA	NA	640.45	637.70	NE of Bldg.6210
EB-GM-02	29.00	1990	EBASCO	NA	NA	NA	NA	NA	637.02	634.90	N of Bldg.7131
EB-GM-03	16.00	1990	EBASCO	NA	NA	NA	NA	NA	638.90	636.20	Behind Bldg.7131
EB-GM-04	16.00	1990	EBASCO	NA	NA	NA	NA	NA	636.34	633.60	SW of Bldg.7122
EB-GM-05	16.00	1990	EBASCO	NA	NA	NA	NA	NA	639.70	637.00	NE corner of Bldg.7121
EB-GM-06	16.00	1990	EBASCO	NA	NA	NA	NA	NA	639.61	637.00	SE corner of Bldg.7121
EB-PS-02	16.00	1990	EBASCO	NA	NA	NA	NA	NA	639.53	636.70	NW of Bldg.6133
EB-PS-03	16.00	1990	EBASCO	NA	NA	NA	NA	NA	637.15	634.40	NE of Bldg.6133
EB-PS-04	16.00	1990	EBASCO	NA	NA	NA	NA	NA	637.87	635.30	N of Bldg.6133
EB-RA-01	16.00	12/4/90	EBASCO	Stainless	2	8	5.5 - 15.5	4	633.97	631.40	Perkville Rd at PBRF
EB-RA-02	20.00	12/13/90	EBASCO	Stainless	2	8	7.75 - 17.75	6	633.95	631.30	NE of Bldg.1134
EB-RA-03	22.00	12/13/90	EBASCO	Stainless	2	8	6.75 - 21.75	5	633.63	630.90	W of Bldg.1131
EB-RA-04	10.00	1990	EBASCO	Stainless	2	8	4.75 - 9.75	2.75	633.54	630.70	S W of Bldg.1131
EB-RA-05	10.00	1990	EBASCO	Stainless	2	8	4.75 - 9.75	2.75	633.34	630.60	S of Bldg.1131
EB-RA-06	10.00	1990	EBASCO	Stainless	2	8	3.7 - 8.7	3.4	632.64	630.10	S of Bldg.1153
EB-SP-01	9.50	1990	EBASCO	NA	NA	8	NA	NA	658.07	652.30	S of Bldg.0115
EB-SP-03	9.50	1990	EBASCO	NA	NA	8	NA	NA	657.73	655.10	N of Bldg.1401
EB-SP-04	9.50	1990	EBASCO	NA	NA	8	NA	NA	658.02	656.25	W of Bldg.1411 Boiler Room
EB-SP-05	9.50	1990	EBASCO	NA	NA	8	NA	NA	657.00	654.50	SW of Bldg.1411 Boiler Room
EB-SP-06	9.00	1990	EBASCO	NA	NA	8	NA	NA	658.25	656.40	S of Bldg.1411
GCL-MW01	11.03	3/12/92	H+GLC	Stainless	1	8	5.99 - 10.97	4	674.81	671.40	SE of the Snake Rd burn pit
GCL-MW02A	22.15	3/11/92	H+GLC	Stainless	1	8	12.09 - 22.09	9.9	672.98	669.70	N of the Snake Rd burn pit
GCL-MW02B	9.83	3/12/92	H+GLC	Stainless	1	8	4.82 - 9.82	3.75	673.42	669.60	N of the Snake Rd burn pit
GCL-MW03	10.60	3/12/92	H+GLC	Stainless	1	8	4.56 - 9.45	3	672.57	669.55	W of the Snake Rd burn pit
IT-MW01	9.00	1996	IT	PVC	2	8	4.0 - 9.0	2	678.19	674.50	Scheid Road Burn Ground
IT-MW02	18.30	1996	IT	PVC	2	8	6.0 - 16.0	3.8	639.28	636.37	West Area RWP
IT-MW05	21.00	1996	IT	PVC	2	8	8.5 - 18.5	6.5	634.67	631.56	Perkville Road RWP
IT-MW06	18.50	1996	IT	PVC	2	8	6.0 - 16.0	4.4	631.70	628.60	Reactor Facility / PRA
IT-MW07	6.50	1996	IT	PVC	2	4.25	0.5 - 5.5	none	635.03	632.30	West Area RWP temporary
IT-MW08	13.40	1996	IT	PVC	2	8.25	3.1 - 13.1	3.6	633.16	630.60	West Area RWP
IT-MW09	14.50	1996	IT	PVC	2	8.25	4.1 - 14.1	2	647.45	645.40	TNT Area C
IT-MW10	19.80	1996	IT	PVC	2	8.25	9.3 - 19.3	8.6	644.90	642.20	West Area RWP
MK-MW09	15.00	1993	MK	PVC	2	10	5.0 - 15.0	3	646.61	642.95	West Area RWP
MK-MW10	14.00	1993	MK	PVC	2	10	4.0 - 14.0	2	640.57	637.74	West Area RWP
MK-MW11	13.00	1993	MK	PVC	2	10	3.0 - 13.0	2	637.38	634.38	West Area RWP
MK-MW12	13.00	1993	MK	PVC	2	10	3.0 - 13.0	2	640.93	638.10	Pipe Creek

Table 4-3

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Well ID	Well Depth (feet bgs)	Date Installed	Installed By	Casing Type	Casing Diameter (inches)	Borehole Diameter (inches)	Screen Interval (feet bgs)	Top of Filter Pack (feet bgs)	TOC Elevation (feet msl)	Ground Elevation (feet msl)	Well Location
MK-MW14	9.00	1993	MK	PVC	2	10	4.0 - 9.0	[illegible]	[illegible]	[illegible]	[illegible]
MK-MW15	9.00	1993	MK	PVC	2	10	4.0 - 9.0	2	[illegible]	[illegible]	[illegible]
MK-MW16	8.00	1993	MK	PVC	2	10	2.0 - 7.0	1	674.03	671.01	TNT Area B
MK-MW17	8.00	1993	MK	PVC	2	10	2.0 - 6.0	1	[illegible]	660.15	TNT Area B
MK-MW19	13.00	1993	MK	PVC	2	10	3.0 - 13.0	2	[illegible]	636.19	Garage Maintenance Area
MK-MW20	23.00	1993	MK	PVC	2	10	5.0 - 20.0	3	637.51	634.30	Toluene Tank No. 265
MK-MW22	9.50	1993	MK	PVC	2	10	2.5 - 7.5	1.5	637.73	636.24	TNT Area A
MK-MW23	16.00	1993	MK	PVC	2	10	6.0 - 16.0	4	638.11	636.63	TNT Area A
MK-MW24	9.50	1993	MK	PVC	2	10	4.5 - 9.5	2.5	655.80	654.12	TNT Area A
PB-MW01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE of Bldg 9206
PB-MW02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NW of Bldg 9206
PB-MW03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SE of Bldg 9206
PB-MW04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SW of Bldg 9206
PR-MW07	22.30	1994	D&M	PVC	2	8	4.3 - 22.3	3	633.67	631.16	Pentolite Road RWP
PR-MW08	27.50	1994	D&M	PVC	2	8	5.0 - 27.5	4	634.70	632.16	Pentolite Road RWP
PR-MW09	19.00	1994	D&M	PVC	2	8	4.0 - 19.0	3	633.39	630.38	Pentolite Road RWP
TNTA-MW10	11.00	1994	D&M	PVC	2	8	3.0 - 11.0	2.5	639.86	637.16	TNT Area A
TNTA-MW11	11.40	1994	D&M	PVC	2	8	3.4 - 11.4	2.5	640.18	637.54	TNT Area A
TNTC-MW03	14.00	1994	D&M	PVC	2	8	5.0 - 14.0	3.2	645.09	642.25	TNT Area C
TNTC-MW04	19.60	1994	D&M	PVC	2	8	6.6 - 18.8	6	654.11	651.57	TNT Area C
TNTC-MW05	29.70	1994	D&M	PVC	2	8	4.7 - 29.7	3.7	651.49	648.75	TNT Area C
TNTC-MW06	12.20	1994	D&M	PVC	2	8	3.2 - 12.2	2.5	659.08	656.50	TNT Area C
WA-MW01	22.30	1994	D&M	PVC	2	8	4.3 - 22.3	3.7	644.11	642.00	West Area RWP
WA-MW02	13.00	1994	D&M	PVC	2	8	3.0 - 12.0	2.5	633.33	630.84	West Area RWP
Bedrock Monitoring Wells											
AA1-BEDGW-001	69.00	9/23/97	IT	Steel to 20', PVC (40) to 65'	10" to 20', 2" to 65'	14.25" to 27', 6" to 65'	49.75-64.75	45	641.04	638.80	[illegible]
AA2-BEDGW-001	43.00	9/22/97	IT	Steel to 20', PVC (40) to 43'	10" to 20', 2" to 43'	14.25" to 20', 6" to 44'	27.75-42.75	23	644.09	641.90	AA2 area in woods, [illegible]
AA3-BEDGW-001	53.00	10/5/97	IT	Steel to 28', PVC (40) to 53'	10" to 28', 2" to 53'	14.25" to 28', 6" to 54'	37.75-52.75	33.0	636.43	634.10	NE of Ranger/Maintenance Rd intersection, [illegible]
ABG-BEDGW-001	21.00	9/10/97	IT	Steel to 7', PVC (40) to 21'	10" to 7', 2" to 21'	14.25" to 7', 6" to 22'	10.75-20.75	9.0	660.59	658.20	SW of Snake/Fox Rd intersection
BG8-BEDGW-001	20.00	9/20/97	IT	Steel to 4', PVC (40) to 20'	10" to 4', 2" to 20'	14.25" to 4', 6" to 21'	4.75-19.75	4	676.56	673.70	NW of Campbell/ Patrol Rd intersection
MNTA-BEDGW-001	64.00	9/22/97	IT	Steel to 31', PVC (40) to 64'	10" to 31', 2" to 64'	14.25" to 31', 6" to 65'	48.75-63.75	44	638.40	636.05	90 ft E of Bldg 7123, 15 ft west of ditch
PB-BED-MW13	75.50	1994	D&M	PVC	4	3 (A)	29.5 (B)	none	647.95	645.49	TNT Area C
PB-BED-MW14	82.20	1994	D&M	PVC	4	3 (A)	23.2 (B)	none	645.72	642.73	West Area RWP
PB-BED-MW15	74.40	1994	D&M	PVC	4	3 (A)	42.9 (B)	none	631.31	628.75	Pentolite Road RWP
PB-BED-MW16	74.00	1994	D&M	PVC	4	3 (A)	24.8 (B)	none	635.70	633.36	Pentolite Road RWP

Table 4-3

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Well ID	Well Depth (feet bgs)	Date Installed	Installed By	Casing Type	Casing Diameter (inches)	Borehole Diameter (inches)	Screen Interval (feet bgs)	Top of Filter Pack (feet bgs)	TOC Elevation (feet msl)	Ground Elevation (feet msl)	Well Location
PB-BED-MW17	44.40	1994	D&M	PVC	4	3 (A)	19.4 (B)	none	629.65	627.02	TNT Area A
PB-BED-MW18	75.40	1994	D&M	PVC	4	3 (A)	24.4 (B)	none	651.16	648.51	TNT Area A
PB-BED-MW19	49.50	1994	D&M	PVC	4	3 (A)	17.5 (B)	none	642.75	640.19	West Area RWP
PB-BED-MW20	49.50	1994	D&M	PVC	4	3 (A)	14.5 (B)	none	676.01	673.25	BG Well - Southern PBS
PB-BED-MW22	42.00	9/10/01	IT	PVC	2	6	27-42	25	629.67	627.22	Downgradient boundary, North of reactor area
PB-BED-MW23	73.00	9/8/01	IT	PVC	2	6	53-73	49	633.71	631.11	South of reactor area, south of Pentolite Rd
PB-BED-MW24	41.00	9/13/01	IT	PVC	2	6	25.5-40.5	23.5	645.98	644.20	Background well, West of WARWP
PB-BED-MW25	38.00	9/12/01	IT	PVC	2	6	27.5-37.5	25.5	684.59	681.99	Background well, West of TNT area B
PB-BED-MW26	57.75	9/10/01	IT	PVC	2	6	42.25-57.25	40	677.21	674.61	SE Background well, SE of TNT Area B
PB-BED-MW27	105.00	9/8/01	IT	6" Steel to 26.50'	6	12" to 18.8', 8" to 26.5", 6" to 105'	26.5(C)	none	627.14	625.24	Downgradient boundary, E-NE of reactor area
TNTA-BEDGW-001	85.00	9/13/01	IT	PVC	2	6	70-85	67	638.79	636.99	TNTA, E of Maint Rd/Shortcut Rd intersect
TNTB-BEDGW-001	24.00	9/31/97	IT	Steel to 9', PVC (40) to 24'	10" to 9', 2" to 24'	14.25" to 9', 6" to 25'	8.75-23.75	7.5	662.43	659.80	48 ft S of Emergency B Rd
TNTB-BEDGW-002	24.20	9/24/97	IT	Steel to 8', PVC (40) to 24.2'	10" to 8', 2" to 24.2'	14.25" to 8', 6" to 25.2'	13.95-23.95	11.2'	673.35	670.10	S of Scheid Rd, 40 ft E of MK-MW10
TNTB-BEDGW-003	43.00	9/8/01	IT	PVC	2	6	32.5-42.5	30.5	683.11	681.34	TNTB, Bldg 452, S of N Magazine Rd
TNTB-BEDGW-004	25.50	9/7/01	IT	PVC	2	6	15-25	13	668.63	666.78	TNTB, Bldg 456, S of N Magazine Rd
TNTC-BEDGW-001	85.00	9/12/01	IT	PVC	2	6	70-85	67	667.04	664.04	TNTC, Bldg 683
REACTOR1	60.00	5/3/60	NASA	NA	NA	8	34.5 B)	none	630.51	630.45	Reactor Facility / PRA
REACTOR2	40.00	5/24/60	NASA	NA	NA	8	33 (B)	none	631.05	631.00	Reactor Facility / PRA
REACTOR3	40.00	5/16/60	NASA	NA	NA	8	32 (B)	none	631.21	631.10	Reactor Facility / PRA
REACTOR4	50.00	5/19/60	NASA	NA	NA	8	32.5 (B)	none	630.83	630.44	Reactor Facility / PRA
REACTOR5	65.00	9/22/58	NASA	NA	NA	5.6	35.5 (B)	none	NA	NA	Reactor Facility / PRA

Wells *not* highlighted were installed in 2001.
Coordinates scaled to the Ohio State Plane coordinate system, North Zone, NAD 1983. Vertical datum is NAVD 1929.
A - 3-inch diameter open borehole into bedrock.
B - Depth at which PVC casing ends; remainder of well is open borehole in bedrock.
C - Depth at which steel casing ends; remainder of well is open hole in bedrock.

BG - Background location.
bgs - Below ground surface.
msl - Mean sea level.
NA - Information not available.
PBS - Plum Brook Station.
PRA - Pentolite Road Area.
PVC - Polyvinyl chloride.
PVC (40) - Schedule 40 polyvinyl chloride.
RWP - Red Water Ponds.
TOC - Top of casing.

Table 5-1

Summary of Analytical Parameters and Methods
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Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Matrix	Analytical Parameters[a]	Analytical Method[b]
Groundwater (Direct-Push)	TCL Volatile Organic Compounds	SW-846 5030/8260B
	Nitroaromatic Compounds	SW-846 8330 Screen
Groundwater (Monitoring Well)	TCL Volatile Organic Compounds	SW-846 5030/8260B
	TCL Semivolatile Organic Compounds	SW-846 3510C/8270C
	Nitroaromatic Compounds	SW-846 8330M
	TAL Metals (T/D)	SW-846 3005A/6010B/7470A
	Turbidity	EPA 180.1
	Alkalinity	EPA 310.1
	Hardness	EPA 130.2
	Total Organic Carbon	SW-846 9060
	Total Dissolved Solids	EPA 160.1
	Total Suspended Solids	EPA 160.2
	Chloride	EPA 325.2
	Cyanide, total	SW-846 9012A
	Nitrate	EPA 353.2
	Sulfate	EPA 375.4
Free-Phase	TCL Volatile Organic Compounds	SW-846 5035/8260B
	Diesel Range Organics	SW-846 8015B
	Gasoline Range Organics	SW-846 8015B
Soil IDW	TCLP Volatile Organic Compounds	SW-846 1311/8260B
	TCLP Semivolatile Organic Compounds	SW-846 1311/8270C
	TCLP Metals	SW-846 1311/6010B/7471A
	Ignitability	SW-846 1010
	Corrosivity	SW-846 1110
	Reactivity	7.3.3.2/7.3.4.2

[a]Target analyte list (TAL) and target compound list (TCL) are used to designate parameter lists with no requirements for Contract Laboratory Program (CLP) method quality control or data reporting packages
[b] Analyses found in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* Third Edition and *Methods for Chemical Analysis of Water and Wastes*, March 1983 and their subsequent revisions.
IDW - Investigation-derived waste.
T/D - Total/dissolved.
TCLP - Toxicity characteristic leaching procedure.

Table 6-1

Summary of Groundwater Elevation Measurements
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 12/94	12/1994[b]	3/19	03/19/95[c]	10/96	10/1996[d]	8/27	8/27/1997[e]	11/12	11/12/1997[f]	2/24	02/24/1998[g]
Overburden Monitoring Wells																
AA1-GW-002	1917728	623068	640.85	638.60	-J	--	--	--	--	--	--	--	6.22	634.63	3.05	637.80
AA2-GW-002	1909481	623589	643.95	641.50	--	--	--	--	--	--	--	--	--	dry	--	dry
AA3-GW-002	1914956	625028	636.11	634.10	--	--	--	--	--	--	--	--	6.30	629.81	3.88	632.23
ABG-GW-002	1921516	621579	661.06	658.20	--	--	--	--	--	--	--	--	6.55	654.51	3.95	657.11
EB-GM-01	1918339	623563	640.45	637.70	--	--	--	--	--	--	8.77	631.68	9.29	631.16	7.35	633.10
EB-GM-02	1917822	624435	637.52	634.90	--	--	--	--	--	--	10.76	626.76	9.46	628.06	4.91	632.61
EB-GM-03	1917775	624131	638.90	636.20	--	--	--	--	--	--	6.28	632.62	7.38	631.52	5.81	633.09
EB-GM-04	1917442	624052	636.34	633.60	--	--	--	--	--	--	5.56	630.78	5.55	630.79	3.27	633.07
EB-GM-05	1917802	623872	639.70	637.00	--	--	--	--	--	--	6.24	633.46	7.57	632.13	5.80	633.90
EB-GM-06	1917799	623723	639.61	637.00	--	--	--	--	--	--	6.08	633.53	7.36	632.25	5.92	633.69
EB-PS-02	1920061	624344	638.53	635.70	--	--	--	--	--	--	5.97	632.56	5.87	632.66	4.81	633.72
EB-PS-03	1920187	624324	637.15	634.40	--	--	--	--	--	--	5.65	631.50	6.35	630.80	5.62	631.53
EB-PS-04	1920259	624298	637.87	635.30	--	--	--	--	--	--	8.87	629.00	9.00	628.87	7.30	630.57
EB-RA-01	1917783	625964	633.97	631.40	--	--	--	--	--	--	6.61	627.36	7.88	626.09	5.63	628.34
EB-RA-02	1918282	626944	633.95	631.30	--	--	--	--	--	--	8.10	625.85	8.72	625.43	6.52	627.43
EB-RA-03	1918346	626788	633.63	630.90	--	--	--	--	--	--	--	dry	--	dry	9.09	624.54
EB-RA-04	1918389	626731	633.54	630.70	--	--	--	--	--	--	8.07	625.47	10.36	623.18	7.12	626.42
EB-RA-05	1918492	626717	633.34	630.60	--	--	--	--	--	--	7.95	625.39	8.87	624.47	6.87	626.47
EB-RA-06	1918750	626748	632.64	630.10	--	--	--	--	--	--	8.65	623.99	7.86	624.78	5.20	627.44
EB-SP-01	1927550	613598	655.07	652.30	--	--	--	--	--	--	6.43	648.64	7.55	647.52	5.54	649.53
EB-SP-03	1926836	613398	657.73	655.10	--	--	--	--	--	--	5.26	652.47	6.94	650.79	4.26	653.47
EB-SP-04	1926937	613162	658.02	655.25	--	--	--	--	--	--	7.20	650.82	8.18	649.84	4.21	653.81
EB-SP-05	1926897	613051	657.00	654.50	--	--	--	--	--	--	5.08	651.92	6.17	650.83	4.92	652.08
EB-SP-06	1927074	613056	658.25	655.40	--	--	--	--	--	--	6.80	651.45	8.10	650.15	7.04	651.21
GCL-MW01	1921255	617560	674.81	671.40	--	--	--	--	--	--	8.32	666.49	8.81	666.00	4.57	670.24
GCL-MW02A	1920961	617937	672.96	669.70	--	--	--	--	--	--	7.57	665.39	7.79	665.17	4.65	668.31
GCL-MW02B	1920984	617941	673.42	669.60	--	--	--	--	--	--	8.32	665.10	8.41	665.01	4.59	668.83
GCL-MW03	1920777	617641	672.57	669.55	--	--	--	--	--	--	6.00	666.57	6.61	665.96	4.20	668.37
IT-MW01	1915525	616901	678.19	674.50	--	--	--	--	--	--	5.45	672.74	7.00	671.19	4.66	673.53
IT-MW02	1910265	622512	639.28	636.37	11.96	627.32	5.53	633.75	9.95	629.33	8.09	631.19	9.78	629.50	5.68	633.60
IT-MW05	1919475	625346	634.67	631.59	14.48	620.19	5.05	629.62	11.31	623.36	9.88	624.79	10.45	624.22	4.42	630.25
IT-MW06	1918768	628642	631.70	628.50	--	--	--	--	--	--	8.34	623.36	9.21	622.49	4.01	627.69
IT-MW07[k]	1909862	622076	635.03	632.30	--	--	--	--	--	--	--	dry	--	dry	--	dry
IT-MW08	1911132	622498	633.16	630.60	--	--	--	--	13.20	619.96	8.22	624.94	10.72	622.44	2.91	630.25
IT-MW09	1910699	620956	647.45	645.40	--	--	--	--	dry	--	6.00	641.45	7.24	640.21	4.72	642.73
IT-MW10	1909485	623027	644.80	642.20	--	--	--	--	18.39	626.41	11.25	633.55	12.12	632.68	8.20	636.60
MK-MW09	1908872	623901	645.61	642.95	--	--	--	--	--	--	6.09	639.52	6.49	639.12	5.00	640.61
MK-MW10	1910564	623861	640.57	637.74	13.91	626.66	--	--	8.34	632.23	7.13	633.44	8.49	632.08	7.15	633.42
MK-MW11	1911843	623829	637.36	634.39	12.14	625.22	6.00	631.36	8.47	628.89	7.13	630.23	8.14	629.22	5.92	631.44
MK-MW12	1908764	621233	640.93	638.10	--	--	--	--	--	--	9.86	631.07	10.78	630.15	7.45	633.48
MK-MW14	1913325	618311	681.26	678.50	--	--	--	--	--	--	8.17	673.09	8.72	672.54	4.62	676.64
MK-MW15	1913304	618488	680.63	677.80	--	--	--	--	--	--	8.22	672.41	8.80	671.83	4.92	675.71

Table 6-1

Summary of Groundwater Elevation Measurements
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 5/5	05/05/1998[h]	9/20[i]	09/20/00	1/17[i]	01/17/01	8/15[i]	08/15/01	11/15[i]	11/15/01	2/2728[i]	02/27/02	5/4[i]	05/04/02
Overburden Monitoring Wells																		
AA1-GW-002	1917728	623068	640.85	638.60	3.42	637.43	4.20	636.65	3.60	637.25	7.32	633.53	4.38	636.47	3.39	637.46	3.32	637.53
AA2-GW-002	1909481	623589	643.95	641.50	--	dry	13.20	630.75	7.50	636.45	16.57	627.38	20.58	623.37	10.63	633.32	4.85	639.10
AA3-GW-002	1914956	625028	636.11	634.10	3.97	632.14	5.10	631.01	4.00	632.11	8.80	627.31	6.82	629.29	4.50	631.61	4.22	631.89
ABG-GW-002	1921516	621579	661.06	658.20	4.92	656.14	5.80	655.26	4.60	656.46	8.51	652.55	6.46	654.60	4.18	656.88	4.06	657.00
EB-GM-01	1918339	623563	640.45	637.70	7.97	632.48	8.40	632.05	8.60	631.85	9.71	630.74	8.57	631.88	8.10	632.35	8.15	632.30
EB-GM-02	1917822	624435	637.52	634.90	5.14	632.38	7.80	629.72	5.10	632.42	14.04	623.48	14.83	622.69	4.72	632.80	5.15	632.37
EB-GM-03	1917775	624131	638.90	636.20	5.99	632.91	6.00	632.90	6.40	632.50	7.60	631.30	6.81	632.09	5.96	632.94	6.17	632.73
EB-GM-04	1917442	624052	636.34	633.60	3.91	632.43	4.60	631.74	3.90	632.44	10.28	626.06	4.57	631.77	3.47	632.87	3.94	632.40
EB-GM-05	1917802	623872	639.70	637.00	dry	dry	6.40	633.30	6.90	632.80	7.48	632.22	7.05	632.65	6.25	633.45	6.40	633.30
EB-GM-06	1917799	623723	639.61	637.00	6.00	633.61	6.30	633.31	6.80	632.81	7.23	632.38	7.65	631.96	6.28	633.33	6.34	633.27
EB-PS-02	1920061	624344	638.53	635.70	4.90	633.63	5.70	632.83	4.50	634.03	7.27	631.26	5.96	632.57	4.70	633.83	5.19	633.34
EB-PS-03	1920187	624324	637.15	634.40	5.52	631.63	5.70	631.45	6.30	630.85	6.27	630.88	6.35	630.80	5.96	631.19	5.98	631.17
EB-PS-04	1920259	624298	637.87	635.30	5.26	632.61	8.40	629.47	8.60	629.27	9.43	628.45	8.60	629.27	8.00	629.87	8.16	629.71
EB-RA-01	1917783	625964	633.97	631.40	5.75	628.22	6.40	627.57	5.90	628.07	9.35	624.62	7.42	626.55	5.85	628.12	6.25	627.72
EB-RA-02	1918282	626944	633.95	631.30	6.72	627.23	7.10	626.85	7.30	626.65	10.45	623.50	9.50	624.45	NM	--	--	--
EB-RA-03	1918346	626788	633.63	630.90	9.70	623.93	12.60	621.03	15.70	617.93	16.03	617.61	14.27	619.36	NM	--	--	--
EB-RA-04	1918389	626731	633.54	630.70	7.53	626.01	8.60	624.94	9.80	623.74	11.30	622.24	9.18	624.36	NM	--	--	--
EB-RA-05	1918492	626717	633.34	630.60	7.07	626.27	7.10	626.24	7.40	625.94	10.10	623.24	8.29	625.05	NM	--	--	--
EB-RA-06	1918750	626748	632.64	630.10	4.49	628.15	6.10	626.54	5.20	627.44	9.66	622.98	6.76	625.88	NM	--	--	--
EB-SP-01	1927550	613598	655.07	652.30	5.78	649.29	7.40	647.67	6.50	648.57	9.34	645.73	7.89	647.18	6.10	648.97	6.20	648.87
EB-SP-03	1926836	613398	657.73	655.10	4.21	653.52	4.80	652.93	--	--	7.07	650.66	5.94	651.79	4.19	653.54	4.76	652.97
EB-SP-04	1926937	613162	658.02	655.25	7.20	650.82	7.40	650.62	--	--	7.76	650.26	7.80	650.22	7.30	650.72	7.44	650.58
EB-SP-05	1926897	613051	657.00	654.50	4.96	652.04	5.40	651.60	--	--	7.03	649.97	5.95	651.05	4.96	652.04	5.27	651.73
EB-SP-06	1927074	613056	658.25	655.40	7.24	651.01	6.40	651.85	--	--	7.63	650.63	7.63	650.62	4.18	654.07	7.25	651.00
GCL-MW01	1921255	617560	674.81	671.40	4.98	669.83	6.80	668.01	6.90	667.91	10.12	664.69	8.94	665.87	5.10	669.71	5.22	669.59
GCL-MW02A	1920961	617937	672.96	669.70	4.85	668.11	5.60	667.36	4.90	668.06	9.20	663.76	6.34	666.62	4.75	668.21	5.25	667.71
GCL-MW02B	1920984	617941	673.42	669.60	5.00	668.42	6.10	667.32	5.20	668.22	9.67	663.75	6.88	666.54	4.84	668.58	5.02	668.40
GCL-MW03	1920777	617641	672.57	669.55	4.50	668.07	5.30	667.27	4.60	667.97	8.25	664.32	5.60	666.97	4.30	668.27	4.52	668.05
IT-MW01	1915525	616901	678.19	674.50	4.60	673.59	5.30	672.89	4.80	673.39	8.12	670.07	5.60	672.59	4.66	673.53	4.85	673.34
IT-MW02	1910265	622512	639.28	636.37	5.79	633.49	6.95	632.33	5.80	633.48	11.66	627.62	9.88	629.40	5.82	633.46	6.03	633.25
IT-MW05	1919475	625346	634.67	631.59	4.76	629.91	8.80	625.87	6.40	628.27	12.35	622.32	14.15	620.52	5.17	629.50	4.80	629.87
IT-MW06	1918768	628642	631.70	628.50	4.02	627.68	--	--	--	--	10.48	621.22	10.08	621.62	5.84	625.86	4.11	627.59
IT-MW07[k]	1909862	622076	635.03	632.30	--	dry	3.90	631.13	2.70	632.33	6.81	628.22	NM	--	NM	--	--	--
IT-MW08	1911132	622498	633.16	630.60	3.12	630.04	6.60	626.56	5.20	627.96	12.18	620.98	14.38	618.78	4.19	628.97	5.30	627.86
IT-MW09	1910699	620956	647.45	645.40	5.02	642.43	8.30	639.15	6.80	640.65	9.50	637.95	7.06	640.39	6.42	641.03	7.18	640.27
IT-MW10	1909485	623027	644.80	642.20	8.19	636.61	10.30	634.50	9.50	635.30	16.06	628.74	14.09	630.71	8.77	636.03	8.25	636.55
MK-MW09	1908872	623901	645.61	642.95	4.99	640.62	5.80	639.81	5.60	640.01	9.21	636.40	6.35	639.26	5.51	640.10	5.41	640.20
MK-MW10	1910564	623861	640.57	637.74	5.22	635.35	5.60	634.97	5.20	635.37	9.33	631.24	6.98	633.59	5.02	635.55	5.56	635.01
MK-MW11	1911843	623829	637.36	634.39	6.51	630.85	6.80	630.56	6.50	630.86	12.07	625.29	7.99	629.37	3.92	633.44	6.91	630.45
MK-MW12	1908764	621233	640.93	638.10	8.38	632.55	--	--	9.40	631.53	11.50	629.43	10.39	630.54	8.30	632.63	8.50	632.43
MK-MW14	1913325	618311	681.26	678.50	4.81	676.45	7.50	673.76	6.00	675.26	9.58	671.68	9.50	671.76	5.88	675.38	5.12	676.14
MK-MW15	1913304	618488	680.63	677.80	4.86	675.77	7.40	673.23	6.80	673.83	9.13	671.50	8.75	671.88	5.29	675.34	5.27	675.36

Table 6-1

Summary of Groundwater Elevation Measurements
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 12/94	12/1994[b]	3/19	03/19/95[c]	10/96	10/1996[d]	8/27	8/27/1997[e]	11/12	11/12/1997[f]	2/24	02/24/1998[g]
MK-MW16	1918011	616834	674.00	671.01	6.86	667.14	4.64	669.36	5.58	668.42	5.97	668.03	7.75	666.25	5.14	668.86
MK-MW17	1917813	618572	664.32	660.65	4.74	659.58	3.22	661.10	3.76	660.56	4.32	660.00	4.75	659.57	3.68	660.64
MK-MW19	1917535	623871	639.13	636.20	--	--	--	--	--	--	7.99	631.14	6.83	632.30	3.67	635.46
MK-MW20	1920539	622912	637.51	634.30	--	--	--	--	--	--	4.97	632.54	4.78	632.73	6.61	630.90
MK-MW22	1923776	624339	637.73	635.24	8.88	628.85	6.18	631.55	7.66	630.07	8.20	629.53	8.24	629.49	6.94	630.79
MK-MW23	1925354	624657	639.11	636.63	18.23	620.88	10.99	628.12	6.97	632.14	8.49	630.62	8.02	631.09	5.61	633.50
MK-MW24	1923302	622264	656.80	654.12	8.49	648.31	6.03	650.77	7.19	649.61	7.08	649.72	7.22	649.58	6.25	650.55
PR-MW07	1919021	624996	633.67	631.18	7.35	626.32	2.02	631.65	4.03	629.64	5.35	628.32	5.06	628.61	2.21	631.46
PR-MW08	1919309	624889	634.70	632.18	10.15	624.55	4.72	629.98	7.14	627.56	6.66	628.04	7.72	626.98	4.90	629.80
PR-MW09	1919510	625092	633.38	630.38	10.46	622.92	3.26	630.12	6.81	626.57	6.50	626.88	7.85	625.53	3.36	630.02
TNTA-MW10	1923399	623864	639.86	637.18	6.15	633.71	2.82	637.04	4.24	635.62	4.16	635.70	4.67	635.19	3.10	636.76
TNTA-MW11	1922744	623518	640.18	637.54	9.68	630.50	7.36	632.82	6.62	633.56	5.49	634.69	5.16	635.02	4.78	635.40
TNTC-MW03	1911391	621465	645.09	642.25	dry	--	5.89	639.20	10.08	635.01	8.07	637.02	9.27	635.82	3.80	641.29
TNTC-MW04	1910470	620413	654.11	651.57	19.24	634.87	3.04	651.07	5.60	648.51	6.15	647.96	7.62	646.49	3.32	650.79
TNTC-MW05	1911811	620692	651.49	648.75	23.48	628.01	3.87	647.62	8.21	643.28	5.62	645.87	5.60	645.89	3.02	648.47
TNTC-MW06	1913006	620429	659.08	656.50	7.15	651.93	3.88	655.20	4.52	654.56	4.46	654.62	5.71	653.37	3.72	655.36
WA-MW01	1909948	622641	644.11	642.00	--	--	--	--	--	--	14.00	630.11	16.15	627.96	4.09	640.02
WA-MW02	1910176	622124	633.33	630.84	--	--	--	--	--	--	3.89	629.44	4.46	628.87	1.53	631.80
Bedrock Monitoring Wells																
AA1-BEDGW-001	1917719	623069	641.04	638.80	--	--	--	--	--	--	--	--	30.52	610.52	30.50	610.54
AA2-BEDGW-001	1909552	623600	644.06	641.60	--	--	--	--	--	--	--	--	13.11	630.95	11.58	632.48
AA3-BEDGW-001	1914957	625037	636.43	634.10	--	--	--	--	--	--	--	--	23.22	613.21	21.53	614.90
ABG-BEDGW-001	1921506	621580	660.59	658.20	--	--	--	--	--	--	--	--	6.09	654.50	3.55	657.04
BG8-BEDGW-001	1909857	618635	676.56	673.70	--	--	--	--	--	--	--	--	6.38	670.18	8.11	668.45
MNTA-BEDGW-001	1918699	623808	638.40	636.05	--	--	--	--	--	--	--	--	28.04	610.36	27.05	611.35
PB-BED-MW13	1912175	621044	647.95	645.49	40.10	607.85	28.66	619.29	26.16	621.79	27.80	620.15	27.08	620.87	48.47	599.48
PB-BED-MW14	1910457	622720	645.72	642.73	23.96	621.76	21.33	624.39	20.49	625.23	18.51	627.21	19.72	626.00	16.44	629.28
PB-BED-MW15	1919283	626179	631.31	628.76	27.77	603.54	32.40	598.91	21.09	610.22	29.95	601.36	21.12	610.19	20.34	610.97
PB-BED-MW16	1920594	623299	635.70	633.36	64.32	571.38	2.02	633.68	5.53	630.17	11.80	623.90	7.41	628.29	2.28	633.42
PB-BED-MW17	1924121	625417	629.65	627.02	27.08	602.57	26.75	602.90	26.89	602.76	26.48	603.17	27.75	601.90	26.85	602.80
PB-BED-MW18	1925483	623849	651.18	648.51	26.13	625.05	30.79	620.39	29.50	621.68	30.58	620.60	30.22	620.96	30.55	620.63
PB-BED-MW19	1910174	623869	642.75	640.19	21.68	621.07	19.23	623.52	19.83	622.92	19.85	622.90	20.55	622.20	19.00	623.75
PB-BED-MW20	1922952	612423	676.01	673.25	14.66	661.35	14.73	661.28	14.03	661.98	14.28	661.73	14.42	661.59	13.98	662.03
PB-BED-MW22	1918367	629778	629.67	627.22	--	--	--	--	--	--	--	--	--	--	--	--
PB-BED-MW23	1918150	625838	633.71	631.11	--	--	--	--	--	--	--	--	--	--	--	--
PB-BED-MW24	1908168	622916	645.98	644.20	--	--	--	--	--	--	--	--	--	--	--	--
PB-BED-MW25	1914458	617821	684.59	681.99	--	--	--	--	--	--	--	--	--	--	--	--
PB-BED-MW26	1920274	613878	677.21	674.61	--	--	--	--	--	--	--	--	--	--	--	--
PB-BED-MW27[m]	1920791	627896	627.14	625.24	--	--	--	--	--	--	--	--	--	--	--	--
TNTA-BEDGW-001	1922580	623447	638.79	636.99	--	--	--	--	--	--	--	--	--	--	--	--
TNTB-BEDGW-001	1917218	618738	662.43	659.80	--	--	--	--	--	--	--	--	4.11	658.32	5.60	656.83
TNTB-BEDGW-002	1918021	616835	673.35	670.10	--	--	--	--	--	--	--	--	6.91	666.44	2.89	670.46
TNTB-BEDGW-003	1918710	618103	683.11	681.34	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-1

Summary of Groundwater Elevation Measurements
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 5/5	05/05/1998[h]	9/20[i]	09/20/00	1/17[i]	01/17/01	8/15[i]	08/15/01	11/15[i]	11/15/01	2/27[j]28[i]	02/27/02	5/4[i]	05/04/02
MK-MW16	1918011	616834	674.00	671.01	5.10	668.90	5.90	668.10	6.10	667.90	8.49	665.51	6.77	667.23	5.36	668.64	5.34	668.66
MK-MW17	1917813	618572	664.32	660.65	3.90	660.42	5.10	659.22	4.90	659.42	5.78	658.55	5.10	659.22	4.46	659.86	4.40	659.92
MK-MW19	1917535	623871	639.13	636.20	4.56	634.57	4.90	634.23	4.80	634.33	8.30	630.83	5.68	633.45	4.27	634.86	4.80	634.33
MK-MW20	1920539	622912	637.51	634.30	5.85	631.66	5.50	632.01	--	--	5.57	631.94	6.12	631.39	NM[j]	--	--	--
MK-MW22	1923776	624339	637.73	635.24	7.42	630.31	7.80	629.93	6.90	630.83	9.60	628.13	7.28	630.45	6.69	631.04	7.35	630.38
MK-MW23	1925354	624657	639.11	636.63	6.54	632.57	7.40	631.71	7.30	631.81	10.35	628.76	7.11	632.00	5.96	633.15	6.43	632.68
MK-MW24	1923302	622264	656.80	654.12	6.18	650.62	7.50	649.30	6.10	650.70	9.39	647.41	8.24	648.56	6.15	650.65	6.18	650.62
PR-MW07	1919021	624996	633.67	631.18	2.17	631.50	--	--	--	--	5.63	628.05	5.08	628.59	2.46	631.21	2.28	631.39
PR-MW08	1919309	624889	634.70	632.18	4.37	630.33	--	--	--	--	7.19	627.51	6.82	627.88	5.08	629.62	4.46	630.24
PR-MW09	1919510	625092	633.38	630.38	3.40	629.98	--	--	--	--	8.70	624.68	6.40	626.98	3.49	629.89	3.42	629.96
TNTA-MW10	1923399	623864	639.86	637.18	3.24	636.62	4.80	635.06	2.90	636.96	8.03	631.83	5.60	634.26	3.20	636.66	3.18	636.68
TNTA-MW11	1922744	623518	640.18	637.54	4.34	635.84	6.20	633.98	3.10	637.08	7.30	632.88	9.40	630.78	4.30	635.88	4.41	635.77
TNTC-MW03	1911391	621465	645.09	642.25	4.95	640.14	6.80	638.29	4.20	640.89	11.46	633.63	11.31	633.78	4.55	640.54	5.21	639.88
TNTC-MW04	1910470	620413	654.11	651.57	3.21	659.90	6.80	647.31	4.00	650.11	7.80	646.31	6.66	647.45	3.85	650.26	4.29	649.82
TNTC-MW05	1911811	620692	651.49	648.75	3.10	648.39	5.20	646.29	3.60	647.89	7.76	643.73	17.60	633.89	3.07	648.42	3.30	648.19
TNTC-MW06	1913006	620429	659.08	656.50	3.81	655.27	4.90	654.18	4.10	654.98	6.68	652.40	4.89	654.19	3.74	655.34	4.40	654.68
WA-MW01	1909948	622641	644.11	642.00	4.70	639.41	14.20	629.91	9.20	634.91	17.65	626.46	21.12	622.99	18.38	625.73	5.29	638.82
WA-MW02	1910176	622124	633.33	630.84	1.54	631.79	3.90	629.43	1.90	631.43	4.74	628.59	3.39	629.94	1.27	632.06	1.22	632.11
Bedrock Monitoring Wells																		
AA1-BEDGW-001	1917719	623069	641.04	638.80	29.1	611.94	14.30	626.74	--	--	31.00	610.04	32.16	608.88	30.93	610.11	32.50	608.54
AA2-BEDGW-001	1909552	623600	644.06	641.60	9.89	634.17	14.30	629.76	--	--	13.25	630.81	15.91	628.15	15.08	628.98	13.62	630.44
AA3-BEDGW-001	1914957	625037	636.43	634.10	21.62	614.81	25.20	611.23	24.90	611.53	25.61	610.82	27.58	608.85	20.66	615.77	25.90	610.53
ABG-BEDGW-001	1921506	621580	660.59	658.20	5.60	654.99	5.80	654.79	4.20	656.39	7.80	652.79	5.99	654.60	3.82	656.77	3.81	656.78
BG8-BEDGW-001	1909857	618635	676.56	673.70	5.86	670.70	5.40	671.16	6.00	670.56	9.04	667.52	5.57	670.99	5.68	670.88	5.82	670.74
MNTA-BEDGW-001	1918699	623808	638.40	636.05	25.60	612.80	--	--	--	--	29.40	609.00	30.99	607.41	30.19	608.21	31.50	606.90
PB-BED-MW13	1912175	621044	647.95	645.49	41.40	606.55	27.90	620.05	28.40	619.55	30.31	617.64	45.60	602.35	37.50	610.45	56.67	591.28
PB-BED-MW14	1910457	622720	645.72	642.73	15.99	629.73	18.80	626.92	17.90	627.82	19.63	626.09	21.73	623.99	18.59	627.13	17.30	628.42
PB-BED-MW15	1919283	626179	631.31	628.76	19.79	611.52	20.40	610.91	18.80	612.51	17.13	614.18	31.18	600.13	23.96	607.35	30.05	601.26
PB-BED-MW16	1920594	623299	635.70	633.36	2.74	632.96	5.00	630.70	--	--	5.29	630.41	30.14	605.56	NM[k]	--	--	--
PB-BED-MW17	1924121	625417	629.65	627.02	26.40	603.25	29.80	599.85	0.00	629.65	29.33	600.32	31.50	598.15	29.65	600.00	31.62	598.03
PB-BED-MW18	1925483	623849	651.18	648.51	30.72	620.46	30.90	620.28	31.80	619.38	31.79	619.39	33.10	618.08	32.43	618.75	32.59	618.59
PB-BED-MW19	1910174	623869	642.75	640.19	18.45	624.30	21.20	621.55	21.90	620.85	25.38	617.38	24.91	617.84	23.27	619.48	22.75	620.00
PB-BED-MW20	1922952	612423	676.01	673.25	13.29	662.72	13.80	662.21	13.80	662.21	13.75	662.26	14.48	661.53	13.81	662.20	13.94	662.07
PB-BED-MW22	1918367	629778	629.67	627.22	--	--	--	--	--	--	--	--	--	--	29.76	599.91	28.50	601.17
PB-BED-MW23	1918150	625838	633.71	631.11	--	--	--	--	--	--	--	--	--	--	60.80	572.91	73.04	560.67
PB-BED-MW24	1908168	622916	645.98	644.20	--	--	--	--	--	--	--	--	--	--	25.80	620.18	24.80	621.18
PB-BED-MW25	1914458	617821	684.59	681.99	--	--	--	--	--	--	--	--	--	--	14.05	670.54	13.90	670.69
PB-BED-MW26	1920274	613878	677.21	674.61	--	--	--	--	--	--	--	--	--	--	59.63	617.58	59.96	617.25
PB-BED-MW27[m]	1920791	627896	627.14	625.24	--	--	--	--	--	--	--	--	--	--	44.60	582.54	46.10	581.04
TNTA-BEDGW-001	1922580	623447	638.79	636.99	--	--	--	--	--	--	--	--	--	--	75.36	[n]576.23	77.70	[n]573.89
TNTB-BEDGW-001	1917218	618738	662.43	659.80	2.91	659.52	3.60	658.83	3.60	658.83	4.78	657.65	3.83	658.60	3.16	659.27	3.10	659.33
TNTB-BEDGW-002	1918021	616835	673.35	670.10	7.67	665.68	6.20	667.15	5.60	667.75	8.20	665.15	6.48	666.87	5.72	667.63	5.80	667.55
TNTB-BEDGW-003	1918710	618103	683.11	681.34	--	--	--	--	--	--	--	--	--	--	19.38	663.73	25.28	657.83

Table 6-1

Summary of Groundwater Elevation Measurements
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Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 12/94	12/1994[b]	3/19	03/19/95[c]	10/96	10/1996[d]	8/27	8/27/1997[e]	11/12	11/12/1997[f]	2/24	02/24/1998[g]
TNTB-BEDGW-004	1918572	618469	668.63	666.78	--	--	--	--	--	--	--	--	--	--	--	--
TNTC-BEDGW-001	1912853	620254	667.04	664.04	--	--	--	--	--	--	--	--	--	--	--	--
REACTOR1	1917983	626773	630.51	630.45	--	--	--	--	--	--	15.32	615.19	22.06	608.45	33.25	597.26
REACTOR2	1918003	626661	631.05	631.00	16.34	614.71	29.16	601.89	--	--	15.40	615.65	4.81	626.24	28.53	602.52
REACTOR3	1918148	626685	631.21	631.10	--	--	--	--	--	--	14.60	616.61	22.17	609.04	37.45	593.76
REACTOR4	1918147	626630	630.83	630.44	--	--	--	--	--	--	--	--	--	--	--	--

Table 6-1

Summary of Groundwater Elevation Measurements
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well Identification	Coordinates (Ohio Plane)[a] Easting (x)	Northing (y)	Top of Casing Elevation[a] (ft msl)	Ground Elevation[a] (ft msl)	Groundwater Elevation Measurements (feet above mean sea level [msl]) 5/5	05/05/1998[n]	9/20[f]	09/20/00	1/17[i]	01/17/01	8/15[i]	08/15/01	11/15[i]	11/15/01	2/2728[i]	02/27/02	5/4[i]	05/04/02
TNTB-BEDGW-004	1918572	618469	668.63	666.78	--	--	--	--	--	--	--	--	--	--	7.31	661.32	7.20	661.43
TNTC-BEDGW-001	1912853	620254	667.04	664.04	--	--	--	--	--	--	--	--	--	--	57.64	609.40	56.96	610.08
REACTOR1	1917983	626773	630.51	630.45	32.30	598.21	25.50	605.01	31.80	598.71	30.20	600.31	28.64	601.87	NM	--	--	--
REACTOR2	1918003	626661	631.05	631.00	27.50	603.55	27.40	603.65	27.10	603.95	0.13	630.93	0.00	631.05	NM	--	--	--
REACTOR3	1918148	626685	631.21	631.10	37.08	594.13	35.60	595.61	35.20	596.01	34.43	596.78	34.43	596.78	NM	--	--	--
REACTOR4	1918147	626630	630.83	630.44	--	--	20.40	610.43	20.30	610.53	20.65	610.18	20.40	610.43	NM	--	--	--

[a] Northings and Eastings are scaled to the Ohio State Plane Coordinate System (North Zone), NAD 1983. Vertical datum to NGVD 1929.
[b] Data from Dames & Moore, Sitewide Groundwater Investigation Final Report (4/97).
[c] Data from Dames & Moore, Sitewide Groundwater Investigation Final Report (4/97).
[d] Data from IT Corporation, Site-Wide Groundwater Investigation Report (9/97).
[e] Data from IT Corporation, 1st Quarterly Water Level Measurement Event Report (10/97).
[f] Data from IT Corporation, 2nd Quarterly Water Level Measurement and 1st Semi-Annual Groundwater Sampling Event Report (5/98).
[g] Data from IT Corporation, 3rd Quarterly Water Level Measurement Event Report (6/97).
[h] Data from IT Corporation, 4th Quarterly Water Level Measurement and 2nd Semi-Annual Groundwater Sampling Event Report (6/99).
[i] Data received from ICI field measurements.
[j] Symbol denotes data are not available.
[k] Temporary piezometer (removed 4/14/02).
[l] Hydrocarbon product in well. No measurement recorded.
[m] Monitoring well PB-BED-MW27 was abandoned at the publics request in January 2003 due to "nuisance" (hydrogen sulfide) odors.
[n] Groundwater elevation corrected for hydrocarbon product in well. TOC elevation - (depth to groundwater - [product thickness x 0.8]).

Table 6-2

Detected Hydrocarbons in 2001 Bedrock Drilling
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Monitoring Well	Date Drilled	Location	Depth to Bedrock (ft)	Depth to Bedrock (refusal - ft)	Depth to Limestone/Unit Screened[a] (ft)	Depth Drilled (ft)	Hydrocarbon/H_2S Odor Detected[b] (ft)	Hydrocarbon Stained Core[c] (ft)	Comments
PB-BED-MW22	8/24/01-9/10/01	Downgradient Boundary, North of Reactor Area	19.5	19.5	19.5/Delaware	43	20-24.5	40-43	
PB-BED-MW23	8/25/01-9/6/01	South of Reactor Area and Pentolite Road	26.3	26.3	26.3/Delaware	74	30-74	33-74	Hydrocarbon observed seepng from rock core.
PB-BED-MW24	8/26/01-9/13/01	Upgradient Boundary, West of West Red Water Ponds (Background)	17.3	17.3	17.3/Delaware	41.5	26.5-40.0	31.5-41.5	Hydrocarbon observed seepng from rock core. Gas discharge (gurgling) heard during water recharge.
PB-BED-MW25	8/26/01-9/11/01	Upgradient Boundary, West of TNT Area B (Background)	8.8	15	21.5/Olentangy Shale	38.5	33.5-38.5	None	
PB-BED-MW26	8/27/01-9/10/01	Southeast Upgradient Boundary, Southeast of TNT B (Background)	6.5	24.5	41.5/Ohio	58.5	32.6-43.0	None	
PB-BED-MW27	8/23/01-9/8/01	Downgradient Boundary, East-Northeast of Reactor Area	18.8	18.8	20.0/Delaware	105	95-105	41-105	Hydrocarbon observed seepng from rock core.
TNTA-BEDGW-001	9/24/01-9/13/01	TNT Area A, Near Maintenance and Short Cut Rd, At Former Bldg 146	8.5	25	51/Delaware	86	None	68-85	A thickness of approx. 3.5 feet free-phase hydrocarbon was encountered prior to sampling (10/9/01).
TNTB-BEDGW-003	8/30/01-9/8/01	TNT Area B, South of North Magazine Rd, North of Former Bldg 456	4.3	18	35.1/Prout	43.3	None	None	
TNTB-BEDGW-004	8/29/01-9/7/01	TNT Area B, South of North Magazine Rd, At Former Bldg 452	4.9	6.3	16.3/Prout	26.1	None	None	
TNTC-BEDGW-001	8/28/01-9/12/01	TNT Area C, At Former Bldg 683	14.5	55.3	57.0/Delware	86	None	None	

Notes

[a] Limestone unit interpretations from Regional Geologic Map, Summary Report, Site-Wide Groundwater Monitoring (1997-1998) (IT, 1999).

[b] A hydrocarbon odor was detected by the olfactory senses. PID readings in the breathing air remained below action levels.

[c] Hydrocarbon staining on the rock core is also seen in photographs (Appendix D).

A hydrocarbon thickness of 0.05 feet was measured in well PB-BED-MW16 on 10/3/01.

A hydrocarbon thickness of 0.63 feet was measured in well AA1-BEDGW-001 on 10/4/01.

Table 6-3

Summary of Hydraulic Conductivity Testing Results
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

Well No.	Date Tested	Aquifer Response	Saturated Aquifer Thickness (Assumed)	Test Type	Transmisivities T (ft^2/day)	Hydraulic Conductivities K (ft/min)	Hydraulic Conductivities K (cm/sec)	Hydraulic Conductivities K (ft/day)
OVERBURDEN								
IT-MW-08	10/96	Unconfined		Rising		3.32E-03	1.69E-03	4.78E+00
		Unconfined		Rising		7.16E-03	3.64E-03	1.03E+01
		Unconfined		Rising		9.57E-03	4.86E-03	1.38E+01
IT-AA1-GW-002	10/10/97	Unconfined	22.13	Rising	1.63E+01	5.13E-04	2.61E-04	7.39E-01
IT-AA2-GW-002	10/97	—	dry	—	—	—	—	—
IT-AA3-GW-002	10/8/97	Unconfined	18.02	Rising	7.63E+01	2.94E-03	1.49E-03	4.23E+00
IT-ABG-GW-002	10/8/97	Unconfined	9.58	Rising	2.03E+03	1.47E-01	7.47E-02	2.12E+02
Maximum					***2.03E+03***	***1.47E-01***	***7.47E-02***	***2.12E+02***
Minimum					***1.63E+01***	***5.13E-04***	***2.61E-04***	***7.39E-01***
Geometric Mean					***1.36E+02***	***6.08E-03***	***3.09E-03***	***8.75E+00***
BEDROCK								
Ohio Shale								
IT-ABG-BEDGW-001	10/8/97	Unconfined	17.65	Rising	3.91E+02	1.54E-02	7.83E-03	2.22E+01
IT-TNTB-BEDGW-002	10/8/97	Unconfined	19.68	Rising	3.51E+02	1.24E-02	6.30E-03	1.79E+01
PB-BED-MW26	11/13/01	slug test not performed due to small water column						
Olentangy Formation								
IT-TNTB-BEDGW-001	10/8/97	Unconfined	22.73	Rising	1.33E+00	4.07E-05	2.07E-05	5.86E-02
TNTB-BEDGW-003	11/13/01	Unconfined	11.68	Falling	insufficient data			
				Rising	2.82E-02	1.68E-06	8.52E-07	2.41E-03
TNTB-BEDGW-004	11/13/01	Unconfined	18.36	Falling	4.03E+01	1.53E-03	7.75E-04	2.20E+00
				Rising	8.51E+01	3.22E-03	1.64E-03	4.63E+00
PB-BED-MW25	11/14/01	Unconfined	25.55	Falling	1.40E+02	3.81E-03	1.94E-03	5.48E+00
				Rising	1.23E+02	3.33E-03	1.69E-03	4.80E+00
IT-BG8-BEDGW-001	10/8/97	Unconfined	16.64	Rising	5.73E+00	2.39E-04	1.21E-04	3.44E-01
Maximum					***3.91E+02***	***1.54E-02***	***7.83E-03***	***2.22E+01***
Minimum					***2.82E-02***	***1.68E-06***	***8.52E-07***	***2.41E-03***
Geometric Mean					***2.29E+01***	***8.33E-04***	***4.24E-04***	***1.20E+00***
Delaware Limestone								
PB-BED-MW22	11/13/01	Unconfined	14.21	Rising	3.69E+00	1.80E-04	9.16E-05	2.59E-01
PB-BED-MW23	11/14/01	Unconfined	8.27	Rising	5.41E-01	4.54E-05	2.31E-05	6.54E-02
PB-BED-MW24	11/13/01	Unconfined	15.32	Falling	2.35E+01	1.07E-03	5.42E-04	1.54E+00
				Rising	2.81E+01	1.28E-03	6.48E-04	1.84E+00
PB-BED-MW27	11/14/01	Unconfined	59.26	Rising	1.37E-01	1.61E-06	8.16E-07	2.31E-03
IT-AA1-BEDGW-001	10/7/97	Unconfined	35.82	Rising	2.67E+00	5.17E-05	2.63E-05	7.44E-02
IT-AA2-BEDGW-001	10/7/97	Unconfined	31.40	Rising	1.02E+00	2.26E-05	1.15E-05	3.25E-02
IT-MNTA-BEDGW-001	10/8/97	Unconfined	38.14	Rising	1.19E+00	2.17E-05	1.10E-05	3.12E-02
IT-AA3-BEDGW-001	10/8/97	Unconfined	30.81	Rising	1.14E+01	2.58E-04	1.31E-04	3.72E-01
TNTA-BEDGW-001	11/13/01	slug test not performed due to small water column						
TNTC-BEDGW-001	11/14/01	Unconfined	28.59	Falling	8.66E+00	2.10E-04	1.07E-04	3.03E-01
				Rising	5.46E+00	1.33E-04	6.74E-05	1.91E-01
Maximum					***2.81E+01***	***1.28E-03***	***6.48E-04***	***1.84E+00***
Minimum					***1.37E-01***	***1.61E-06***	***8.16E-07***	***2.31E-03***
Geometric Mean					***3.16E+00***	***9.03E-05***	***4.59E-05***	***1.30E-01***

ft^2/day - Square feet per day.
ft/min - Feet per minute.
cm/sec - Centimeters per second.
ft/day - Feet per day.

Table 6-4

Well Pair Vertical Hydraulic Gradients
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

	Well Name	Unit Monitored (ft bgs)	Well TD (ft bgs)	Depth of Monitored Zone (ft bgs)	Elevation of Ground Surface (ft)	Elevation of Center of Monitored Zone (ft)	Groundwater Elevation					Average Vertical Gradient (ft/ft)
							11/12/97	2/24/98	5/5/98	11/15/01	2/27/02	
Pair 1	IT-AA1-GW002	OB/OS	22	6.8-21.9	638.6	624.25	634.63	637.80	637.43	636.47	637.46	
	IT-AA1-BED-GW001	DL	65.0	49.8-64	638.8	581.90	610.52	610.54	611.94	608.88	610.11	
	Distance between Center of Monitored Zones					42.35						
	Vertical Gradient						0.569	0.644	0.602	0.651	0.646	0.622
Pair 2	IT-AA2-GW-002	OB/OLS	18.5	8.3-18.3	641.5	628.20	DRY	DRY	643.95	623.37	633.32	
	IT-AA2-BED-GW001	DL	54	27.8-42.8	641.6	606.30	630.95	632.48	634.17	628.15	628.98	
	Distance between Center of Monitored Zones					21.90						
	Vertical Gradient						NA	NA	0.447	-0.218	0.198	0.085
Pair 3	AA3-GW002	OB	16	5.8-15.8	634.1	623.30	629.81	632.23	622.14	629.29	631.61	
	AA3-BED-GW001	DL	53	37.8-52.8	634.1	588.80	613.21	614.9	614.81	608.85	615.77	
	Distance between Center of Monitored Zones					34.50						
	Vertical Gradient						0.481	0.502	0.212	0.592	0.459	0.450
Pair 4	ABG-GW002	OB	6.8	2.5-6.5	658.2	653.70	654.51	657.11	657.06	654.60	656.88	
	ABG-BED-GW001	OS	21	10.8-20.8	658.2	642.40	654.5	657.04	656.99	654.60	656.77	
	Distance between Center of Monitored Zones					11.30						
	Vertical Gradient	OB/OS					0.001	0.006	0.006	0.000	0.010	0.005
Pair 5	MK-MW16	OB/OS	8	2-7	671.01	666.51	666.25	669.18	669.22	667.23	668.64	
	TNTB-BED-GW002	OS	24.2	14-24	670.10	651.10	666.44	670.46	665.68	666.87	667.63	
	Distance between Center of Monitored Zones					15.41						
	Vertical Gradient						-0.012	-0.083	0.230	0.023	0.066	0.045

OB - Overburden.
OS - Ohio Shale
OLS - Olentangy shale.
DL - Delaware limestone.

A negative vertical gradient indicates an upward force.
A positive vertical gradient indicates a downward force.
ft - Feet.
bgs - Below ground surface.
ft/ft - Foot per foot.

Table 6-5

Detected Constituents in Bedrock Monitoring Well
West Area Red Water Ponds
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Sample Area:	West Area Red Water											
				Location Code:	PB-BED-MW14											
				Sample No:	5900		5905		5905R		BD3018		BD3018R		CB3022	
				Sample Date:	18-NOV-97		16-MAY-98		18-MAY-98		28-SEP-01		05-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Volatiles																
Acetone	µg/L	61	ND	NE									9.4	B		
Benzene	µg/L	0.34	1.1	NE	1.1											
Carbon disulfide	µg/L	104	1.3	NE	1.3				0.25	J						
Ethylbenzene	µg/L	130	0.59 J	NE	0.59	J										
Methylene chloride	µg/L	4.28	ND	NE									1.4	B	1.9	B
Toluene	µg/L	72	ND	NE	1.7	B										
Xylenes, total	µg/L	21	3.9	NE	3.9											
Semivolatiles																
Dinitro-2-methylphenol, 4,6-	µg/L	0.36	28 NJ	NE					28	NJ						
Dinitrophenol, 2,4-	µg/L	7.3	14 J	NE					14	J						
Dinitrotoluene, 2,4-	µg/L	0.10	19	NE					16						10	
Nitroaniline, 3-	µg/L	6.1	150	NE											150	
Nitrobenzene	µg/L	0.34	5.8 J	NE					5.8	J						
Metals - Unfiltered																
Aluminum	µg/L	3650	374 J	TBD	374	J					64.9	B			87.5	B
Arsenic	µg/L	0.045	9.5 J	TBD							6.1	J			9.5	J
Barium	µg/L	255	51.4 J	TBD							49.5	J			51.4	J
Chromium	µg/L	11	10.2	TBD	10.2						1.6	J			3.4	J
Cobalt	µg/L	73	267	TBD							102				267	
Copper	µg/L	146	94.8	TBD							30.7				94.8	
Iron	µg/L	1095	923	TBD	923		427	J			164				438	
Lead	µg/L	15	3.6	TBD											3.6	
Manganese	µg/L	88	136	TBD	54		32				65.2				[illegible]	
Nickel	µg/L	73	278	TBD	42.3		45.5				111				[illegible]	
Selenium	µg/L	18	7.8	TBD							5.5				7.8	
Thallium	µg/L	0.24	ND	TBD							6.0	B				
Vanedium	µg/L	26	5.5 J	TBD							2.4	B			5.5	J
Zinc	µg/L	1095	64.8	TBD	39.8		42.2	B			10.8	J			64.8	
Metals - Filtered																
Aluminum	µg/L	3650	ND	TBD							54.9	B			94.8	B
Arsenic	µg/L	0.045	9.0 J	TBD							5.5	J			9.0	J
Barium	µg/L	255	51.4 J	TBD							50.8	J			51.4	J
Chromium	µg/L	11	3.0 J	TBD							1.9	J			3.0	J
Cobalt	µg/L	73	265	TBD			65.4				105				265	
Copper	µg/L	146	92	TBD							27.0				92.0	
Iron	µg/L	1095	417	TBD			269				145				417	
Lead	µg/L	15	3.6	TBD											3.6	
Manganese	µg/L	88	136	TBD	29.1		32.6				68.0				[illegible]	
Nickel	µg/L	73	276	TBD	40.7		71.3				117				[illegible]	
Selenium	µg/L	18	7.4	TBD							8.2	B			7.4	
Thallium	µg/L	0.24	ND	TBD							7.2	B				
Vanadium	µg/L	26	5.8 J	TBD							2.4	J			5.8	J
Zinc	µg/L	1095	68.2 J	TBD	32.4		53.9	B			12.6	J			68.2	J

Table 6-5

Detected Constituents in Bedrock Monitoring Well
West Area Red Water Ponds
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Sample Area:	West Area Red Water											
				Location Code:	PB-BED-MW14											
				Sample No:	5900		5905		5905R		BD3018		BD3018R		CB3022	
				Sample Date:	18-NOV-97		16-MAY-98		18-MAY-98		28-SEP-01		05-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters																
Alkalinity	µg/L	NE	500000	NE	210000		500000				482000	J			481000	
Chloride	µg/L	NE	79000	NE	79000		3000				72200				75600	J
Cyanide, Total	µg/L	73	44	NE	16		44								38	
Hardness	µg/L	NE	1230000	NE	640000		730000				1200000				1230000	
Nitrate	µg/L	1000	79300	NE	300		24000						22000		[illegible]	
Sulfate	µg/L	NE	2660000	NE	610000		630000				1440000				2660000	
Total dissolved solids	µg/L	NE	7360000	NE	2500000		2300000				3570000				7360000	
Total organic carbon	µg/L	NE	937000	NE	190000		160000				617000				937000	
Total suspended solids	µg/L	NE	54000	NE	37000		23000				11000				54000	
Turbidity	NTU	NE	4.2 J	NE									4.2	J		

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

RBSC - Risk-based screening concentration.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-6

Detected Constituents in Bedrock Monitoring Wells
Pentolite Road Red Water Ponds
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Sample Area:	Pentolite Road Red Water Area											
				Location Code:	PB-BED-MW15								PB-BED-MW23			
				Sample No:	5910		5915		BD3019		CB3041		BD3028		CB3040	
				Sample Date:	18-NOV-97		28-MAY-98		09-OCT-01		15-APR-02		09-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives																
Amino-2,6-dinitrotoluene, 4-	µg/L	0.22	0.97	NE							0.97					
Dinitrotoluene, 2,4-	µg/L	0.10	0.89	NE			0.89									
Dinitrotoluene, 2,6-	µg/L	0.10	0.89	NE			0.89									
Nitrobenzene	µg/L	0.34	0.35	NE							0.35					
RDX	µg/L	0.61	0.51	NE							0.51					
Trinitrotoluene, 2,4,6-	µg/L	1.82	1.6	NE					1.6		1.3					
Volatiles																
Acetone	µg/L	61	1600 J	NE					170	J	61	J	[illegible]	J	[illegible]	
Benzene	µg/L	0.34	2500	NE	570		780		670		650		[illegible]		[illegible]	
Carbon disulfide	µg/L	104	3.1 J	NE							3.1	J				
Chlorobenzene	µg/L	11	5.5 J	NE			5.5	J								
Chloroform	µg/L	0.62	ND	NE	8.4	B										
Ethylbenzene	µg/L	130	230	NE	130		140		150	J	130		[illegible]		230	
Methylene chloride	µg/L	4.3	160 J	NE	31	B	83	B	180	J	31	J	[illegible]		100	
Toluene	µg/L	72	1000	NE	490		550		630		450		670		1000	
Trichloroethane, 1,1,2-	µg/L	0.20	4.9 J	NE			4.9	J								
Xylenes, total	µg/L	21	1600	NE	920		880		1000		880		1300		1600	
Semivolatiles																
Bis(2-ethylhexyl)phthalate	µg/L	4.8	37	NE	37		28	B	2.2	J	1.8	J	7.1	J	3.3	J
Butyl benzyl phthalate	µg/L	730	1.5 J	NE									1.5	J		
Di-n-butyl phthalate	µg/L	365	1.1 J	NE									1.1	J		
Diethyl phthalate	µg/L	2920	1.2 J	NE									1.2	J	0.68	J
Dimethylphenol, 2,4-	µg/L	73	51	NE	6.7	J	10		5.6	J	6.8	J	42		51	
Fluorene	µg/L	24	1.7 J	NE	1.7	J									1.4	J
Isophorone	µg/L	71	4.2 J	NE	4.2	J	3.8	J								
Methylnaphthalene, 2-	µg/L	12	37	NE	31		37		25		21		23		[illegible]	
Methylphenol, 2-	µg/L	182	37	NE	3.0	J	6.7	J	3.3	J	3.9	J	25		37	
Methylphenol, 4-	µg/L	18	43	NE	3.9	J	7.7	J	4.2	J	5.6	J	[illegible]		[illegible]	
Naphthalene	µg/L	0.62	31	NE	22		31		24		26		[illegible]		[illegible]	
Phenanthrene	µg/L	18	2.4 J	NE	2.2	J	2.0	J	0.98	J	1.3	J	1.3	J	2.4	J
Phenol	µg/L	2190	150	NE	18		32		12		15		80		150	
n-Nitrosodiphenylamine	µg/L	14	0.64 J	NE									0.64	J		

Table 6-6

Detected Constituents in Bedrock Monitoring Wells
Pentolite Road Red Water Ponds
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Sample Area:	**Pentolite Road Red Water Area**											
				Location Code:	**PB-BED-MW15**								**PB-BED-MW23**			
				Sample No:	**5910**		**5915**		**BD3019**		**CB3041**		**BD3028**		**CB3040**	
				Sample Date:	**18-NOV-97**		**28-MAY-98**		**09-OCT-01**		**15-APR-02**		**09-OCT-01**		**11-APR-02**	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals - Unfiltered																
Aluminum	µg/L	3650	513 J	TBD			513	J	51.1	B	74.8	B	350		104	B
Arsenic	µg/L	0.045	ND	TBD									[illegible]	B		
Barium	µg/L	255	1710	TBD	605		1710		481		650		64.2	J	106	J
Chromium	µg/L	11	20.6	TBD			20.6						[illegible]		6.1	J
Cobalt	µg/L	73	5.9 J	TBD									5.9	J		
Copper	µg/L	146	39.5	TBD			39.5						4.8	J		
Iron	µg/L	1095	7280	TBD	930		4810				142		[illegible]		[illegible]	
Manganese	µg/L	88	1170	TBD	26.3		139		5.6	J	7.0	J	[illegible]		[illegible]	
Nickel	µg/L	73	13.6 J	TBD					3.8	J			13.6	J	7.2	J
Thallium	µg/L	0.24	50.8	TBD			50.8									
Zinc	µg/L	1095	30.6	TBD	30.6		105	B					18.0	J	3.0	J
Metals - Filtered																
Aluminum	µg/L	3650	38.1 J	TBD					64.5	B	52.4	B	93.6	B	38.1	J
Arsenic	µg/L	0.045	2.9 J	TBD									[illegible]	J		
Barium	µg/L	255	1390	TBD	555		1390		484		555		54.4	J	104	J
Chromium	µg/L	11	1.5 J	TBD									1.5	J		
Cobalt	µg/L	73	2.6 J	TBD									2.6	J		
Iron	µg/L	1095	4450 J	TBD									[illegible]		[illegible]	
Manganese	µg/L	88	988	TBD					5.2	J	6.3	J	[illegible]		[illegible]	
Nickel	µg/L	73	5 J	TBD					2.4	J			5.0	J	4.8	J
Thallium	µg/L	0.24	62.2	TBD			62.2									
Zinc	µg/L	1095	30.9	TBD	30.9		47.3	B			9.4	J			8.6	J
Water Quality Parameters																
Alkalinity	µg/L	NE	501000	NE	85000		500000		382000	J	501000		227000	J	246000	
Chloride	µg/L	NE	6400000	NE	1400000		2200000		1910000		2100000		2480000		6400000	
Hardness	µg/L	NE	5740000	NE	1500000		1800000		855000		1490000		5410000	J	5740000	
Sulfate	µg/L	NE	218000	NE			82000		89200		103000		85800		218000	
Total dissolved solids	µg/L	NE	12500000	NE	3200000		3800000		2570000		3720000		3080000		12500000	
Total organic carbon	µg/L	NE	13000	NE	11000		13000		8400		6500		6200		6400	
Total suspended solids	µg/L	NE	1660000	NE	7000		13000				25000		292000		1660000	
Turbidity	NTU	NE	6500	NE					203		140		324		6500	

Bold text indicates cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-7

Detected Constituents in Temporary Piezometers
TNT Manufacturing Areas A, B, and C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Sample Area:	TNT Area A		TNT Area B		TNT Area C			
		Sample Location:	TNTA-DP21		TNTB-DP03		TNTC-DP13		TNTC-DP19	
		Sample Number:	BA3021		BB3003		BC3013		BC3019	
		Sample Date:	1-Aug-01		1-Aug-01		1-Aug-01		6-Aug-01	
Parameter	**Units**	**RBSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives										
4-Amino-2,6-dinitrotoluene	µg/L	0.22	3.9							
2-Amino-4,6-dinitrotoluene	µg/L	0.22	14.3							
2,4-Dinitrotoluene	µg/L	0.10	9.5							
2,6-Dinitrotoluene	µg/L	0.10	4.9							
2-Nitrotoluene	µg/L	6.1	24							
3-Nitrotoluene	µg/L	6.1	1.3							
4-Nitrotoluene	µg/L	6.1	3.1							
2,4,6-Trinitrotoluene	µg/L	1.82	4.1		0.14				4	
Volatiles										
Acetone	µg/L	61	8.8		10		8.8			
Chloroform	µg/L	0.62	1							

Bold italic/shaded cell indicates value is greater than the RBSC.
µg/L - Micrograms per liter.
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
VQ - Validation qualifier.

Table 6-8

Detected Constituents in Overburden Monitoring Wells
TNT Manufactruing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTA-MW10						TNTA-MW11							
				Sample No:	5610		5615		CB3042		5620		5625		BD3034		CB3043	
				Sample Date:	18-NOV-97		29-MAY-98		15-APR-02		18-NOV-97		29-MAY-98		03-OCT-01		15-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives																		
Amino-2,6-dinitrotoluene, 4-	µg/L	0.22	16	NE														
Amino-4,6-dinitrotoluene, 2-	µg/L	0.22	46	NE														
Trinitrotoluene, 2,4,6-	µg/L	1.8	110	NE											0.29			
Volatiles																		
Acetone	µg/L	61	35 J	NE	35	J	7.6	J	6.8	J					2.8	B	1.7	J
Methylene chloride	µg/L	4.3	ND	NE			2.1	B	0.43	B			0.95	B			0.32	B
Toluene	µg/L	72	ND	NE			0.25	B					0.26	B				
Metals - Unfiltered																		
Aluminum	µg/L	3650	8950 J	TBD	877	J	2280	J	60.0	B	3170	J	2990	J			807	
Arsenic	µg/L	0.045	14.5	TBD	12.2		14.5				10.5							
Barium	µg/L	255	373	TBD	373				56.0	J					88.4	J	24.0	J
Cadmium	µg/L	1.8	ND	TBD											1.2	B		
Chromium	µg/L	11	18.2 J	TBD							15.6						2.0	J
Cobalt	µg/L	73	10 J	TBD											10	J		
Copper	µg/L	146	15.9 J	TBD											15.9	J		
Iron	µg/L	1095	18700	TBD	18200		18700		4710		13300					J		
Lead	µg/L	15	10.4	TBD			5.6				10.4		3.2		9.4	J	3.0	
Manganese	µg/L	88	1530	TBD	1530		1250		607		1030					J	86.5	
Nickel	µg/L	73	22.4 J	TBD					2.1	J					22.4	J	3.9	J
Vanadium	µg/L	26	17.8 J	TBD											17.8	J	1.9	J
Zinc	µg/L	1095	47.1	TBD	27.0		48.1	B	31.8	J	47.1		37.5	B	39.2	J	5.9	J
Metals - Filtered																		
Aluminum	µg/L	3650	ND	TBD					36.0	B							35.6	B
Barium	µg/L	255	338	TBD	338				56.6	J							27.3	J
Cobalt	µg/L	73	2.4 J	TBD													2.4	J
Iron	µg/L	1095	9330	TBD	7310		9330		3270									
Manganese	µg/L	88	1440	TBD	1440		1300		625		566		565				80.7	
Nickel	µg/L	73	3.4 J	TBD													3.4	J
Zinc	µg/L	1095	45.4	TBD	25.0		22.7	B	30.4	J	45.4						26.8	J
Water Quality Parameters																		
Alkalinity	µg/L	NE	490000	NE	490000		410000		378000		450000		460000				402000	
Chloride	µg/L	NE	180000	NE	47000		100000		40100		140000		180000				10500	
Hardness	µg/L	NE	1100000	NE	1100000		730000		738000		940000		680000				611000	
Sulfate	µg/L	NE	309000	NE	160000		100000		261000		150000		93000				309000	
Total dissolved solids	µg/L	NE	1000000	NE	780000		760000		792000		1000000		1000000				848000	
Total organic carbon	µg/L	NE	9000	NE	4200		2000		4000		4500		3000		4300		9000	
Total suspended solids	µg/L	NE	140000	NE	7000				14000		140000		7000				74000	
Turbidity	NTU	NE	78.5	NE					36.2								78.5	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

BSC - Background screening concentration.
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established (RBSCs), not evaluated (BSCs).
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW17							
				Sample No:	5930		5935		BD3021		CB3014	
				Sample Date:	20-NOV-97		29-MAY-98		03-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives												
Amino-2,6-dinitrotoluene, 4-	µg/L	0.22	1.3	NE								
Amino-4,6-dinitrotoluene, 2-	µg/L	0.22	0.55	NE								
Dinitrobenzene, 1,3-	µg/L	0.36	1	NE								
Dinitrotoluene, 2,4-	µg/L	0.10	0.49	NE								
Dinitrotoluene, 2,6-	µg/L	0.10	3.6	NE					0.30	J		
Nitrobenzene	µg/L	0.34	2	NE	0.84							
Nitrotoluene, 2-	µg/L	6.1	0.55	NE							0.55	
Nitrotoluene, 3-	µg/L	6.1	0.30	NE								
Trinitrobenzene, 1,3,5-	µg/L	109	1.5	NE								
Volatiles												
Acetone	µg/L	61	290 J	NE					87	B		
Benzene	µg/L	0.34	700 J	NE	10	J					13	J
Carbon disulfide	µg/L	104	40 J	NE	40	J					2.3	J
Chloromethane	µg/L	1.5	35 J	NE								
Ethylbenzene	µg/L	130	240 J	NE	79		9.9	J	120		100	
Methylene chloride	µg/L	4.3	330 J	NE	16	B	65	B	41	J	[illegible]	J
Toluene	µg/L	72	730 J	NE	140		20	B	[illegible]		[illegible]	
Xylenes, total	µg/L	21	1400	NE	340		46		650		[illegible]	
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	8.6 J	NE			6.8	B	4.0	J	4.0	J
Chrysene	µg/L	9.2	15 J	NE								
Dibenzofuran	µg/L	2.4	12 J	NE								
Dimethylphenol, 2,4-	µg/L	73	18 J	NE			2.8	J	3.8	J	3.0	J
Fluorene	µg/L	24	28 J	NE								
Methylnaphthalene, 2-	µg/L	12	470	NE			20		9.2	J	7.5	J
Methylphenol, 2-	µg/L	182	12 J	NE					1.1	J		
Methylphenol, 4-	µg/L	18	15 J	NE					2.0	J	1.4	J
Naphthalene	µg/L	0.62	170	NE			18		9.8	J	10	J
Phenanthrene	µg/L	18	74 J	NE					0.99	J		
Phenol	µg/L	2190	27 J	NE					2.6	J	2.0	J

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW17							
				Sample No:	5930		5935		BD3021		CB3014	
				Sample Date:	20-NOV-97		29-MAY-98		03-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Unfiltered												
Aluminum	µg/L	3650	8300 J	TBD	396	B			106	J	97.0	B
Arsenic	µg/L	0.045	17.3 J	TBD					2.4	J	[illegible]	[illegible]
Barium	µg/L	255	1290	TBD	948		800		912		[illegible]	[illegible]
Beryllium	µg/L	7.3	1.1 J	TBD								
Cadmium	µg/L	1.8	1.2 J	TBD								
Chromium	µg/L	11	37.2 J	TBD								
Cobalt	µg/L	73	12.7 J	TBD								
Copper	µg/L	146	53.1 J	TBD								
Iron	µg/L	1095	33400 J	TBD	1580		456		160			
Lead	µg/L	15	18.4 J	TBD								
Manganese	µg/L	88	11700 J	TBD	124		20.4		21.6		8.4	J
Mercury	µg/L	1.1	1.0	TBD								
Nickel	µg/L	73	75.7 J	TBD								
Thallium	µg/L	0.24	ND	TBD							0.21	B
Vanadium	µg/L	26	36.9 J	TBD								
Zinc	µg/L	1095	425 J	TBD	49.9		30.8	B			5.7	J
Metals - Filtered												
Aluminum	µg/L	3650	239 J	TBD					77.8	B	53.2	J
Arsenic	µg/L	0.045	13.1	TBD			13.1		2.7	J	[illegible]	[illegible]
Barium	µg/L	255	1330	TBD	1100		871		911		[illegible]	[illegible]
Chromium	µg/L	11	6.8 J	TBD								
Iron	µg/L	1095	856 J	TBD								
Lead	µg/L	15	6.8	TBD			6.8					
Manganese	µg/L	88	107	TBD					9.8	J	10.2	J
Selenium	µg/L	18	4.5 J	TBD								
Vanadium	µg/L	26	12.5 J	TBD								
Zinc	µg/L	1095	33.3 J	TBD	33.3	J	73.4	B			10	J

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW17							
				Sample No:	5930		5935		BD3021		CB3014	
				Sample Date:	20-NOV-97		29-MAY-98		03-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters												
Alkalinity	µg/L	NE	930000	NE	830000		930000		741000	J	874000	
Chloride	µg/L	NE	12900000 J	NE	1800000		1600000		2420000		2210000	
Cyanide, total	µg/L	73	320	NE	320							
Hardness	µg/L	NE	10000000	NE	1800000		1300000		1680000		1330000	
Sulfate	µg/L	NE	388000	NE	59000		80000		53600		42700	
Total dissolved solids	µg/L	NE	33000000	NE	3000000		2900000		2680000		3020000	
Total organic carbon	µg/L	NE	12300	NE	1200		3000		5700		5300	
Total suspended solids	µg/L	NE	1080000	NE			4000		53000		18000	
Turbidity	NTU	NE	605	NE					57.4	J	9.2	

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW18								TNTA-BEDGW-001			
				Sample No:	5940		5945		BD3024		CB3015		BD3037		CB3044	
				Sample Date:	19-NOV-97		19-MAY-98		02-OCT-01		05-APR-02		09-OCT-01		15-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives																
Amino-2,6-dinitrotoluene, 4-	µg/L	0.22	1.3	NE									1.3		1.3	
Amino-4,6-dinitrotoluene, 2-	µg/L	0.22	0.55	NE									0.55		0.55	
Dinitrobenzene, 1,3-	µg/L	0.36	1	NE	1.0											
Dinitrotoluene, 2,4-	µg/L	0.10	0.49	NE			0.49									
Dinitrotoluene, 2,6-	µg/L	0.10	3.6	NE			3.6									
Nitrobenzene	µg/L	0.34	2	NE	2.0											
Nitrotoluene, 2-	µg/L	6.1	0.55	NE							0.31					
Nitrotoluene, 3-	µg/L	6.1	0.30	NE							0.30					
Trinitrobenzene, 1,3,5-	µg/L	109	1.5	NE	1.5											
Volatiles																
Acetone	µg/L	61	290 J	NE			34	J	88	J					[illegible]	[illegible]
Benzene	µg/L	0.34	700 J	NE	11		5.7				14	J	700	J	[illegible]	J
Carbon disulfide	µg/L	104	40 J	NE	32		7.9				4.8	J				
Chloromethane	µg/L	1.5	35 J	NE					35	J						
Ethylbenzene	µg/L	130	240 J	NE	32		88		32	J	100	J	[illegible]	J	[illegible]	[illegible]
Methylene chloride	µg/L	4.3	330 J	NE			2.4	B	47	J			[illegible]	[illegible]	[illegible]	[illegible]
Toluene	µg/L	72	730 J	NE	21		53				74	J	[illegible]	[illegible]	[illegible]	[illegible]
Xylenes, total	µg/L	21	1400	NE	170		420		150		[illegible]	J	[illegible]	[illegible]	1200	[illegible]
Semivolatiles																
Bis(2-ethylhexyl)phthalate	µg/L	4.8	8.6 J	NE	3.5	J	16	B					[illegible]	J		
Chrysene	µg/L	9.2	15 J	NE									[illegible]	J	0.62	J
Dibenzofuran	µg/L	2.4	12 J	NE									[illegible]	J		
Dimethylphenol, 2,4-	µg/L	73	18 J	NE	5.1	J	11		7.2	J	12		13	J	18	J
Fluorene	µg/L	24	28 J	NE									[illegible]	J	1.9	J
Methylnaphthalene, 2-	µg/L	12	470	NE	2.2	J	5.0	J	1.6	J	5.3	J	[illegible]	[illegible]	[illegible]	[illegible]
Methylphenol, 2-	µg/L	182	12 J	NE	2.6	J	3.3	J	2.6	J	4.7	J			12	J
Methylphenol, 4-	µg/L	18	15 J	NE	2.8	J	4.0	J	1.2	J	4.4	J	9.8	J	15	J
Naphthalene	µg/L	0.62	170	NE	3.8	J	10		3.1	J	[illegible]	J	[illegible]	[illegible]	[illegible]	[illegible]
Phenanthrene	µg/L	18	74 J	NE									[illegible]	J	3.4	J
Phenol	µg/L	2190	27 J	NE	21	J			3.5	J	1.4	J	13	J	27	J

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW18								TNTA-BEDGW-001			
				Sample No:	5940		5945		BD3024		CB3015		BD3037		CB3044	
				Sample Date:	19-NOV-97		19-MAY-98		02-OCT-01		05-APR-02		09-OCT-01		15-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Unfiltered																
Aluminum	µg/L	3650	8300 J	TBD	283	J			54.6	B	79.2	J			[illegible]	[illegible]
Arsenic	µg/L	0.045	17.3 J	TBD									[illegible]	J	[illegible]	[illegible]
Barium	µg/L	255	1290	TBD	893		942		916		1290		[illegible]	J	[illegible]	[illegible]
Beryllium	µg/L	7.3	1.1 J	TBD									1.1	B	1.1	J
Cadmium	µg/L	1.8	1.2 J	TBD											1.2	J
Chromium	µg/L	11	37.2 J	TBD											37.2	J
Cobalt	µg/L	73	12.7 J	TBD									6.4	J	12.7	J
Copper	µg/L	146	53.1 J	TBD									3.2	J	53.1	J
Iron	µg/L	1095	33400 J	TBD	476	B	166		40.0	J			127	J	33400	J
Lead	µg/L	15	18.4 J	TBD											18.4	J
Manganese	µg/L	88	11700 J	TBD	36.8		80.8		41.8		109		11700	J	1630	J
Mercury	µg/L	1.1	1.0	TBD	1.0								0.067	J		
Nickel	µg/L	73	75.7 J	TBD									75.7	J	48.8	J
Thallium	µg/L	0.24	ND	TBD												
Vanadium	µg/L	26	36.9 J	TBD											36.9	J
Zinc	µg/L	1095	425 J	TBD	31.0						48.1		297	J	425	J
Metals - Filtered																
Aluminum	µg/L	3650	239 J	TBD					55.4	B	71.3	B	239	J	74.0	J
Arsenic	µg/L	0.045	13.1	TBD												
Barium	µg/L	255	1330	TBD	1010		994		938		1330		382	J	388	J
Chromium	µg/L	11	6.8 J	TBD											6.8	J
Iron	µg/L	1095	856 J	TBD									856	J	152	J
Lead	µg/L	15	6.8	TBD												
Manganese	µg/L	88	107	TBD	35.9		80.9		37.7		107		54.6	J	26.7	J
Selenium	µg/L	18	4.5 J	TBD											4.5	J
Vanadium	µg/L	26	12.5 J	TBD									12.5	J		
Zinc	µg/L	1095	33.3 J	TBD			23.5	B			9.1	J	17.1	J	5.7	J

Table 6-9

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area A
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW18								TNTA-BEDGW-001			
				Sample No:	5940		5945		BD3024		CB3015		BD3037		CB3044	
				Sample Date:	19-NOV-97		19-MAY-98		02-OCT-01		05-APR-02		09-OCT-01		15-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters																
Alkalinity	µg/L	NE	930000	NE	120000		550000		170000	J	350000				282000	
Chloride	µg/L	NE	12900000 J	NE	6900000		1200000		9450000		12900000	J			4810000	
Cyanide, total	µg/L	73	320	NE												
Hardness	µg/L	NE	10000000	NE	4000000		10000000		3980000		7000000				5020000	
Sulfate	µg/L	NE	388000	NE	16000		18000		56500		440	B			388000	
Total dissolved solids	µg/L	NE	33000000	NE	12000000		33000000		13400000		15200000				7960000	
Total organic carbon	µg/L	NE	12300	NE	6500		3000		2500	J	1400		12300		10700	
Total suspended solids	µg/L	NE	1080000	NE	61000		100000		33000		4000				1080000	
Turbidity	NTU	NE	605	NE					99.2	J	69.0	J			605	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for this Area of Concern.

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-10

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	MK-MW16						MK-MW17							
				Sample No:	5780		5785		CB3017		5790		5795		BD3012		CB3038	
				Sample Date:	21-NOV-97		18-MAY-98		08-APR-02		21-NOV-97		27-MAY-98		01-OCT-01		12-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives																		
Amino-2,6-dinitrotoluene, 4-	µg/L	0.22	22	NE							3.6		5.7					
Amino-4,6-dinitrotoluene, 2-	µg/L	0.22	26	NE														
Dinitrotoluene, 2,4-	µg/L	0.10	5.8	NE									1.7					
Dinitrotoluene, 2,6-	µg/L	0.10	4.0 J	NE														
Trinitrotoluene, 2,4,6-	µg/L	1.82	68	NE									0.68		2.3			
Volatiles																		
Acetone	µg/L	61	5.2 J	NE			5.2	J							4.0	B	2.4	J
Methylene chloride	µg/L	4.3	ND	NE	0.40	B	0.52	B			0.39	B	0.28	B				
Toluene	µg/L	72	ND	NE									0.21	B				
Semivolatiles																		
Benzo(ghi)perylene	µg/L	18	0.97 J	NE											0.97	J		
Bis(2-ethylhexyl)phthalate	µg/L	4.8	2.4 J	NE	2.4	J	2.8	B										
Dinitrotoluene, 2,4-	µg/L	0.10	4.0 J	NE									1.8	J	2.0			J
Dinitrotoluene, 2,6-	µg/L	0.10	1.4 J	NE														J
Indeno(1,2,3-cd)pyrene	µg/L	0.092	1.0 J	NE											1.0	J		
Metals - Unfiltered																		
Aluminum	µg/L	3650	6920 J	TBD	4980	J	1180		2380		1830	J	[illegible]	J	3310		[illegible]	
Arsenic	µg/L	0.045	18.7	TBD							12.6		8.7		[illegible]			
Barium	µg/L	255	23.1 J	TBD					13.1	J					23.1	J	14.6	J
Beryllium	µg/L	7.3	2.0 J	TBD					0.82	J					2.0	J	2.4	B
Cadmium	µg/L	1.8	0.59 J	TBD					0.59	J					0.58	B		
Cobalt	µg/L	73	101	TBD			69.8		47.3	J	78.8		54.9		[illegible]		[illegible]	
Copper	µg/L	146	32.9	TBD					7.4	J			32.9		6.7	J		
Iron	µg/L	1095	44300	TBD	19800		20700	J	11300		44300		[illegible]		[illegible]		11800	
Lead	µg/L	15	16.4	TBD	8.0	B			1.9	J	4.4	B	[illegible]					
Manganese	µg/L	88	13600	TBD	6970		13600		8520		1410		[illegible]		1700		[illegible]	
Nickel	µg/L	73	240	TBD	61.8		106		60.4		150		[illegible]		210		[illegible]	
Selenium	µg/L	18	5.1	TBD	5.0						5.1							
Thallium	µg/L	0.24	ND	TBD													[illegible]	
Vanadium	µg/L	26	2.0 J	TBD					2.0	J								
Zinc	µg/L	1095	214	TBD	75.5		209		59.8		137		152		214		194	

Table 6-10

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	MK-MW16						MK-MW17							
				Sample No:	5780		5785		CB3017		5790		5795		BD3012		CB3038	
				Sample Date:	21-NOV-97		18-MAY-98		08-APR-02		21-NOV-97		27-MAY-98		01-OCT-01		12-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered																		
Aluminum	µg/L	3650	7430	TBD	1080		663		1480				7430		3390			
Arsenic	µg/L	0.045	22.0	TBD									22.0					
Barium	µg/L	255	23.4 J	TBD					8.4	J					23.4	J	14.1	J
Beryllium	µg/L	7.3	2.3 J	TBD					0.76	J					2.3	J	2.0	J
Cadmium	µg/L	1.8	0.54 J	TBD											0.54	J		
Cobalt	µg/L	73	105	TBD			51.9		45.3	J	72.9		56.7		105		105.5	
Copper	µg/L	146	39.2	TBD			39.2		3.2	B			32.2		2.2	B		
Iron	µg/L	1095	41600	TBD	2410		5970		695		34100		41		14800		10500	
Lead	µg/L	15	17	TBD			7.4											
Manganese	µg/L	88	8850	TBD	6900		8850		8290		1260		1170		1830		1530	
Mercury	µg/L	1.1	0.30	TBD							0.30							
Nickel	µg/L	73	248	TBD	47.2		81.7		76.0		140		131		248		216	
Selenium	µg/L	18	5.0	TBD	5.0													
Thallium	µg/L	0.24	ND	TBD									10.1	B				
Zinc	µg/L	1095	231	TBD	54.7	J	141	B	70.1	J	87.7	J	157		231		200	
Water Quality Parameters																		
Alkalinity	µg/L	NE	320000	NE	36000		320000		2600	B	38000				2700	B	1900	B
Chloride	µg/L	NE	6000	NE	3000	B	3000		1700	J	4000	B	6000		4800		2100	
Hardness	µg/L	NE	750000	NE	490000		750000		430000		440000		490000		443000		272000	
Nitrate	µg/L	1000	42 J	NE					42	J								
Sulfate	µg/L	NE	719000	NE	470000		550000		719000		300000		330000		504000		286000	
Total dissolved solids	µg/L	NE	868000	NE	290000		800000		868000		660000		590000		764000		518000	
Total organic carbon	µg/L	NE	3400	NE	2500		2000		2000		3400		3000		2700		1600	
Total suspended solids	µg/L	NE	150000	NE			9000		150000		5000		120000		5000			
Turbidity	NTU	NE	156	NE					156						2.5	J	0.98	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-11

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTB-BEDGW-001									
				Sample No:	5420		5425		BD3009		BD3009R		CB3019	
				Sample Date:	17-NOV-97		18-MAY-98		28-SEP-01		05-OCT-01		05-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Volatiles														
Acetone	µg/L	61	110 J	NE			1.9	B			3.0	B	2.3	B
Benzene	µg/L	0.34	17	NE	0.14	J								
Butanone, 2-	µg/L	190	75 J	NE										
Carbon disulfide	µg/L	104	8	NE	0.82	J	7.2							
Dichloroethane, 1,1-	µg/L	81	0.38 J	NE			0.19	J					0.38	J
Ethylbenzene	µg/L	130	0.85 J	NE										
Hexanone, 2-	µg/L	150	0.56 J	NE										
Methyl-2-pentanone, 4-	µg/L	16	0.7 J	NE										
Methylene chloride	µg/L	4.3	ND	NE							0.50	B		
Toluene	µg/L	72	5.2	NE	0.22	B								
Xylenes, total	µg/L	21	12	NE	0.44	B								
Semivolatiles														
Bis(2-ethylhexyl)phthalate	µg/L	4.8	3.6 J	NE	3.6	J	13	B						
Methylnaphthalene, 2-	µg/L	12	4.8 J	NE										
Naphthalene	µg/L	0.62	2.8 J	NE										
Phenanthrene	µg/L	18	0.73 J	NE										
Phenol	µg/L	2190	2.3 J	NE										
Metals - Unfiltered														
Aluminum	µg/L	3650	16900 J	TBD	654		1130	J			69.7	B	54.8	J
Arsenic	µg/L	0.045	22.7	TBD			12.9							
Barium	µg/L	255	1780	TBD			1100				1410		1080	
Beryllium	µg/L	7.3	ND	TBD										
Chromium	µg/L	11	32.3	TBD										
Cobalt	µg/L	73	18.7 J	TBD										
Copper	µg/L	146	99.2	TBD	33.9		80.9				6.0	B		
Iron	µg/L	1095	41700	TBD	41700		19000				132			
Lead	µg/L	15	15.7	TBD	3.9		6.2							
Manganese	µg/L	88	1140	TBD	677		196				35.3		33.2	
Mercury	µg/L	1.1	0.079 J	TBD										
Nickel	µg/L	73	71.2	TBD	42.1									
Selenium	µg/L	18	14.4	TBD										
Thallium	µg/L	0.24	ND	TBD										
Vanadium	µg/L	26	48.6 J	TBD										
Zinc	µg/L	1095	184	TBD	48.8		150	J			9.1	J	2.6	J

Table 6-11

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTB-BEDGW-001									
				Sample No:	5420		5425		BD3009		BD3009R		CB3019	
				Sample Date:	17-NOV-97		18-MAY-98		28-SEP-01		05-OCT-01		05-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered														
Aluminum	µg/L	3650	56.7 J	TBD							76.3	B	66.6	B
Arsenic	µg/L	0.045	4.9 J	TBD										
Barium	µg/L	255	1750	TBD			1040				1350		974	
Chromium	µg/L	11	1.2 J	TBD										
Copper	µg/L	146	3.2 J	TBD										
Iron	µg/L	1095	16300	TBD	16300		302							
Lead	µg/L	15	3.0	TBD										
Manganese	µg/L	88	812	TBD	694		278				36.0		51.1	J
Nickel	µg/L	73	2.1 J	TBD							2.1	J		
Selenium	µg/L	18	20.4	TBD										
Vanadium	µg/L	26	8.5 J	TBD										
Zinc	µg/L	1095	45.9 J	TBD										
Water Quality Parameters														
Alkalinity	µg/L	NE	432000 J	NE	180000		360000		381000	J			375000	
Chloride	µg/L	NE	3720000	NE	90000		600000		704000				761000	J
Hardness	µg/L	NE	2500000	NE	360000		650000		443000				420000	
Nitrate	µg/L	1000	48 J	NE										
Sulfate	µg/L	NE	165000	NE	140000		120000		72500				32100	
Total dissolved solids	µg/L	NE	7600000	NE	730000		1200000		1390000				1520000	
Total organic carbon	µg/L	NE	12100 J	NE	12000		5000		4900				3400	
Total suspended solids	µg/L	NE	1430000	NE	480000		9000							
Turbidity	NTU	NE	9250	NE							68.4	J	38.4	J

Table 6-11

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTB-BEDGW-002								TNTB-BEDGW-003				TNTB-BEDGW-004			
				Sample No:	5430		5435		BD3010		CB3018		BD3038		CB3024		BD3041		CB3023	
				Sample Date:	16-NOV-97		18-MAY-98		27-SEP-01		05-APR-02		08-OCT-01		10-APR-02		05-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Volatiles																				
Acetone	µg/L	61	110 J	NE					2.0	B	3.2	B	110	J	95	J	36	J	1.8	B
Benzene	µg/L	0.34	17	NE	0.91	J							11		14		1.4	J	0.50	J
Butanone, 2-	µg/L	190	75 J	NE									75	J	69	J				
Carbon disulfide	µg/L	104	8	NE	6.4								8.0		0.37	J				
Dichloroethane, 1,1-	µg/L	81	0.38 J	NE																
Ethylbenzene	µg/L	130	0.85 J	NE	0.85	J									0.52	J				
Hexanone, 2-	µg/L	150	0.56 J	NE											0.56	J				
Methyl-2-pentanone, 4-	µg/L	16	0.7 J	NE											0.70	J				
Methylene chloride	µg/L	4.3	ND	NE	4.8	B	3.1	B					1.5	B	0.44	B	0.50	B		
Toluene	µg/L	72	5.2	NE									5.2		4.7		1.3	J		
Xylenes, total	µg/L	21	12	NE	12										2.3					
Semivolatiles																				
Bis(2-ethylhexyl)phthalate	µg/L	4.8	3.6 J	NE	3.0	J	3.1	B					2.0	J						
Methylnaphthalene, 2-	µg/L	12	4.8 J	NE											4.8	J				
Naphthalene	µg/L	0.62	2.8 J	NE											2.8	J				
Phenanthrene	µg/L	18	0.73 J	NE											0.73	J				
Phenol	µg/L	2190	2.3 J	NE	2.3	J							2.2	J	1.6	J				
Metals - Unfiltered																				
Aluminum	µg/L	3650	16900 J	TBD	317				48.3	B	45.4	J	16900	J	9810		1010	J	163	J
Arsenic	µg/L	0.045	22.7	TBD									[illegible]		[illegible]					
Barium	µg/L	255	1780	TBD	326		406		391	J	411		1100		1200		51.3	J	39.9	J
Beryllium	µg/L	7.3	ND	TBD									1.5	B	0.66	B				
Chromium	µg/L	11	32.3	TBD									32.3		14.4		1.3	J		
Cobalt	µg/L	73	18.7 J	TBD									18.7	J	10.1	J				
Copper	µg/L	146	99.2	TBD					2.0	B			99.2		49.4		10.9	J		
Iron	µg/L	1095	41700	TBD	1030		168	J					38000		12100	J	8090		6500	
Lead	µg/L	15	15.7	TBD	4.8		7.1						[illegible]		7.0					
Manganese	µg/L	88	1140	TBD	85.4		36.6		31.4	J	33.8		1140		509		926		634	
Mercury	µg/L	1.1	0.079 J	TBD									0.079	J						
Nickel	µg/L	73	71.2	TBD									71.2		37.7	J	5.4	J		
Selenium	µg/L	18	14.4	TBD									14.4		5.6					
Thallium	µg/L	0.24	ND	TBD											2.7	B				
Vanadium	µg/L	26	48.6 J	TBD									48.6	J	23.2	J	2.3	J		
Zinc	µg/L	1095	184	TBD	73.9		39.6	B	5.0	B			184		98.7		37.5		51.3	

Table 6-11

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area B
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTB-BEDGW-002								TNTB-BEDGW-003				TNTB-BEDGW-004			
				Sample No:	5430		5435		BD3010		CB3018		BD3038		CB3024		BD3041		CB3023	
				Sample Date:	16-NOV-97		18-MAY-98		27-SEP-01		05-APR-02		08-OCT-01		10-APR-02		05-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered																				
Aluminum	µg/L	3650	56.7 J	TBD					48.9	B	64.2	B	96.7	B	56.7	J	69.0	B	68.3	B
Arsenic	µg/L	0.045	4.9 J	TBD									**4.8**	J						
Barium	µg/L	255	1750	TBD	**384**		**414**		**391**	J	**403**		**429**		**1750**		40.8	J	39.2	J
Chromium	µg/L	11	1.2 J	TBD									1.2	J						
Copper	µg/L	146	3.2 J	TBD									2.4	B	3.2	J				
Iron	µg/L	1095	16300	TBD	586												**5670**		**9550**	
Lead	µg/L	15	3.0	TBD	3.0															
Manganese	µg/L	88	812	TBD	71.0		36.5		31.6	J	32.2		1.6	J			**812**		**41**	
Nickel	µg/L	73	2.1 J	TBD													2.0	J		
Selenium	µg/L	18	20.4	TBD									**20.4**							
Vanadium	µg/L	26	8.5 J	TBD									8.5	J	6.3	J				
Zinc	µg/L	1095	45.9 J	TBD			40.4	B									19.9	J	45.9	J
Water Quality Parameters																				
Alkalinity	µg/L	NE	432000 J	NE	220000		380000		432000	J	365000		86300	J	68600		126000	J	123000	
Chloride	µg/L	NE	3720000	NE	91000		74000		77900		117000	J	1460000		3720000		7400		2800	J
Hardness	µg/L	NE	2500000	NE	450000		530000		414000		390000		453000		2500000		229000		330000	
Nitrate	µg/L	1000	48 J	NE									48	J						
Sulfate	µg/L	NE	165000	NE	90000		140000		152000		165000		86200		31100		129000		160000	
Total dissolved solids	µg/L	NE	7600000	NE	760000		7600000		776000		740000		2180000		5370000		347000		378000	
Total organic carbon	µg/L	NE	12100 J	NE	5000		4000		3700		3000		12100	J	4600		3600	B	2900	
Total suspended solids	µg/L	NE	1430000	NE	5000		6000						1430000		115000		65000		26000	
Turbidity	NTU	NE	9250	NE					178	J	72.6	J	370	J	9250		91.2	J	53.6	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-12

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTC-MW03						TNTC-MW04							
				Sample No:	5630		5635		CB3027		5640		5645		BD3043		CB3028	
				Sample Date:	21-NOV-97		18-MAY-98		10-APR-02		24-NOV-97		18-MAY-98		04-OCT-01		10-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives																		
Trinitrotoluene, 2,4,6-	µg/L	1.8	0.61	NE														
Volatiles																		
Acetone	µg/L	61	13 J	NE					13	J			2.5	B	39	B		
Butanone, 2-	µg/L	190	4.9 J	NE					4.9	J								
Carbon disulfide	µg/L	104	ND	NE														
Methylene chloride	µg/L	4.3	ND	NE			0.47	B							1.5	B		
Xylenes, total	µg/L	21	3.3 J	NE											3.3	J		
Metals - Unfiltered																		
Aluminum	µg/L	3650	6160 J	TBD			6030		128	B	3820	J	4570	J	1800	J	1190	
Arsenic	µg/L	0.045	21.5	TBD			18.6				21.5							
Barium	µg/L	255	203 J	TBD					27.5	J					29.5	J	28.6	J
Chromium	µg/L	11	30.0	TBD			30.0				25.2		11.0		3.4	J	2.4	J
Cobalt	µg/L	73	67.5	TBD	67.5										7.2	J	10.3	J
Copper	µg/L	146	31.5	TBD			31.5								6.7	B		
Iron	µg/L	1095	23500 J	TBD	805		23600	J	61.3	J	17400		8230		3060		[illegible]	
Lead	µg/L	15	20.1	TBD			13.8				14.5		3.2				2.0	J
Manganese	µg/L	88	2950	TBD	2950		973		8.1	J	800		715		613		[illegible]	
Nickel	µg/L	73	120	TBD	120						52.4				10.4	J	9.2	J
Selenium	µg/L	18	7.2	TBD							7.2							
Thallium	µg/L	0.24	ND	TBD					5.0	B					0.4	B		
Vanadium	µg/L	26	14.4 J	TBD											3.1	J	2.1	J
Zinc	µg/L	1095	58.7	TBD	34.5		80.8	B	4.7	J	58.7		41.2	B	25.2		13.0	J
Metals - Filtered																		
Aluminum	µg/L	3650	433	TBD					57.2	J	432				64.8	B	59.5	J
Barium	µg/L	255	64.1 J	TBD					31.2	J					24.0	J	14.9	J
Cobalt	µg/L	73	7.5 J	TBD											7.5	J	3.1	J
Iron	µg/L	1095	515	TBD	132	B					403	B						
Lead	µg/L	15	11.0	TBD							11.0							
Manganese	µg/L	88	2900	TBD	2900		617		6.7	J	1120		582		605		[illegible]	
Nickel	µg/L	73	77.1	TBD	77.1						56.8				15.6	J	6.6	J
Selenium	µg/L	18	11.4	TBD							11.4							
Thallium	µg/L	0.24	ND	TBD														
Zinc	µg/L	1095	64.7	TBD	28.5	J	45.5	B	18.2	J	52.0	J			64.7		7.9	J

Table 6-12

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTC-MW03						TNTC-MW04							
				Sample No:	5630		5635		CB3027		5640		5645		BD3043		CB3028	
				Sample Date:	21-NOV-97		18-MAY-98		10-APR-02		24-NOV-97		18-MAY-98		04-OCT-01		10-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters																		
Alkalinity	µg/L	NE	380000	NE	270000		350000		233000		330000		250000		350000	J	351000	
Chloride	µg/L	NE	50000	NE	17000		14000		4500		23000		27000		19800		20000	
Hardness	µg/L	NE	13000000	NE	13000000		1800000		496000		9200000		720000		1120000		980000	
Nitrate	µg/L	1000	91000 J	NE							91000	J	400				120	
Sulfate	µg/L	NE	2000000	NE	2000000		1300000		248000		1100000		990000		839000	J	749000	
Total dissolved solids	µg/L	NE	3000000	NE	3000000		2900000		670000		2100000		1600000		1650000		784000	
Total organic carbon	µg/L	NE	5700	NE	2400		3000		2000		2600		3000		5700		1100	
Total suspended solid	µg/L	NE	355000	NE			150000		21000		5000		280000		48000		37000	
Turbidity	NTU	NE	520 J	NE					59.0						73.5	J	147	

Table 6-12

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTC-MW05							
				Sample No:	5650		5655		BD3035		CB3029	
				Sample Date:	21-NOV-97		18-MAY-98		03-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives												
Trinitrotoluene, 2,4,6-	µg/L	1.8	0.61	NE					0.61			
Volatiles												
Acetone	µg/L	61	13 J	NE					3.7	B		
Butanone, 2-	µg/L	190	4.9 J	NE								
Carbon disulfide	µg/L	104	ND	NE	0.51	B						
Methylene chloride	µg/L	4.3	ND	NE	0.43	B	0.51	B				
Xylenes, total	µg/L	21	3.3 J	NE								
Metals - Unfiltered												
Aluminum	µg/L	3650	6160 J	TBD	3490	J	5230		6160	J	164	J
Arsenic	µg/L	0.045	21.5	TBD	10.1		21.3		8.8	J		
Barium	µg/L	255	203 J	TBD					203	J	24.0	J
Chromium	µg/L	11	30.0	TBD	18.4		28.0		13.9	J		
Cobalt	µg/L	73	67.5	TBD					16.7	J		
Copper	µg/L	146	31.5	TBD			31.0		19.5	J		
Iron	µg/L	1095	23500 J	TBD	13900		22700	J	13300	J	199	
Lead	µg/L	15	20.1	TBD	13.8		20.1		10.5	J		
Manganese	µg/L	88	2950	TBD	713		616		1520	J	56.3	
Nickel	µg/L	73	120	TBD					17.2	J	2.2	J
Selenium	µg/L	18	7.2	TBD								
Thallium	µg/L	0.24	ND	TBD					5.0	B		
Vanadium	µg/L	26	14.4 J	TBD					14.4	J		
Zinc	µg/L	1095	58.7	TBD	53.0		56.3	B	31.0	J	2.8	J
Metals - Filtered												
Aluminum	µg/L	3650	433	TBD					433		70.4	B
Barium	µg/L	255	64.1 J	TBD					64.1	J	21.3	J
Cobalt	µg/L	73	7.5 J	TBD					6.7	J		
Iron	µg/L	1095	515	TBD					515			
Lead	µg/L	15	11.0	TBD	4.2							
Manganese	µg/L	88	2900	TBD	522		452		1180		24.2	
Nickel	µg/L	73	77.1	TBD					6.7	J		
Selenium	µg/L	18	11.4	TBD								
Thallium	µg/L	0.24	ND	TBD					5.9	B		
Zinc	µg/L	1095	64.7	TBD			27.0	B	3.2	J	16.0	J

Table 6-12

Detected Constituents in Overburden Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	TNTC-MW05							
				Sample No:	5650		5655		BD3035		CB3029	
				Sample Date:	21-NOV-97		18-MAY-98		03-OCT-01		08-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters												
Alkalinity	µg/L	NE	380000	NE	320000		380000		296000	J	229000	
Chloride	µg/L	NE	50000	NE	50000		26000		46900		4800	J
Hardness	µg/L	NE	13000000	NE	500000		850000		517000		284000	
Nitrate	µg/L	1000	91000 J	NE			200					
Sulfate	µg/L	NE	2000000	NE	430000		240000		423000		163000	
Total dissolved solids	µg/L	NE	3000000	NE	1000000		1200000		1020000		506000	
Total organic carbon	µg/L	NE	5700	NE	3000		3000		2100		2900	
Total suspended solid	µg/L	NE	355000	NE	7000		240000		355000		75000	
Turbidity	NTU	NE	520 J	NE					520	J	112	

Bold text and shaded cell indicates value is greater than the RBSC.
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the AOC ("B" qualified data not included).
BSC - Background screening concentration.
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established (RBSCs), not evaluated (BSCs).
TBD - To be determined.
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-13

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW13								TNTC-BEDGW-001			
				Sample No:	5890		5895		BD3017		CB3025		BD3042		CB3026	
				Sample Date:	13-NOV-97		29-MAY-98		03-OCT-01		10-APR-02		04-OCT-01		09-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Volatiles																
Acetone	µg/L	61	53 J	NE									54	B	53	J
Benzene	µg/L	0.34	410 J	NE	130	D	47		270	J	410	J			0.4	J
Carbon disulfide	µg/L	104	5.8	NE	5.8											
Ethylbenzene	µg/L	130	130 J	NE	73	D	57		120	J	130	J	22	J	12	J
Methylene chloride	µg/L	4.3	160 J	NE			51	B	43	J	[illegible]	J	160	J	19	J
Toluene	µg/L	72	300 J	NE	170	D	120		270	J	[illegible]	J			8.8	J
Xylenes, total	µg/L	21	1300	NE	520	D	540		1200	J	1300		190		90	
Semivolatiles																
Bis(2-ethylhexyl)phthalate	µg/L	4.8	55 J	NE	39		55	J	7.7	J	5.2	J				
Dimethylphenol, 2,4-	µg/L	73	22	NE	16		13	J	22		21					
Fluorene	µg/L	24	1.4 J	NE					1.0	J	1.4	J				
Isophorone	µg/L	71	2.7 J	NE			2.7	J								
Methylnaphthalene, 2-	µg/L	12	34	NE	20		14	J	25		34		4.5	J	3.2	J
Methylphenol, 2-	µg/L	182	6.6 J	NE	4.1	J	3.3	J	6.6	J	6.0	J				
Methylphenol, 4-	µg/L	18	6.9 J	NE	4.7	J	3.3	J	6.9	J	5.8	J				
Naphthalene	µg/L	0.62	34	NE	15		10	J	27		34		5.2	J	2.5	J
Phenanthrene	µg/L	18	1.9 J	NE					1.3	J	1.9	J				
Phenol	µg/L	2190	69 J	NE	62		69	J	12		11					
Metals - Unfiltered																
Aluminum	µg/L	3650	96.8 J	TBD					96.8	J	177	B	130	B	90.6	B
Arsenic	µg/L	0.045	4.1 J	TBD									4.1	J		
Barium	µg/L	255	2680	TBD	1550				2090	J	2680		29.4	J	16.5	J
Copper	µg/L	146	6.1 J	TBD					6.1	J						
Iron	µg/L	1095	335 J	TBD	244	B	207		106	J	335	J	66.6	J		
Manganese	µg/L	88	271	TBD	17.4		41.9		29.1	J	23.7		271		5.1	J
Nickel	µg/L	73	2.3 J	TBD									2.3	J		
Thallium	µg/L	0.24	ND	TBD					6.0	B	5.1	B			[illegible]	
Zinc	µg/L	1095	47.2	TBD	47.2				5.6	J	7.1	J				
Metals - Filtered																
Aluminum	µg/L	3650	86.4 J	TBD					80.9	B	86.4	J	82.5	B	64.1	J
Arsenic	µg/L	0.045	6.0 J	TBD							3.5	J	6.0	J		
Barium	µg/L	255	2680	TBD	1680		208		2090	J	2680		30.8	J	18.0	J
Iron	µg/L	1095	ND	TBD	116	B										
Manganese	µg/L	88	290	TBD			43.8		28.1	J	18.0		290		5.2	J
Nickel	µg/L	73	2.3 J	TBD									2.3	J		
Zinc	µg/L	1095	30.1	TBD	30.1				5.0	J	9.5	J				

Table 6-13

Detected Constituents in Bedrock Monitoring Wells
TNT Manufacturing Area C
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW13								TNTC-BEDGW-001			
				Sample No:	5890		5895		BD3017		CB3025		BD3042		CB3026	
				Sample Date:	13-NOV-97		29-MAY-98		03-OCT-01		10-APR-02		04-OCT-01		09-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Water Quality Parameters																
Alkalinity	µg/L	NE	562000	NE	430000		300000		402000	J	476000		440000	J	562000	
Chloride	µg/L	NE	4290000	NE	2500000				4290000		4220000		274000		242000	
Hardness	µg/L	NE	2050000	NE	1600000		450000		2050000		1960000		1720000		1450000	
Sulfate	µg/L	NE	1340000 J	NE	13000		5000		78400		66600		1340000	J	1030000	
Total dissolved solids	µg/L	NE	5970000	NE	4800000		510000		5970000		4810000		2350000		2200000	
Total organic carbon	µg/L	NE	9600	NE	9600		2000		6600		7400		2500	B	1400	
Total suspended solids	µg/L	NE	32000	NE	16000				23000		32000		18000		11000	
Turbidity	NTU	NE	585	NE					76.8	J	585		172	J	158	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

D - Dilution.

Table 6-14

Detected Constituents in Bedrock Monitoring Wells
Acid Area No. 1
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	AA1-BEDGW-001							
				Sample No:	5450		5455		NA		NA	
				Sample Date:	16-NOV-97		12-MAY-98		OCT-01		APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives												
Dinitrotoluene, 2,4-	µg/L	0.10	0.23	NE			0.23		NS		NS	
Nitrotoluene, 2-	µg/L	6.1	1.1	NE			1.1		NS		NS	
Nitrotoluene, 3-	µg/L	6.1	0.31	NE			0.31		NS		NS	
RDX	µg/L	0.61	2.8	NE			2.8		NS		NS	
Tetryl	µg/L	36	2.4	NE			2.4		NS		NS	
Volatiles												
Benzene	µg/L	0.34	31	NE	11	J	31		NS		NS	
Carbon disulfide	µg/L	104	63	NE	29	J	63		NS		NS	
Ethylbenzene	µg/L	130	39	NE	7.7	J	39		NS		NS	
Methylene chloride	µg/L	4.3	ND	NE	8.8	B	4.4	B	NS		NS	
Toluene	µg/L	72	ND	NE	18	B	50	B	NS		NS	
Xylenes, total	µg/L	21	500	NE	150		500		NS		NS	
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	28	NE	28		23	B	NS		NS	
Dimethylphenol, 2,4-	µg/L	73	3.6 J	NE			3.6	J	NS		NS	
Isophorone	µg/L	71	2.9 J	NE	2.9	J						
Methylnaphthalene, 2-	µg/L	12	31	NE	28		31		NS		NS	
Naphthalene	µg/L	0.62	18	NE	16		18		NS		NS	
Phenanthrene	µg/L	18	2.3 J	NE			2.3	J	NS		NS	
Phenol	µg/L	2190	43	NE	43		15		NS		NS	
Metals - Unfiltered												
Aluminum	µg/L	3650	637	TBD	637		468		NS		NS	
Arsenic	µg/L	0.045	21.2	TBD	16.5		21.2		NS		NS	
Barium	µg/L	255	1330	TBD	1060		1330		NS		NS	
Chromium	µg/L	11	12.7	TBD	12.7				NS		NS	
Copper	µg/L	146	26.2	TBD	26.2				NS		NS	
Iron	µg/L	1095	2540	TBD	1920		2540		NS		NS	
Manganese	µg/L	88	732	TBD	575		732		NS		NS	
Zinc	µg/L	1095	ND	TBD	32.8		38.3	B	NS		NS	
Metals - Filtered												
Arsenic	µg/L	0.045	19.6	TBD			19.6		NS		NS	
Barium	µg/L	255	1490	TBD	1260		1490		NS		NS	
Iron	µg/L	1095	ND	TBD	137	B			NS		NS	
Manganese	µg/L	88	696	TBD	516		696		NS		NS	
Zinc	µg/L	1095	105	TBD	105		66.3	B	NS		NS	

Table 6-14

Detected Constituents in Bedrock Monitoring Wells
Acid Area No. 1
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	AA1-BEDGW-001							
				Sample No:	5450		5455		NA		NA	
				Sample Date:	16-NOV-97		12-MAY-98		OCT-01		APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Water Quality Parameters												
Alkalinity	µg/L	NE	900000	NE	830000		900000		NS		NS	
Chloride	µg/L	NE	3000000 J	NE	1900000		3000000	J	NS		NS	
Hardness	µg/L	NE	2000000	NE	1800000		2000000		NS		NS	
Sulfate	µg/L	NE	40000	NE	7000		40000	J	NS		NS	
Total dissolved solids	µg/L	NE	3600000	NE	3600000		730000		NS		NS	
Total organic carbon	µg/L	NE	16000	NE	16000		11000	J	NS		NS	
Total suspended solids	µg/L	NE	330000	NE	6000		330000		NS		NS	

Bold text and shaded cell indicates value is greater than the RBSC.
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the AOC ("B" qualified data not included).
BSC - Background screening concentration.
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established (RBSCs), not evaluated (BSCs).
NS - Not sampled.
TBD - To be determined.
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-15

Detected Constituents in Bedrock Monitoring Wells
Acid Area No. 2
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	AA2-BEDGW-001								PB-BED-MW19							
				Sample No:	5460		5465		BD3004		CB3030		5950		5955		BD3025		CB3013	
				Sample Date:	20-NOV-97		12-MAY-98		08-OCT-01		10-APR-02		14-NOV-97		16-MAY-98		04-OCT-01		04-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives																				
Dinitrobenzene, 1,3-	µg/L	0.36	0.81	NE			0.81						0.22							
Dinitrotoluene, 2,4-	µg/L	0.10	2.5	NE			2.5													
Dinitrotoluene, 2,6-	µg/L	0.10	1.2	NE			1.2													
Nitrobenzene	µg/L	0.34	0.32	NE									0.32							
Nitrotoluene, 3-	µg/L	6.1	0.62	NE											0.62					
RDX	µg/L	0.61	0.17 J	NE															0.17	J
Trinitrotoluene, 2,4,6-	µg/L	1.8	1.6	NE					1.6											
Volatiles																				
Acetone	µg/L	61	68 J	NE			41	J	54	B			68	J			[illegible]	B		
Benzene	µg/L	0.34	130	NE	33		130		45	J	4.6	J	11		1.9	J	[illegible]		[illegible]	
Bromomethane	µg/L	0.87	7.9 J	NE													7.9	J		
Butanone, 2-	µg/L	190	18 J	NE			18	J												
Carbon disulfide	µg/L	104	6.9	NE	5.5	J	1.7	J			0.84	J	2.0		6.9					
Chlorobenzene	µg/L	11	21 J	NE	21	J														
Chloromethane	µg/L	1.5	30 J	NE			10		30	J										
Ethylbenzene	µg/L	130	64 J	NE	23	J	43		64	J	13		5.1		1.2	J	17	J	16	J
Methylene chloride	µg/L	4.3	100 J	NE	7.4	B	3.2	B	100	J	3.9	J			2.3	B	30	J	[illegible]	J
Toluene	µg/L	72	21 J	NE	32	B	20				2.2	J	8.9		1.5	B	21	J	18	J
Xylenes, total	µg/L	21	360	NE	200		220		360		98		38		10		180		[illegible]	
Semivolatiles																				
Bis(2-ethylhexyl)phthalate	µg/L	4.8	9.7 J	NE			5.6	B			2.0	J	5.8	J	24	B			[illegible]	[illegible]
Dimethylphenol, 2,4-	µg/L	73	8.6 J	NE	1.3	J	8.6	J	2.5	J	1.8	J								
Methylnaphthalene, 2-	µg/L	12	12	NE	1.3	J	5.6	J	9.8	J	3.2	J	3.3	J	1.5	J	12		10	
Methylphenol, 2-	µg/L	182	1.6 J	NE			1.6	J												
Methylphenol, 4-	µg/L	18	1.6 J	NE			1.6	J												
Naphthalene	µg/L	0.62	12	NE			8.1	J	12		2.5	J	2.1	J			[illegible]		[illegible]	J
Phenanthrene	µg/L	18	0.82 J	NE													0.82	J	0.74	J
Phenol	µg/L	2190	74	NE			74		2.2	J			55				1.2	J		
Metals - Unfiltered																				
Aluminum	µg/L	3650	10200	TBD	1060	J	10200		1170	J	195	B					94.8	B	56.2	J
Arsenic	µg/L	0.045	34.2	TBD			34.2		9.1	J	6.6	J								
Barium	µg/L	255	1800	TBD	220		640		943		368		1520		1800		[illegible]		[illegible]	
Chromium	µg/L	11	307	TBD			307		2.4	J	1.3	J	10.0				1.2	J		
Cobalt	µg/L	73	63.3	TBD			63.3		5.9	J	9.2	J								
Copper	µg/L	146	99.0	TBD			62.7		3.6	B			61.7				99.0		15.6	J
Iron	µg/L	1095	51600	TBD	5240		51600		7210		2020	J	376	B	141	J	149			
Lead	µg/L	15	38.6	TBD	6.5	B	38.6						6.8							
Manganese	µg/L	88	5130	TBD	522		5130		1090		228		30.4				2.2	J	2.2	J
Nickel	µg/L	73	238	TBD			238		3.7	J	4.0	J					13.8	J	3.5	J
Thallium	µg/L	0.24	ND	TBD					5.3	B	5.2	B								
Vanadium	µg/L	26	108	TBD			108													
Zinc	µg/L	1095	144	TBD	55.0		137	B	10.2	J	6.2	J	62.3		29.5	B	144		31.3	

Table 6-15

Detected Constituents in Bedrock Monitoring Wells
Acid Area No. 2
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	AA2-BEDGW-001								PB-BED-MW19							
				Sample No:	5460		5465		BD3004		CB3030		5950		5955		BD3025		CB3013	
				Sample Date:	20-NOV-97		12-MAY-98		08-OCT-01		10-APR-02		14-NOV-97		16-MAY-98		04-OCT-01		04-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals - Filtered																				
Aluminum	µg/L	3650	42.6 J	TBD					75.6	B	42.6	J					86.0	B	66.6	B
Arsenic	µg/L	0.045	9.0 J	TBD					3.7	J	9.0	J								
Barium	µg/L	255	1740	TBD	212		279		724		336		1520		1740		1080		[illegible]	
Beryllium	µg/L	7.3	ND	TBD					0.56	B										
Cobalt	µg/L	73	3.4 J	TBD							3.4	J								
Iron	µg/L	1095	1300	TBD	106	B			1300		124	J								
Manganese	µg/L	88	995	TBD	351		995		946		207				16.3		4.0	J	2.5	J
Nickel	µg/L	73	7.9 J	TBD													7.9	J	4.3	J
Zinc	µg/L	1095	66.2 J	TBD	66.2	J	29.1	B	7.1	J	5.0	J	57.4		24.4	B	5.2	J	3.1	J
Water Quality Parameters																				
Alkalinity	µg/L	NE	750000	NE	510000		600000		552000	J	586000		310000		750000		707000	J	302000	
Chloride	µg/L	NE	373000 J	NE	47000		53000	J	68100		56000		330000		280000		248000	J	373000	J
Cyanide, total	µg/L	73	16	NE											16					
Hardness	µg/L	NE	1700000	NE	700000		860000		360000		700000		1700000		750000		905000		424000	
Sulfate	µg/L	NE	70000 J	NE	48000		70000	J	31700		32700		14000		49000		27700	J	32200	
Total dissolved solids	µg/L	NE	1200000	NE	750000		310000		716000		712000		1200000		590000		1110000		651000	
Total organic carbon	µg/L	NE	16000	NE	7400		6000	J	3100		3100		16000		9000		8600		5900	
Total suspended solids	µg/L	NE	199000	NE	4000				113000		22000		41000		5000		199000		44000	
Turbidity	NTU	NE	662 J	NE					313	J	137						662	J	164	

Bold text and shaded cell indicates value is greater than the RBSC.
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the AOC ("B" qualified data not included).
BSC - Background screening concentration.
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established (RBSCs), not evaluated (BSCs).
TBD - To be determined.
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-16

Detected Constituents in Bedrock Monitoring Well
Acid Area No.3
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

				Location Code:	AA3-BEDGW-001							
				Sample No:	5470		5475		BD3005		CB3033	
				Sample Date:	19-NOV-97		14-MAY-98		27-SEP-01		10-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Volatiles												
Acetone	µg/L	61	36 J	NE	36	J			22	B		
Benzene	µg/L	0.34	11	NE					11			
Bromomethane	µg/L	0.87	8.0 J	NE							8	J
Carbon disulfide	µg/L	104	4.2 J	NE	4.2	J						
Ethylbenzene	µg/L	130	4.6 J	NE					4.0	J	4.6	J
Methylene chloride	µg/L	4.3	9.2 J	NE	2.1	B	160	B	2.2	B	93	J
Toluene	µg/L	72	12 J	NE			29	B	11		12	J
Trichloroethene	µg/L	0.028	31	NE					28		31	
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	5.8 J	NE	5.8	J						
Naphthalene	µg/L	0.62	0.7 J	NE							0.7	J
Phenol	µg/L	2190	3.1 J	NE	3.1	J						
Metals - Unfiltered												
Aluminum	µg/L	3650	397	TBD			397		59.6	B	104	B
Barium	µg/L	255	102 J	TBD					102	J	80.2	J
Chromium	µg/L	11	ND	TBD					1.6	B		
Iron	µg/L	1095	450	TBD	168	B	450		126		118	J
Manganese	µg/L	88	83.8	TBD	74.6		83.8		28.7		20.7	
Thallium	µg/L	0.24	ND	TBD			10.1	B			6.9	B
Zinc	µg/L	1095	29.2	TBD	29.2		67.6	B				

Table 6-16

Detected Constituents in Bedrock Monitoring Well
Acid Area No.3
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	AA3-BEDGW-001							
				Sample No:	5470		5475		BD3005		CB3033	
				Sample Date:	19-NOV-97		14-MAY-98		27-SEP-01		10-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered												
Aluminum	µg/L	3650	49.2 J	TBD					50.2	B	49.2	J
Barium	µg/L	255	99.5 J	TBD					99.5	J	78.1	J
Manganese	µg/L	88	57.6	TBD	57.6		51.3		23.9		17	
Thallium	µg/L	0.24	ND	TBD					**6.4**	**B**		
Zinc	µg/L	1095	23.0	TBD	23.0		42.8	B				
Water Quality Parameters												
Alkalinity	µg/L	NE	790000	NE	670000		790000		750000	J	650000	
Chloride	µg/L	NE	860000 J	NE	790000		860000	J	451000		369000	
Hardness	µg/L	NE	13000000	NE	13000000		860000		630000		480000	
Sulfate	µg/L	NE	31100	NE			8000	J	31100			
Total dissolved solids	µg/L	NE	1900000	NE	1900000		1800000		1440000		1200000	
Total organic carbon	µg/L	NE	5300 J	NE	5300	J	2000	J	840	J	1000	
Total suspended solids	µg/L	NE	54000	NE	38000		54000				16000	
Turbidity	NTU	NE	179 J	NE					179	J	118	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-17

Detected Constituents in Bedrock Monitoring Well
Maintenance Shop Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

(Page 1 of 2)

			Location Code:		MNTA-BEDGW-001							
			Sample No:		5440		5445		BD3008		CB3039	
			Sample Date:		20-NOV-97		28-MAY-98		03-OCT-01		12-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives												
Dinitrobenzene, 1,3-	µg/L	0.36	0.86	NE			0.86					
Dinitrotoluene, 2,4-	µg/L	0.10	2.0	NE			2.0					
Dinitrotoluene, 2,6-	µg/L	0.10	0.34	NE			0.34					
Volatiles												
Acetone	µg/L	61	140 J	NE							140	J
Benzene	µg/L	0.34	110 J	NE			19		110	J	[illegible]	J
Carbon disulfide	µg/L	104	21	NE	3.7	J	21					
Ethylbenzene	µg/L	130	61 J	NE			7.7		61	J	25	J
Methylene chloride	µg/L	4.3	200 J	NE	5.1	B	2.6	B	200	J	[illegible]	J
Toluene	µg/L	72	140 J	NE			18		[illegible]	J	[illegible]	J
Xylenes, total	µg/L	21	490	NE	8.2	B	150		490		[illegible]	J
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	5.0 J	NE	3.9	J	5.5	B	5.0	J	0.91	J
Chrysene	µg/L	9.2	0.80 J	NE					0.80	J	0.54	J
Dimethylphenol, 2,4-	µg/L	73	1.8 J	NE	1.7	J	1.8	J				
Dinitrotoluene, 2,4-	µg/L	0.10	1.3 J	NE			1.3	J				
Fluorene	µg/L	24	1.6 J	NE					1.6	J	1.2	J
Methylnaphthalene, 2-	µg/L	12	23	NE	1.9	J	1.2	J	21		23	
Naphthalene	µg/L	0.62	16	NE	2.3	J			11		16	
Phenanthrene	µg/L	18	2.8 J	NE					2.8	J	1.9	J
Phenol	µg/L	2190	17	NE	17		11					
Metals - Unfiltered												
Aluminum	µg/L	3650	119 J	TBD	249	B			119	J	129	B
Arsenic	µg/L	0.045	2.9 J	TBD					[illegible]	J		
Barium	µg/L	255	457	TBD	424		457		[illegible]		388	
Chromium	µg/L	11	2.9 J	TBD					2.9	J		
Copper	µg/L	146	24.3 J	TBD					24.3	J		
Iron	µg/L	1095	6400	TBD	6400		481		978		376	J
Manganese	µg/L	88	849	TBD	849		181		[illegible]		[illegible]	
Thallium	µg/L	0.24	ND	TBD					[illegible]	B	[illegible]	B
Vanadium	µg/L	26	ND	TBD					2.1	B		
Zinc	µg/L	1095	16.2 J	TBD	34.4	B	68.0	B	16.2	J	12.9	J

Table 6-17

Detected Constituents in Bedrock Monitoring Well
Maintenance Shop Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	MNTA-BEDGW-001							
				Sample No:	5440		5445		BD3008		CB3039	
				Sample Date:	20-NOV-97		28-MAY-98		03-OCT-01		12-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered												
Aluminum	µg/L	3650	51.1 J	TBD					86.0	B	51.1	J
Barium	µg/L	255	596	TBD	449		596		492		499	
Iron	µg/L	1095	ND	TBD	298	B						
Manganese	µg/L	88	899	TBD	899		183		881		880	
Thallium	µg/L	0.24	ND	TBD					0.8	B		
Zinc	µg/L	1095	24.8 J	TBD	24.8	J	32.8	B			2.6	J
Water Quality Parameters												
Alkalinity	µg/L	NE	691000	NE	670000				630000	J	691000	
Chloride	µg/L	NE	4130000	NE	55000		3800000		4130000		3480000	
Hardness	µg/L	NE	2100000	NE	2000000		2100000		1660000		1580000	
Sulfate	µg/L	NE	64000	NE	62000		64000				1400	J
Total dissolved solids	µg/L	NE	7200000	NE	5300000		7200000		5860000		6010000	
Total organic carbon	µg/L	NE	11000	NE	11000		7000		3900		5900	
Total suspended solids	µg/L	NE	79000	NE	4000		29000		79000		24000	
Turbidity	NTU	NE	392 J	NE					392	J	277	

Bold/italicized/shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).
BSC - Background screening concentration.
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not established (RBSCs), not evaluated (BSCs).
TBD - To be determined.
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-18

Detected Constituents in Bedrock Monitoring Well
Additional Burning Ground Area
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	ABG-BEDGW-01									
				Sample No:	5480		5485		BD3006		BD3006R		CB3016	
				Sample Date:	13-Nov-97		13-MAY-98		28-SEP-01		05-OCT-01		05-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Volatiles														
Acetone	µg/L	61	ND	NE							2.7	B		
Carbon disulfide	µg/L	104	0.97 J	NE			0.97	J						
Methylene chloride	µg/L	4.3	ND	NE			0.41	B					0.49	B
Trichloroethene	µg/L	0.03	0.25 J	NE	**0.25**	J								
Semivolatiles														
Benzo(a)pyrene	µg/L	0.009	1.2 J	NE					**1.2**	J				
Benzo(ghi)perylene	µg/L	18	1.7 J	NE					1.7	J				
Chrysene	µg/L	9.2	0.54 J	NE					0.54	J				
Dibenz(a,h)anthracene	µg/L	0.009	1.2 J	NE					**1.2**	J				
Indeno(1,2,3-cd)pyrene	µg/L	0.092	1.7 J	NE					**1.7**	J				
Metals - Unfiltered														
Aluminum	µg/L	3650	522	TBD	522						45.3	B	39.2	J
Arsenic	µg/L	0.045	11.7	TBD	**11.7**									
Barium	µg/L	255	89.2 J	TBD							89.2	J	82.7	J
Iron	µg/L	1095	9130	TBD	**8890**		**5770**				**7900**		**9130**	
Lead	µg/L	15	20.2	TBD	6.9		**20.2**							
Manganese	µg/L	88	912	TBD	**912**		**745**				**846**		**872**	
Mercury	µg/L	1.1	3.6	TBD	**3.6**									
Zinc	µg/L	1095	35.3	TBD	27.7		37.4	B			14.9	J	35.3	
Metals - Filtered														
Aluminum	µg/L	3650	408	TBD			408				67.6	B	63.7	B
Barium	µg/L	255	88.0 J	TBD							88.0	J	78.2	J
Beryllium	µg/L	7.3	ND	TBD							0.55	B		
Iron	µg/L	1095	7400	TBD	**7260**		**5580**				**7400**		**8630**	
Manganese	µg/L	88	990	TBD	**990**		**813**				**810**		**[illegible]**	
Zinc	µg/L	1095	35.4 J	TBD			38.9	B			14.3	J	35.4	J
Water Quality Parameters														
Alkalinity	µg/L	NE	370000 J	NE	280000		270000		370000	J			250000	
Chloride	µg/L	NE	10000 J	NE	2000	B	3000	J	4400				10000	J
Hardness	µg/L	NE	552000	NE	500000		530000		552000				440000	
Sulfate	µg/L	NE	292000	NE	140000		190000	J	163000				292000	
Total dissolved solids	µg/L	NE	731000	NE	640000		600000		644000				731000	
Total organic carbon	µg/L	NE	7000	NE	3800		3000	J	7000				3300	
Total suspended solids	µg/L	NE	24000	NE	11000		7000		21000				24000	
Turbidity	NTU	NE	151 J	NE							64.2	J	151	J

Bold text and highlighted cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-19

Detected Constituents in Bedrock Monitoring Well
Upper Toluene Tanks Area
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW16							
				Sample No:	5920		5925		BD3020		CB3037	
				Sample Date:	24-NOV-97		01-JUN-98		10-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BCS	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives												
Dinitrotoluene, 2,6-	µg/L	0.10	11	NE							11	
Volatiles												
Acetone	µg/L	61	930 J	NE					[illegible]	J	60	J
Benzene	µg/L	0.34	800 J	NE	490		450	J	[illegible]		150	J
Ethylbenzene	µg/L	130	200 J	NE	130		140	J	[illegible]		40	J
Methylene chloride	µg/L	4.3	52 J	NE	3.8	B	100	B	[illegible]		11	
Toluene	µg/L	72	590 J	NE	350		150	J	[illegible]		[illegible]	
Xylenes, total	µg/L	21	1500	NE	1100		1000	J	[illegible]		410	
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	920 J	NE	920	J	4.9	B	2.4	J	2.1	J
Chrysene	µg/L	9.2	0.87 J	NE					0.87	J		
Dibenzofuran	µg/L	2.4	1.2 J	NE					1.2	J		
Dichlorobenzene, 1,3-	µg/L	0.55	4.4 J	NE			4.4	J				
Dimethylphenol, 2,4-	µg/L	73	13	NE					3.0	J	13	
Fluorene	µg/L	24	2.8 J	NE					2.8	J	1.8	J
Methylnaphthalene, 2-	µg/L	12	64	NE					64		2.6	
Methylphenol, 2-	µg/L	182	1.6 J	NE					1.6	J	0.88	J
Methylphenol, 4-	µg/L	18	1.7 J	NE					1.7	J		
Naphthalene	µg/L	0.62	52	NE					52		0.9	J
Phenanthrene	µg/L	18	5.1 J	NE					5.1	J	2.6	J
Phenol	µg/L	2190	4.6 J	NE					4.6	J	1.0	J
Trichlorobenzene, 1,2,4-	µg/L	19	1.6 J	NE			1.6	J				
Trichlorophenol, 2,4,5-	µg/L	365	35	NE			35					
Metals - Unfiltered												
Aluminum	µg/L	3650	11000	TBD	502	J	11000		36.2	B	85.3	B
Barium	µg/L	255	612	TBD	468		612		147	J	19.2	J
Chromium	µg/L	11	105	TBD	24.4		105					
Cobalt	µg/L	73	2.4 J	TBD					2.4	J		
Copper	µg/L	146	84.9	TBD			84.9					
Iron	µg/L	1095	45900	TBD	1140		45900		73.2	J		
Lead	µg/L	15	40.4	TBD			40.4					
Manganese	µg/L	88	2200	TBD	133		2200		2.9	J	17.0	
Nickel	µg/L	73	54.7	TBD			54.7		10.8	J	3.2	J
Thallium	µg/L	0.24	101	TBD			101				0.9	B
Vanadium	µg/L	26	126	TBD	64.7		126					
Zinc	µg/L	1095	235	TBD	30.0		235					

Table 6-19

Detected Constituents in Bedrock Monitoring Well
Upper Toluene Tanks Area
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW16							
				Sample No:	5920		5925		BD3020		CB3037	
				Sample Date:	24-NOV-97		01-JUN-98		10-OCT-01		11-APR-02	
Parameter	Units	RBSC	MDC	BCS	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered												
Aluminum	µg/L	3650	ND	TBD					55.2	B	61.4	B
Barium	µg/L	255	523	TBD	389		523		143	J	18.4	J
Chromium	µg/L	11	14.8	TBD	13.4		14.8					
Manganese	µg/L	88	6.8 J	TBD							6.8	J
Nickel	µg/L	73	10.2 J	TBD					10.2	J		
Thallium	µg/L	0.24	53.1	TBD			53.1		6.4	B	6.2	B
Vanadium	µg/L	26	58.3	TBD	58.3		50.6					
Zinc	µg/L	1095	365	TBD					4.2	J	365	
Water Quality Parameters												
Alkalinity	µg/L	NE	1700000	NE	1600000		1700000		1060000	J		
Chloride	µg/L	NE	370000	NE	88000		140000		370000		75900	
Hardness	µg/L	NE	5300000	NE	5300000		2000000		1650000		700000	
Sulfate	µg/L	NE	734000	NE	150000		37000		212000		734000	
Total dissolved solids	µg/L	NE	6400000	NE	6400000		4000000		1950000		1450000	
Total organic carbon	µg/L	NE	14000	NE	8400		14000		6800		5500	
Total suspended solids	µg/L	NE	330000	NE	7000		330000		12000		14000	
Turbidity	NTU	NE	8.0	NE					3.6		8.0	

Bold text and shaded cell indicates value is greater than the RBSC.

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BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-20

Detected Constituents in Bedrock Monitoring Wells
Downgradient Perimeter Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW22				PB-BED-MW27			
				Sample No:	BD3027		CB3009		BD3032		CB3012	
				Sample Date:	08-OCT-01		04-APR-02		09-OCT-01		09-APR-02	
Parameter	Units	RBSC	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives												
Dinitrotoluene, 2,4-	µg/L	0.10	1.5	NE					[illegible]		[illegible]	
Dinitrotoluene, 2,6-	µg/L	0.10	1.1	NE					[illegible]		[illegible]	
Trinitrotoluene, 2,4,6-	µg/L	1.8	0.27	NE	0.27							
Volatiles												
Acetone	µg/L	61	210 J	NE	4.8	B			[illegible]	J	[illegible]	
Benzene	µg/L	0.34	130 J	NE	0.60	J			[illegible]	J	[illegible]	
Ethylbenzene	µg/L	130	100 J	NE	1.0	J			100	J	83	J
Methylene chloride	µg/L	4.3	98 J	NE	0.63	B	11	J	[illegible]	J	[illegible]	
Toluene	µg/L	72	120 J	NE	1.2	J			[illegible]	J	[illegible]	
Xylenes, total	µg/L	21	560	NE	6.4				[illegible]		[illegible]	
Semivolatiles												
Bis(2-ethylhexyl)phthalate	µg/L	4.8	2.9 J	NE					2.9	J		
Dimethylphenol, 2,4-	µg/L	73	5.1 J	NE					3.1	J	5.1	J
Methylnaphthalene, 2-	µg/L	12	24	NE	1.7	J			[illegible]		[illegible]	
Methylphenol, 2-	µg/L	182	0.89 J	NE							0.89	J
Methylphenol, 4-	µg/L	18	1.1 J	NE							1.1	J
Naphthalene	µg/L	0.62	17	NE					[illegible]		[illegible]	
Phenanthrene	µg/L	18	1.4 J	NE					1.4	J	0.75	J
Phenol	µg/L	2190	2.0 J	NE					1.3	J	2.0	J
Metals - Unfiltered												
Aluminum	µg/L	3650	353 J	TBD	353	J	71.3	J	152	J	232	B
Arsenic	µg/L	0.045	ND	TBD					[illegible]			
Barium	µg/L	255	649	TBD	649		620		133	J	93.8	J
Cadmium	µg/L	1.8	1.1 J	TBD							1.1	J
Chromium	µg/L	11	24.4	TBD					7.1	J	[illegible]	
Cobalt	µg/L	73	10.9 J	TBD					3.1	J	10.9	J
Copper	µg/L	146	13.3 J	TBD					13.3	J	6.3	B
Iron	µg/L	1095	257000 J	TBD	284		43.2	J	[illegible]		[illegible]	
Manganese	µg/L	88	4660	TBD	38.1		45.1		[illegible]		[illegible]	
Nickel	µg/L	73	17.7 J	TBD					12.4	J	17.7	J
Vanadium	µg/L	26	7.8 J	TBD							7.8	J
Zinc	µg/L	1095	21.6	TBD			20.2		21.6		18.5	J

Table 6-20

Detected Constituents in Bedrock Monitoring Wells
Downgradient Perimeter Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

				Location Code:	PB-BED-MW22				PB-BED-MW27			
				Sample No:	BD3027		CB3009		BD3032		CB3012	
				Sample Date:	08-OCT-01		04-APR-02		09-OCT-01		09-APR-02	
Parameter	**Units**	**RBSC**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals - Filtered												
Aluminum	µg/L	3650	59.0 J	TBD	69.3	B	64.5	B	58.0	B	59.0	J
Arsenic	µg/L	0.045	5.2 J	TBD							**[illegible]**	**[illegible]**
Barium	µg/L	255	634	TBD	**634**		**617**		126	J	83.6	J
Chromium	µg/L	11	1.4 J	TBD							1.4	J
Iron	µg/L	1095	189 J	TBD					144		189	J
Manganese	µg/L	88	1460	TBD	34.3		43.3		**141**		**[illegible]**	**[illegible]**
Nickel	µg/L	73	2.0 J	TBD					2.0	J		
Zinc	µg/L	1095	12.7 J	TBD			12.7	J			3.0	J
Water Quality Parameters												
Alkalinity	µg/L	NE	488000	NE	410000	J	416000		473000	J	488000	
Chloride	µg/L	NE	260000	NE	43400		86300	J	260000		194000	
Hardness	µg/L	NE	1910000	NE	412000		388000		1910000		1750000	
Sulfate	µg/L	NE	1280000	NE	27100				1280000		868000	
Total dissolved solids	µg/L	NE	2560000	NE	489000		476000		2560000		2280000	
Total organic carbon	µg/L	NE	3700	NE	1700		2200		3700		3500	
Total suspended solids	µg/L	NE	499000	NE	9000		4000		200000		499000	
Turbidity	NTU	NE	1470	NE	129	J	76.4		188		1470	

Bold text and shaded cell indicates value is greater than the RBSC.

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.

MDC - Maximum detected concentration for the AOC ("B" qualified data not included).

BSC - Background screening concentration.

µg/L - Micrograms per liter.

ND - Not detected in this Area of Concern without a "B" qualifier.

NE - Not established (RBSCs), not evaluated (BSCs).

TBD - To be determined.

NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)

J - The compound/analyte was positively identified; the reported value is an estimated concentration.

B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.

N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	BG8-BEDGW-001												IT-MW01					
			Sample No:	5410		5415		BD3007		CA3006		CB3007		CC3001		5530		5535/5535R		CC3009	
			Sample Date:	17-NOV-97		15-MAY-98		27-SEP-01		16-JAN-02		03-APR-02		12-JUL-02		19-NOV-97		16-MAY-98		10-JUL-02	
Parameter	**Unit**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives																					
Dinitrotoluene, 2,6-	µg/L	0.43	NE																		
Nitrobenzene	µg/L	0.33	NE																		
RDX	µg/L	0.22 J	NE																		
Volatiles																					
Acetone	µg/L	170 J	NE									3.5	J	2.6	B					3.5	B
Benzene	µg/L	110	NE																		
Bromomethane	µg/L	0.27 J	NE																		
Butanone, 2-	µg/L	17 J	NE											3.2	B						
Carbon disulfide	µg/L	1.5	NE	0.65	J																
Chloroform	µg/L	1.1	NE																		
Chloromethane	µg/L	1.3 J	NE																		
Ethylbenzene	µg/L	38	NE																		
Methyl-2-pentanone, 4-	µg/L	0.30 J	NE																		
Methylene chloride	µg/L	21 J	NE	0.37	B											0.33	B	0.58	B	0.19	B
Toluene	µg/L	100	NE															22			
Xylenes, total	µg/L	210	NE	0.38	B							1.0				0.31	B				
Semivolatiles																					
Bis(2-ethylhexyl)phthalate	µg/L	2.9 J	NE	1.7	J	4.0	B							4.3	B						
Dimethylphenol, 2,4-	µg/L	1.1 J	NE																		
Methylnaphthalene, 2-	µg/L	10 J	NE																		
Naphthalene	µg/L	8.7 J	NE																		
Phenol	µg/L	1.4 J	NE																		
Metals - Unfiltered																					
Aluminum	µg/L	93200	TBD	9020		307		51.6	B	78.7	B	31.5	J	65.2	B					117	J
Arsenic	µg/L	56.8	TBD	17.6										3.6	J						
Barium	µg/L	24000	TBD	520				285		68	J	29.9	J	229						75.9	J
Beryllium	µg/L	ND	TBD							1.2	B										
Chromium	µg/L	454	TBD	18.2				1.4	B												
Cobalt	µg/L	12.1 J	TBD											12.1	J					7.5	J
Copper	µg/L	59.5	TBD	59.5								3.3	J							9.1	J
Iron	µg/L	232000	TBD	22600		1230	J	204		118	B	38.2	J	1490		1320		2200	J	563	
Lead	µg/L	79.2	TBD	26.3		6.8															
Manganese	µg/L	7470	TBD	2240		130		71.6		107		29.0		688		323		348		292	
Mercury	µg/L	0.45	TBD													0.45					
Nickel	µg/L	15.0 J	TBD									6.8	J	8.6	J					15.0	J
Thallium	µg/L	ND	TBD							3.3	B										
Vanadium	µg/L	6.1	TBD																		
Zinc	µg/L	149	TBD	126		49.7	B			12.6	J	15.6	J	10.0		51.6		149		34.3	

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	BG8-BEDGW-001												IT-MW01					
			Sample No:	5410		5415		BD3007		CA3006		CB3007		CC3001		5530		5535/5535R		CC3009	
			Sample Date:	17-NOV-97		15-MAY-98		27-SEP-01		16-JAN-02		03-APR-02		12-JUL-02		19-NOV-97		16-MAY-98		10-JUL-02	
Parameter	**Unit**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals - Filtered																					
Aluminum	µg/L	276	TBD					56.6	B	83.6	B	52.0	B	113	B			276		62.2	B
Arsenic	µg/L	2.8 J	TBD																		
Barium	µg/L	24400	TBD	366				279		83.6	J	30.6	J	236						82.5	J
Beryllium	µg/L	ND	TBD							1.5	B										
Cobalt	µg/L	10.3 J	TBD											8.2	J					10.3	J
Copper	µg/L	26.5	TBD																	2.8	J
Iron	µg/L	6180	TBD	563				169		216				1160		1090		1970		745	
Manganese	µg/L	1300	TBD	1300		658		73.5		117		23.6		728		331		395		326	
Mercury	µg/L	0.24	TBD																		
Nickel	µg/L	26.2 J	TBD									7.0	J	8.5	J					26.2	J
Thallium	µg/L	6.4 J	TBD							4.6	B										
Zinc	µg/L	124	TBD			44.9	B			13.5	J	17.3	J	7.3	J	46.9		47.5	B	124	
Water Quality Parameters																					
Alkalinity	µg/L	979000	NE	350000		180000		357000	J	200000		157000		367000		360000		110000		90000	
Chloride	µg/L	22400000	NE	780000		34000		932000		78000		63200	J	896000		4000		3000		3400	
Hardness	µg/L	20000000	NE	1000000		340000		719000		380000		314000		647000		420000		200000		144000	
Nitrate	µg/L	200	NE	200																	
Nitrate	µg/L	22000	NE			7300				22000		10400								190	
Sulfate	µg/L	416000	NE	70000		45000		28300		68000		63300		9200		79000		140000		118000	
Total dissolved solids	µg/L	35500000	NE	1800000		300000		1990000		500000		458000		2040000		310000		400000		279000	
Total organic carbon	µg/L	8600	NE			1000								1900		8600		7000		7100	
Total suspended solids	µg/L	280000	NE	10000		280000		4000				3000	J	21000		84000		5000		4000	
Turbidity	NTU	742	NE					104	J			0.61		39.0						1.7	

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	PB-BED-MW20												PB-BED-MW24							
			Sample No:	5960		5965		BD3026		CA3005		CB3001		CC3003		BD3029		CA3001		CB3008		CC3004	
			Sample Date:	17-NOV-97		28-MAY-98		26-SEP-01		15-JAN-02		04-APR-02		10-JUL-02		09-OCT-01		17-JAN-02		03-APR-02		12-JUL-02	
Parameter	Unit	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Explosives																							
Dinitrotoluene, 2,6-	µg/L	0.43	NE																	0.43			
Nitrobenzene	µg/L	0.33	NE									0.088	J							0.33			
RDX	µg/L	0.22 J	NE																	0.22	J		
Volatiles																							
Acetone	µg/L	170 J	NE					1.2	J			5.3	J	10	B	120	J			170	J	60	
Benzene	µg/L	110	NE	0.93	J	1.6		0.25	J					3.2		60		91		110		14	J
Bromomethane	µg/L	0.27 J	NE											0.27	J								
Butanone, 2-	µg/L	17 J	NE											9.8				8.1		17	J	12	B
Carbon disulfide	µg/L	1.5	NE			0.17	J											1.2		0.59	J		
Chloroform	µg/L	1.1	NE																				
Chloromethane	µg/L	1.3 J	NE															1.3	J				
Ethylbenzene	µg/L	38	NE	0.15	J											19	J	32		38		8.0	J
Methyl-2-pentanone, 4-	µg/L	0.30 J	NE																				
Methylene chloride	µg/L	21 J	NE	0.30	B	0.49	B.									21	J						
Toluene	µg/L	100	NE	0.73	B	0.95	B			2.4	B			0.76	B	58		90		100		17	J
Xylenes, total	µg/L	210	NE	2.6		0.91	J					0.67	J			110		180		210		55	
Semivolatiles																							
Bis(2-ethylhexyl)phthalate	µg/L	2.9 J	NE			5.4	B	2.9	J													4.6	B
Dimethylphenol, 2,4-	µg/L	1.1 J	NE													1.1	J					0.76	J
Methylnaphthalene, 2-	µg/L	10 J	NE	1.1	J											3.6	J	5.6		4.6	J	10	J
Naphthalene	µg/L	8.7 J	NE													2.9	J	7		4.0	J	8.7	J
Phenol	µg/L	1.4 J	NE													1.4	J						
Metals - Unfiltered																							
Aluminum	µg/L	93200	TBD	3290		678	J	207	J			48.6	J	83.4	B	37.8	J	77.7	B	35.7	J	1150	
Arsenic	µg/L	56.8	TBD																			4.3	
Barium	µg/L	24000	TBD	19000		16400		23900		22500		23700		24000		932		938		1160		680	
Beryllium	µg/L	ND	TBD															1.2	B				
Chromium	µg/L	454	TBD					7.6	B			1.7	J									9.4	
Cobalt	µg/L	12.1 J	TBD					7.1	J			6.1	J	8.0	J							2.9	
Copper	µg/L	59.5	TBD	32.8				15.8	B	32.8		30.5										8.6	
Iron	µg/L	232000	TBD	13200		6770		5920	J	6480		853		4970		48.3	J	72.7	B			13400	
Lead	µg/L	79.2	TBD																			5.2	B
Manganese	µg/L	7470	TBD	180		153		189	J	128		156		190		24.8		19.2		14.8	J	420	
Mercury	µg/L	0.45	TBD																				
Nickel	µg/L	15.0 J	TBD					3.5	J			3.4	J									7.9	
Thallium	µg/L	ND	TBD							7.1	B							4.2	B				
Vanadium	µg/L	6.1	TBD																			6.1	
Zinc	µg/L	149	TBD	41.6		42.1	B	5.3		23.4		64.9		9.7	J							28.4	

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	PB-BED-MW20												PB-BED-MW24							
			Sample No:	5960		5965		BD3026		CA3005		CB3001		CC3003		BD3029		CA3001		CB3006		CC3004	
			Sample Date:	17-NOV-97		28-MAY-98		26-SEP-01		15-JAN-02		04-APR-02		10-JUL-02		09-OCT-01		17-JAN-02		03-APR-02		12-JUL-02	
Parameter	Unit	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered																							
Aluminum	µg/L	276	TBD					40.9	B			55.9	B	63.1	B	55.1	B	89.6	B	74.0	B	110	B
Arsenic	µg/L	2.8 J	TBD					2.8	J														
Barium	µg/L	24400	TBD	21000		4950		24400		21300		23800		23900		942		962		1170		670	
Beryllium	µg/L	ND	TBD															1.5	B				
Cobalt	µg/L	10.3 J	TBD					6.4	J			5.9	J	8.0	J								
Copper	µg/L	26.5	TBD					2.0	B	5.7	J	26.5											
Iron	µg/L	6180	TBD	2310		1320		5350		6180		1130		5100				40.7	B				
Manganese	µg/L	1300	TBD	162		47.0		188		129		156		193		22.1		18.7		16.6		44.2	
Mercury	µg/L	0.24	TBD			0.24																	
Nickel	µg/L	26.2 J	TBD					2.9	J			3.2	J										
Thallium	µg/L	6.4 J	TBD							7.3	B							4.1	B				
Zinc	µg/L	124	TBD					3.3	J	21.6		59.2	J	3.2	J					3.4	J		
Water Quality Parameters																							
Alkalinity	µg/L	979000	NE	240000		260000		255000	J	280000		229000		293000		697000	J	810000		157000		979000	
Chloride	µg/L	22400000	NE	19000000		21000000		22400000		18000000		17300000	J	19000000		149000		140000		175000	J	155000	
Hardness	µg/L	20000000	NE	20000000		10000000		9360000		8200000		8850000		8140000		566000		710000		715000		1370000	
Nitrate	µg/L	200	NE																				
Nitrate	µg/L	22000	NE																				
Sulfate	µg/L	416000	NE							3200						21400		150000		23600		32300	
Total dissolved solids	µg/L	35500000	NE	32000000		24000000		27400000	J	26000000		27800000		35500000		948000		1000000		2200000		1020000	
Total organic carbon	µg/L	8600	NE					500	J	1100	J	740	J			3000		1800		2400		3700	
Total suspended solids	µg/L	280000	NE	74000		90000		125000		13000		13000		33000						14000		124000	
Turbidity	NTU	742	NE					48.4	J	8.8		10.5		7.4		266		61		116		742	

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	PB-BED-MW25								PB-BED-MW26	
			Sample No:	BD3030		CA3002		CB3004		CC3005		CA3004	
			Sample Date:	05-OCT-01		16-JAN-02		03-APR-02		11-JUL-02		17-JAN-02	
Parameter	**Unit**	**MDC**	**BSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives													
Dinitrotoluene, 2,6-	µg/L	0.43	NE										
Nitrobenzene	µg/L	0.33	NE					0.076	J				
RDX	µg/L	0.22 J	NE										
Volatiles													
Acetone	µg/L	170 J	NE	1.7	B					1.4	B		
Benzene	µg/L	110	NE	0.37	J								
Bromomethane	µg/L	0.27 J	NE										
Butanone, 2-	µg/L	17 J	NE										
Carbon disulfide	µg/L	1.5	NE	0.48	J	1.5		0.36	J	0.17	J		
Chloroform	µg/L	1.1	NE	1.1									
Chloromethane	µg/L	1.3 J	NE										
Ethylbenzene	µg/L	38	NE	0.22	J								
Methyl-2-pentanone, 4-	µg/L	0.30 J	NE	0.30	J								
Methylene chloride	µg/L	21 J	NE	0.30	B			0.21	B				
Toluene	µg/L	100	NE	0.80	J			0.25	J				
Xylenes, total	µg/L	210	NE	1.5									
Semivolatiles													
Bis(2-ethylhexyl)phthalate	µg/L	2.9 J	NE	0.86	J					3.0	B		
Dimethylphenol, 2,4-	µg/L	1.1 J	NE										
Methylnaphthalene, 2-	µg/L	10 J	NE										
Naphthalene	µg/L	8.7 J	NE										
Phenol	µg/L	1.4 J	NE										
Metals - Unfiltered													
Aluminum	µg/L	93200	TBD	78.2	B	79.8	B	41.3	J	44.6	J	93200	
Arsenic	µg/L	56.8	TBD									56.8	
Barium	µg/L	24000	TBD	226		247		434		164	J	1970	
Beryllium	µg/L	ND	TBD			1.2	B						
Chromium	µg/L	454	TBD									454	
Cobalt	µg/L	12.1 J	TBD										
Copper	µg/L	59.5	TBD										
Iron	µg/L	232000	TBD	795		357		91.1	J	103		232000	
Lead	µg/L	79.2	TBD									79.2	
Manganese	µg/L	7470	TBD	89.0		56.2		68.8		95.6		7470	
Mercury	µg/L	0.45	TBD										
Nickel	µg/L	15.0 J	TBD										
Thallium	µg/L	ND	TBD			4.7	B						
Vanadium	µg/L	6.1	TBD										
Zinc	µg/L	149	TBD	7.7	J			79.5					

Table 6-21

Detected Constituents in Bedrock Monitoring Wells
Background Monitoring Wells
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

			Location Code:	PB-BED-MW25								PB-BED-MW26	
			Sample No:	BD3030		CA3002		CB3004		CC3005		CA3004	
			Sample Date:	05-OCT-01		16-JAN-02		03-APR-02		11-JUL-02		17-JAN-02	
Parameter	Unit	MDC	BSC	Result	VQ	Result	VQ	Result	VQ	Result	VQ	Result	VQ
Metals - Filtered													
Aluminum	µg/L	276	TBD	68.7	B			52.7	B	97.8	B		
Arsenic	µg/L	2.8 J	TBD										
Barium	µg/L	24400	TBD	224		234		452		160	J		
Beryllium	µg/L	ND	TBD										
Cobalt	µg/L	10.3 J	TBD										
Copper	µg/L	26.5	TBD										
Iron	µg/L	6180	TBD	713		337				59.8	J		
Manganese	µg/L	1300	TBD	87.0		52.2		65.6		94.0			
Mercury	µg/L	0.24	TBD										
Nickel	µg/L	26.2 J	TBD										
Thallium	µg/L	6.4 J	TBD							6.4	J		
Zinc	µg/L	124	TBD	3.0	J			19.9	J				
Water Quality Parameters													
Alkalinity	µg/L	979000	NE	278000	J	320000		337000		329000			
Chloride	µg/L	22400000	NE	404000		460000		558000	J	219000			
Hardness	µg/L	20000000	NE	627000		720000		611000		772000			
Nitrate	µg/L	200	NE										
Nitrate	µg/L	22000	NE										
Sulfate	µg/L	416000	NE	121000		79000		36200		416000			
Total dissolved solids	µg/L	35500000	NE	1000000		1100000		1330000		1180000			
Total organic carbon	µg/L	8600	NE	4000	B	2000		3000		2700			
Total suspended solids	µg/L	280000	NE	4000				9000		5000			
Turbidity	NTU	742	NE	21.7	J	21		112		23.6			

RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
MDC - Maximum detected concentration for the AOC ("B" qualified data not included).
BSC - Background screening concentration
µg/L - Micrograms per liter.
ND - Not detected in this Area of Concern without a "B" qualifier.
NE - Not evaluated.
TBD - To be determined.
NTU - Nephelometric turbidity unit.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
B - The analyte was not detected significantly above the levels found in the associated method blank or field blanks.
N - Tentative identification. Condsider present. Special methods may be needed to confirm its presence in future sampling efforts.

Table 6-22

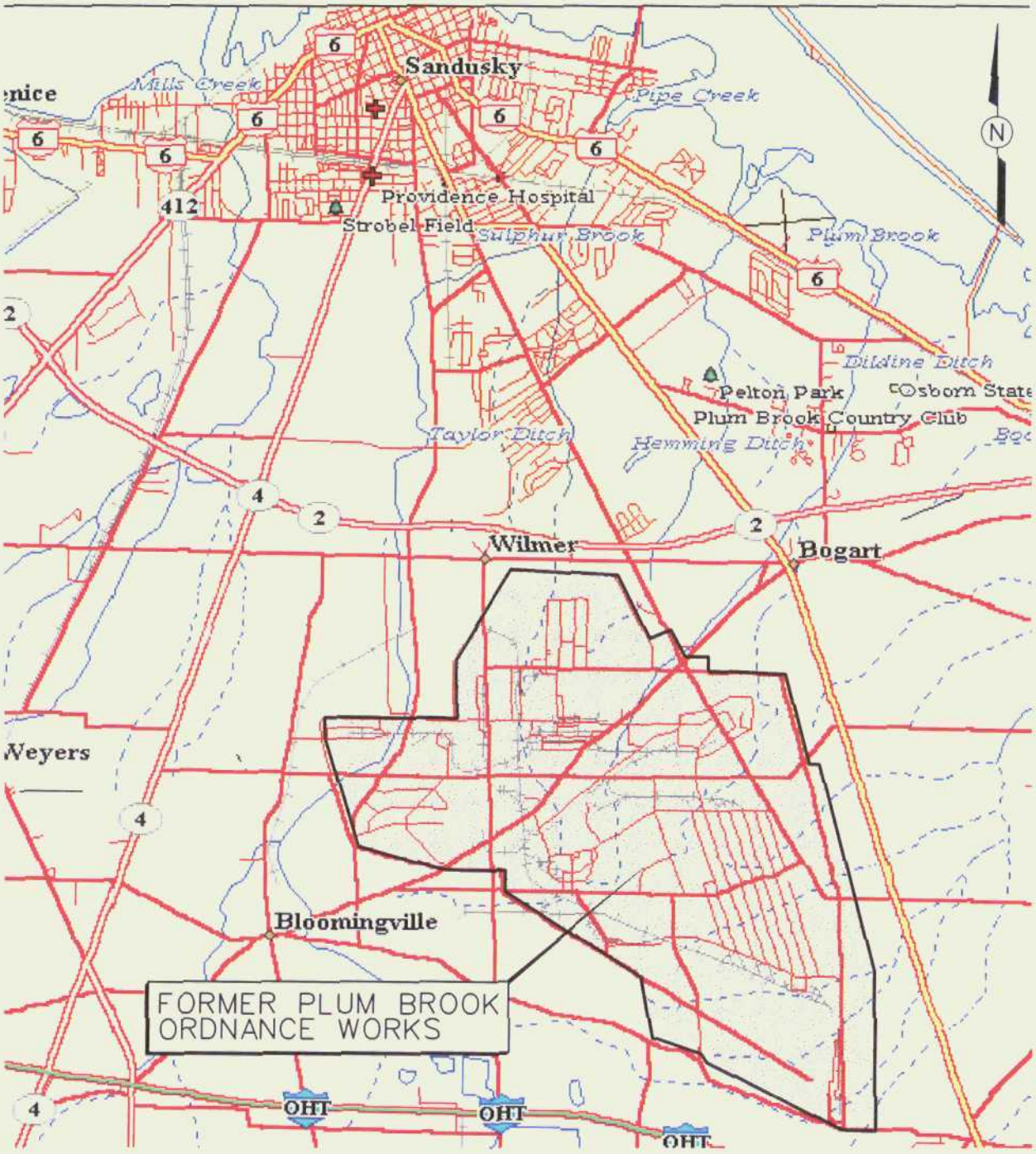
Free-Phase and Groundwater Analytical Results
2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Sample Area:	Upper Toluene Tanks				TNT Area A	
		Sample Location:	PB-BED-MW16		MK-MW20		TNTA-BEDGW-001	
		Sample Number:	FP7002		CC3002		FP7001	
		Sample Date:	10-Oct-01		11-Jul-02		8-Oct-01	
Parameter	**Units:**	**RBSC**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Volatiles - Free Phase								
Acetone	mg/kg	157	30		NA			
Benzene	mg/kg	0.60	**25**	J	NA		**[illegible]**	
Ethylbenzene	mg/kg	190	**200**		NA		**[illegible]**	
Methylene chloride	mg/kg	9.11	**42**		NA		**[illegible]**	
Toluene	mg/kg	66	**120**		NA		**[illegible]**	
Trichloroethene	mg/kg	0.053	**4.6**		NA			
Xylenes, total	mg/kg	27	**1600**		NA		**[illegible]**	
Range Organics - Free Phase								
Diesel Range Organics	mg/kg	NE	4800		NA		31000	
Gasoline Range Organics	mg/kg	NE	52000		NA		160000	
BTEX - Water								
Toluene	µg/L	72	NA		**37000**		NA	
Range Organics - Water								
Diesel Range Organics	µg/L	NE	NA		65000		NA	
Gasoline Range Organics	µg/L	NE	NA		140		NA	

Bold text and shaded cell indicates value is greater than the RBSC.
RBSC - Risk-based screening concentration. Values reflect an incremental lifetime cancer risk (ILCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.1. For chemicals that exhibit both cancer and noncancer effects, whichever type of effect results in a lower concentration (using an ILCR of 1E-6 and an HQ of 0.1), that concentration is selected as the RBSC.
VQ - Validation qualifier.
mg/kg - Milligrams per kilogram (ppm).
NA - Not analyzed.
Bold text and shaded cell indicates value is greater than the RBSC.
J - The compound/analyte was positively identified; the reported value is an estimated concentration.
NE - Not established.
BTEX - Benzene, toluene, ethylbenzene, and xylene.
µg/L - Micrograms per liter.

Validation Qualifiers (VQ)
J - The compound/analyte was positively identified; the reported value is an estimated concentration.

FIGURES



NOT TO SCALE

FIGURE 1-1
VICINITY MAP

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

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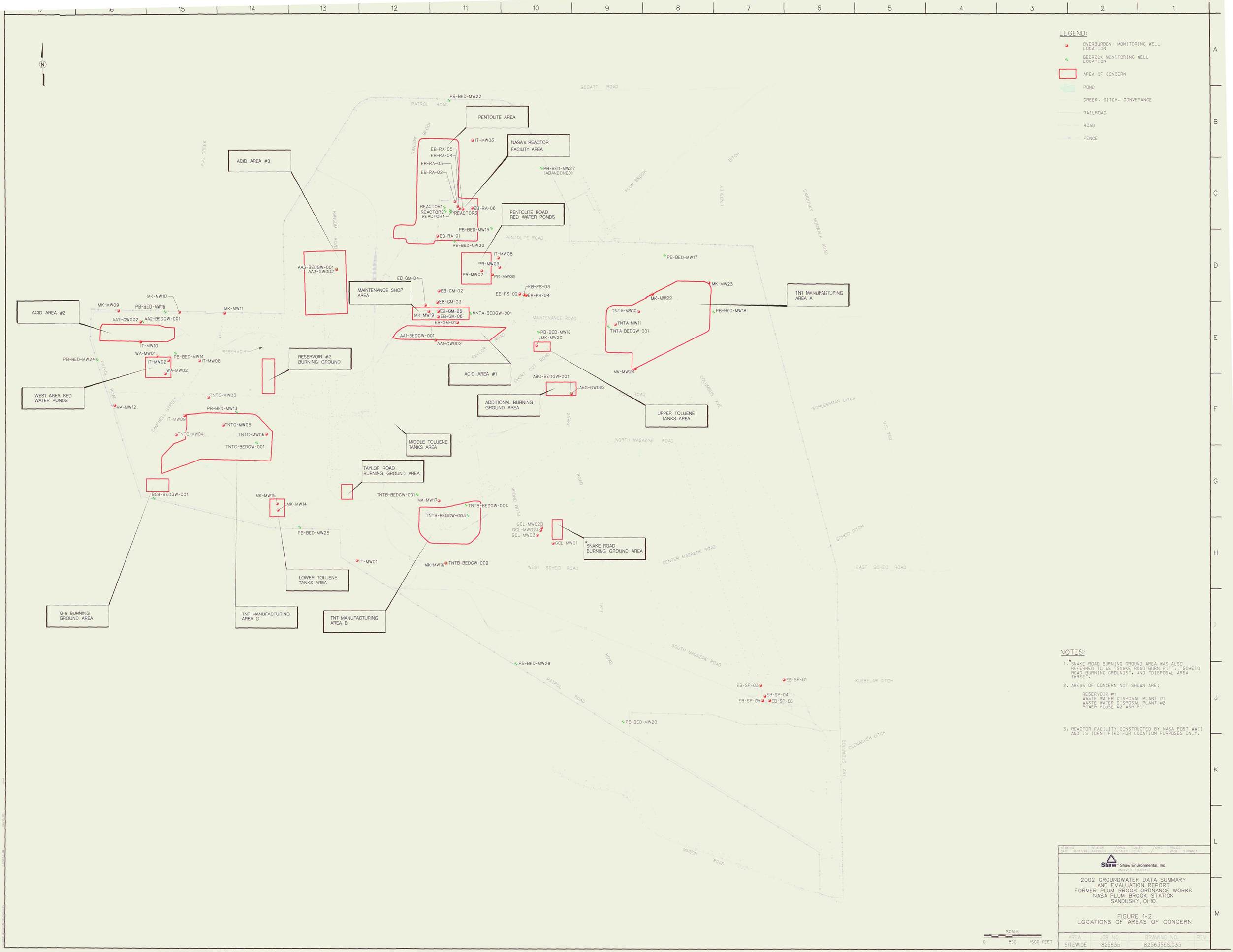

NOTES:

1. *SNAKE ROAD BURNING GROUND AREA WAS ALSO REFERRED TO AS "SNAKE ROAD BURN PIT", "SCHEID ROAD BURNING GROUNDS", AND "DISPOSAL AREA THREE".
2. AREAS OF CONCERN NOT SHOWN ARE:

   RESERVOIR #1
   WASTE WATER DISPOSAL PLANT #1
   WASTE WATER DISPOSAL PLANT #2
   POWER HOUSE #2 ASH PIT

3. REACTOR FACILITY CONSTRUCTED BY NASA POST WWII AND IS IDENTIFIED FOR LOCATION PURPOSES ONLY.

DRAFTING DATE	DRAFTER	CHKD	DRAWN	CHKD	PROJECT MNGR
05/07/99	SKESSLER	KESSLER	SHA		S.DOWNEY

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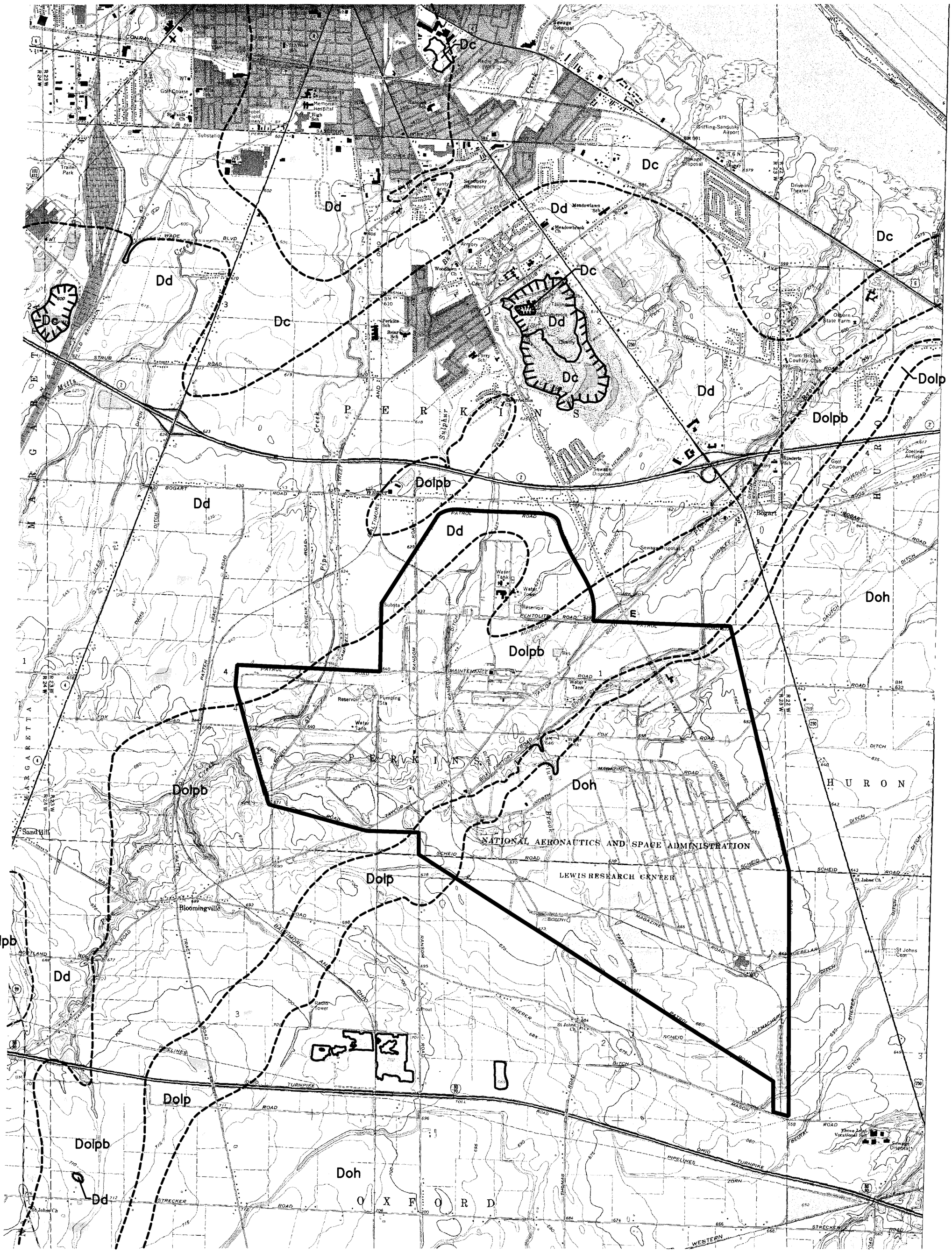
2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 1-2
LOCATIONS OF AREAS OF CONCERN

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	825635	825635ES.035	



N

NOTES:

CONTACT LINES WERE ADJUSTED BASED ON 2001 BEDROCK MONITORING WELLS.

REFERENCE:

PRELIMINARY BEDROCK GEOLOGY OF THE KIMBALL AND SANDUSKY, OHIO, QUADRANGLES, STATE OF OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY, 1995.

BASE MAPS (COMBINED BY SHAW) FROM KIMBALL AND SANDUSKY QUADRANGLES, 7.5 MINUTE SERVICES, (TOPOGRAPHIC), 1969. SANDUSKY MAP WAS PHOTOREVISED 1979.

LEGEND:

AGE	FORMATION/GROUP	ROCK DESCRIPTION
DEVONIAN	Doh - Ohio Shale	Shale: black, thin-bedded with bituminous and carboneous material, pyrite, natural gas pockets.
	Dolp - Prout Limestone Member (Olentangy Shale)	Limestone: light gray, calcareous.
	Dolpb - Plum Brook Member (Olentangy Shale)	Shale: dark gray, thin-bedded.
	Dd - Delaware Limestone	Limestone: buff, earthy, interbedded with brown crystalline dolomite, fossiliferous, hydrogen sulfide, petroleum hydrocarbon.
	Dc - Columbus Limestone	Limestone: brown to gray, fine crystalline, fossiliferous with tan to buff gray, partly sandy dolomite at base.

——— — — CONTACT SOLIID LINE WHERE EXPOSED; DASHED WHERE CONCEALED BY SEDIMENTS

SCALE
0 1250 2500 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 03/05/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFF | CHKD | PROJECT MNGR S. DOWNEY

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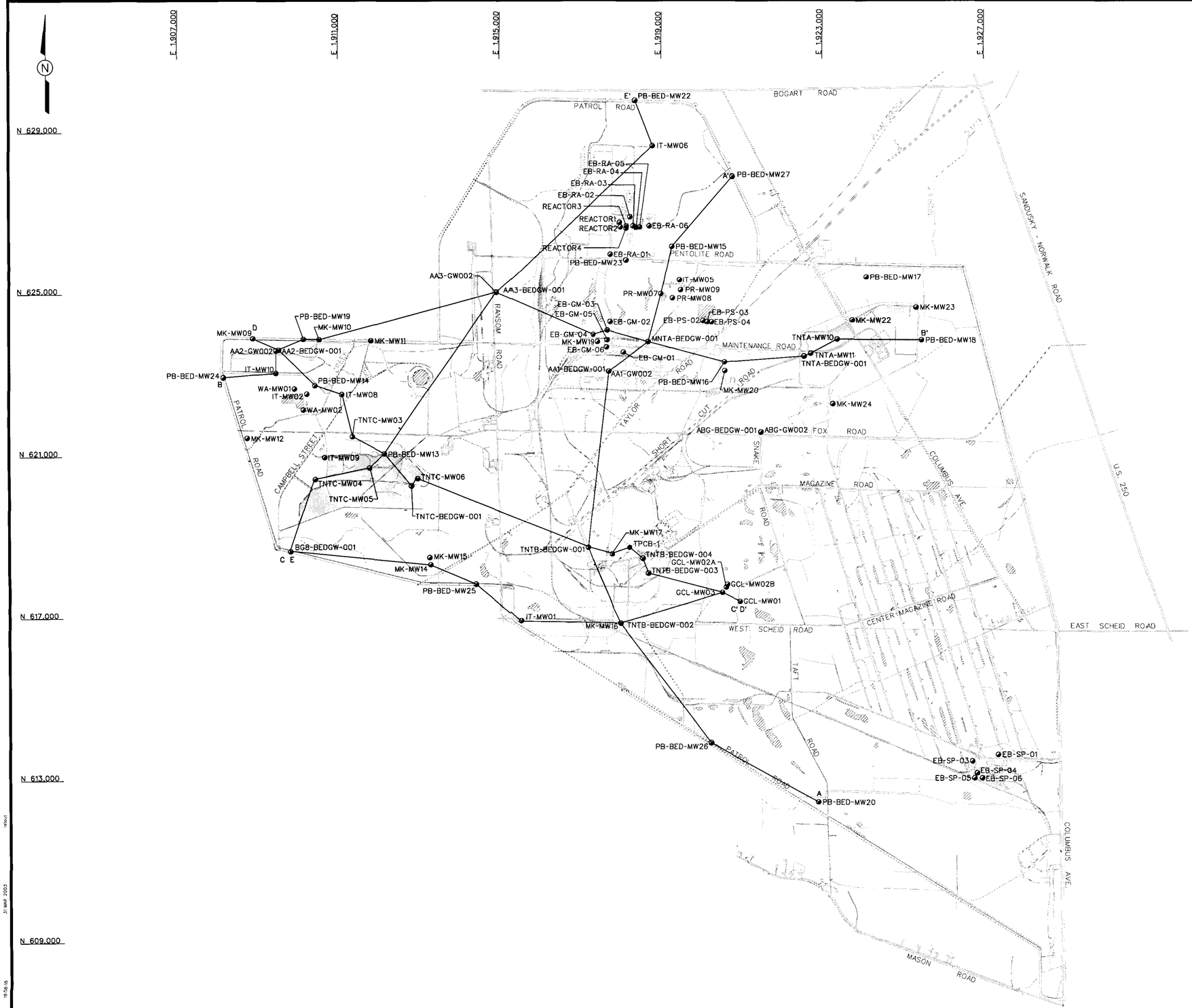
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 2-1
REGIONAL GEOLOGIC MAP WITH SITE TOPOGRAPHY

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES.197	



LEGEND:

- ABG-BED-GW001 MONITORING WELL LOCATION
- TPCB-1 SOIL BORING LOCATION
- BUILDING
- RAILROAD
- SURFACE WATER
- DITCH
- FENCE (PBOW BOUNDARY)
- A —— A' GEOLOGIC CROSS-SECTION LINE

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. SOIL BORING TPCB-1 NOT SURVEYED. APPROXIMATE LOCATION BASED ON FIELD NOTES. LITHOLOGIC DEPTHS USED ONLY FOR CROSS-SECTION CONSTRUCTION.

SCALE
0 1200 2400 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 03/05/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFF | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

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2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
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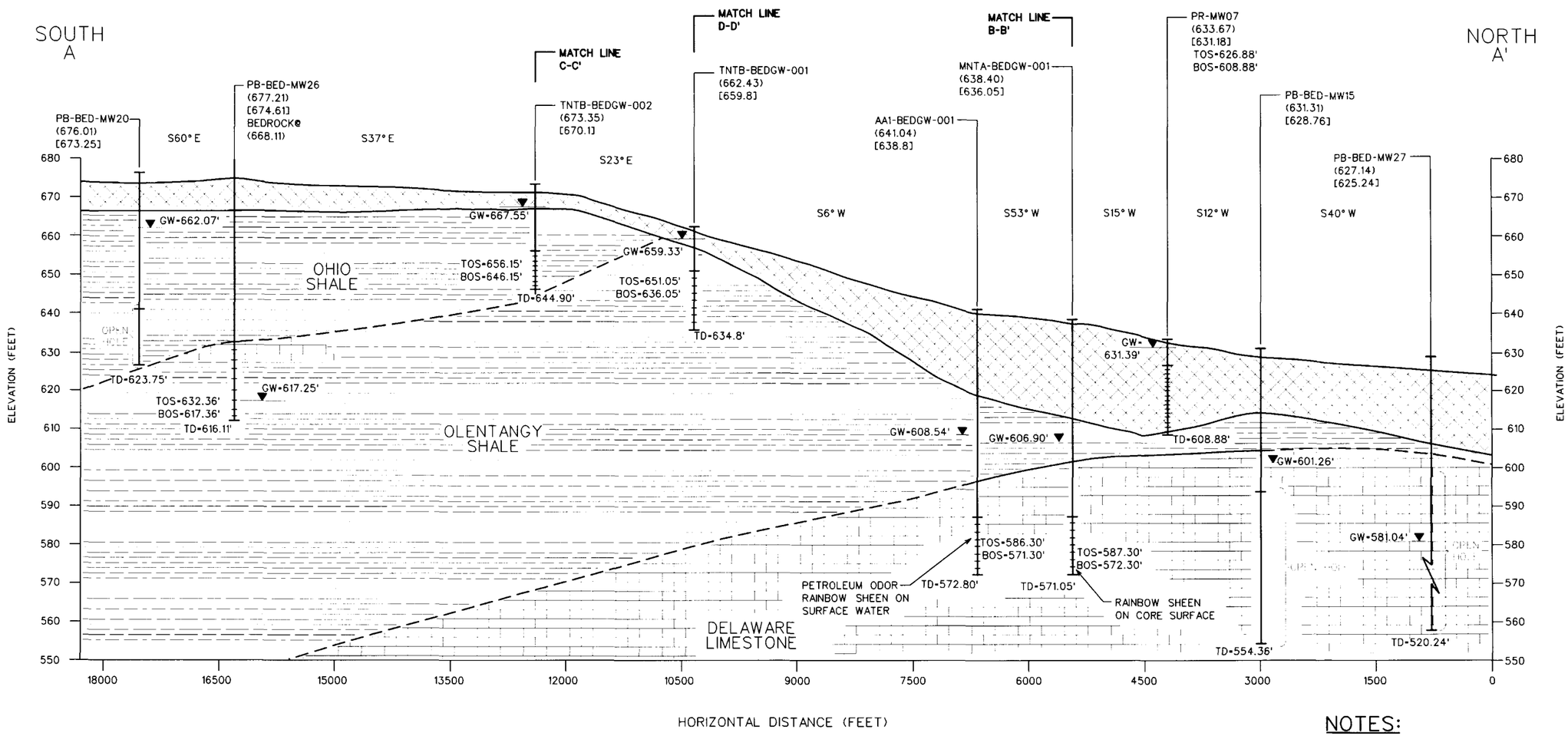
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 2-2
SITE MAP WITH WELLS AND
LINES OF CROSS-SECTION

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES.196	



CROSS SECTION A-A'

NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (1929).
2. REFERENCE- PRELIMINARY OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SERVICES, OPEN FILE MAP BG-D3DG

LEGEND:

OVERBURDEN	BED-MW15	WELL ID
	(631.31)	CASING ELEVATION
SHALE	[628.76]	GROUND SURFACE ELEVATION
	TD=610.80'	BOTTOM OF BOREHOLE ELEVATION
LIMESTONE	TOS	TOP OF SCREEN
	BOS	BOTTOM OF SCREEN
CONTACT AREA UNCERTAIN	N15° E	BEARING OF CROSS-SECTION SEGMENT
GW=627.68' GROUNDWATER ELEVATION (MAY 4, 2002)		WELL SCREEN INTERVAL

HORIZONTAL SCALE:

0 1500 3000 FEET

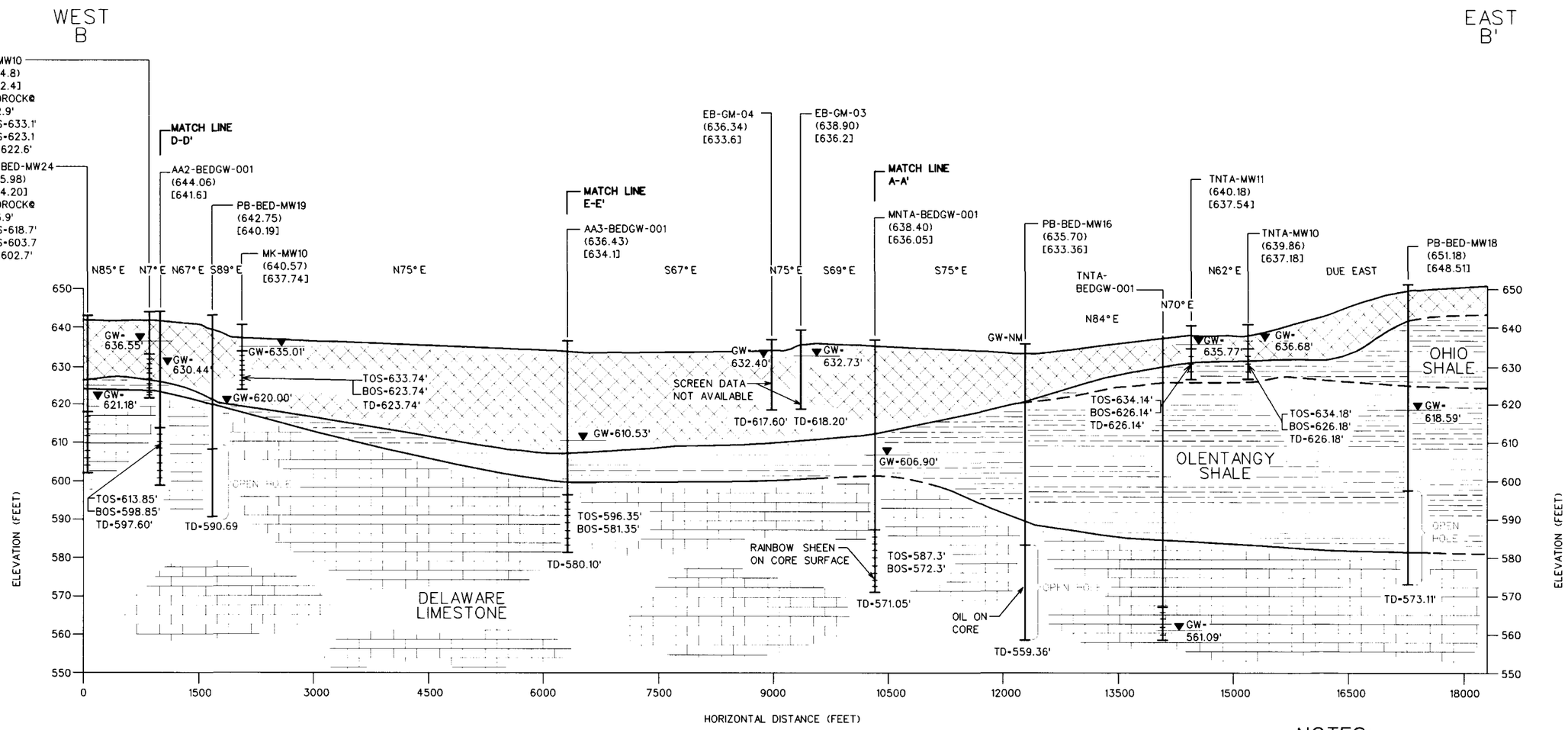
VERTICAL SCALE:

0 30 60 FEET

FIGURE 2-3
GEOLOGIC CROSS-SECTION A-A'

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw Shaw Environmental, Inc.



CROSS SECTION B-B'

NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (1929).
2. REFERENCE- PRELIMINARY OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SERVICES, OPEN FILE MAP BG-D3DG

LEGEND:

OVERBURDEN	
SHALE	
LIMESTONE	
CONTACT AREA UNCERTAIN	
GW=627.68'▼	GROUNDWATER ELEVATION (MAY 4, 2002)

BED-MW15	WELL ID
(631.31)	CASING ELEVATION
[628.76]	GROUND SURFACE ELEVATION
TD=610.80'	BOTTOM OF BOREHOLE ELEVATION
TOS	TOP OF SCREEN
BOS	BOTTOM OF SCREEN
N15° E	BEARING OF CROSS-SECTION SEGMENT
	WELL SCREEN INTERVAL

HORIZONTAL SCALE:
0 1500 3000 FEET

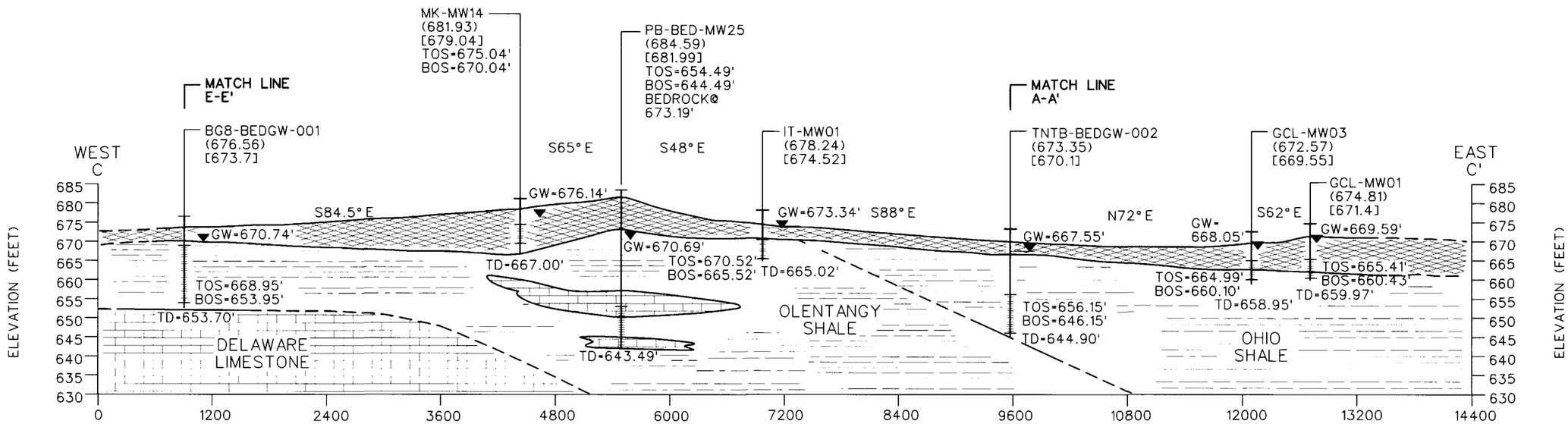
VERTICAL SCALE:
0 30 60 FEET

FIGURE 2-4
GEOLOGIC CROSS-SECTION B-B'

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHCK BY: C. TUVLIN
EN.GR. CHCK BY: D. KESSLER
INIT. ACT. BY: D. KESSLER
PROJ. MGR: S. DOWNLY
DWG. NO.: 147146 es 220
PROJ. NO.: 77148
STARTING DATE: 1/4/99
DATE LAST REV.:
DRAWN BY: R. SPIRES
DRAWN BY:
31 MAR 2003
7/3/04
Issued:



HORIZONTAL DISTANCE (FEET)

CROSS SECTION C-C'

LEGEND:

OVERBURDEN	
SHALE	
LIMESTONE	
CONTACT AREA UNCERTAIN	
GW=627.68'▼	GROUNDWATER ELEVATION (MAY 4, 2002)
BED-MW15	WELL ID
(631.31)	CASING ELEVATION
[628.76]	GROUND SURFACE ELEVATION
TD=610.80'	BOTTOM OF BOREHOLE ELEVATION
TOS	TOP OF SCREEN
BOS	BOTTOM OF SCREEN
N15° E	BEARING OF CROSS-SECTION SEGMENT
	WELL SCREEN INTERVAL

HORIZONTAL SCALE:
0 1200 2400 FEET

VERTICAL SCALE:
0 30 60 FEET

NOTES:

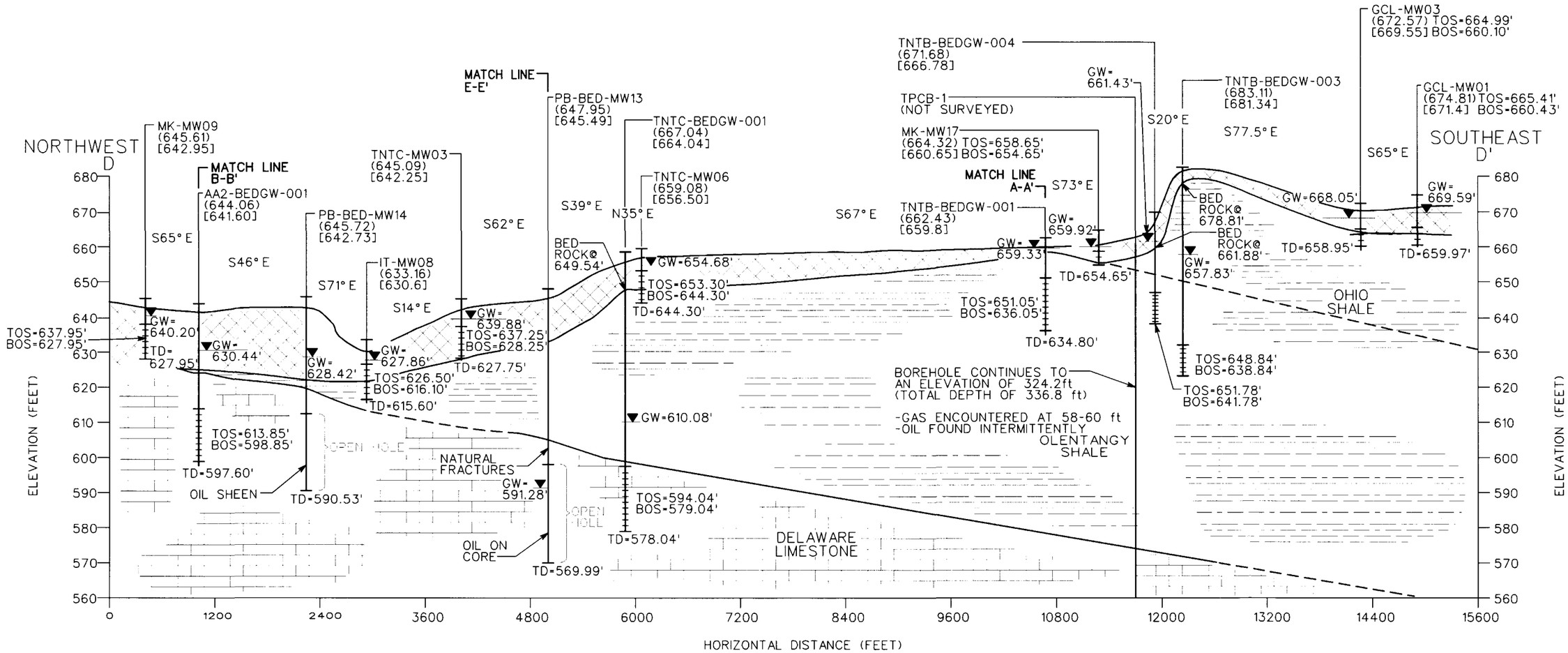
1. ALL ELEVATIONS ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (1929).
2. REFERENCE- PRELIMINARY OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SERVICES, OPEN FILE MAP BG-D3DG

FIGURE 2-5
GEOLOGIC CROSS-SECTION C-C'

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 05/26/99 | DATE LAST REV.: | DRAFT. CHECK BY: C. TUMLIN | INITIALORED: KESSLER | DWG. NO.: 7/1481es.221
DRAWN BY: R. SPRES | DRAWN BY: | ENGR. CHECK BY: D. KESSLER | PROJ. MGR.: S. DOWNEY | PROJ. NO.: 7/1481
3 MAR 2003 7:38:33
Latest: c:\cadd\design\7/1481es.221



CROSS SECTION D-D'

LEGEND:

	OVERBURDEN	BED-MW15	WELL ID
	SHALE	(631.31)	CASING ELEVATION
		[628.76]	GROUND SURFACE ELEVATION
	LIMESTONE	TD=610.80'	BOTTOM OF BOREHOLE ELEVATION
		TOS	TOP OF SCREEN
		BOS	BOTTOM OF SCREEN
	CONTACT AREA UNCERTAIN	N15° E	BEARING OF CROSS-SECTION SEGMENT
GW=627.68'	GROUNDWATER ELEVATION (MAY 4, 2002)		WELL SCREEN INTERVAL

NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (1929).
2. REFERENCE- PRELIMINARY OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SERVICES, OPEN FILE MAP BG-D3DG

HORIZONTAL SCALE:

0 1200 2400 FEET

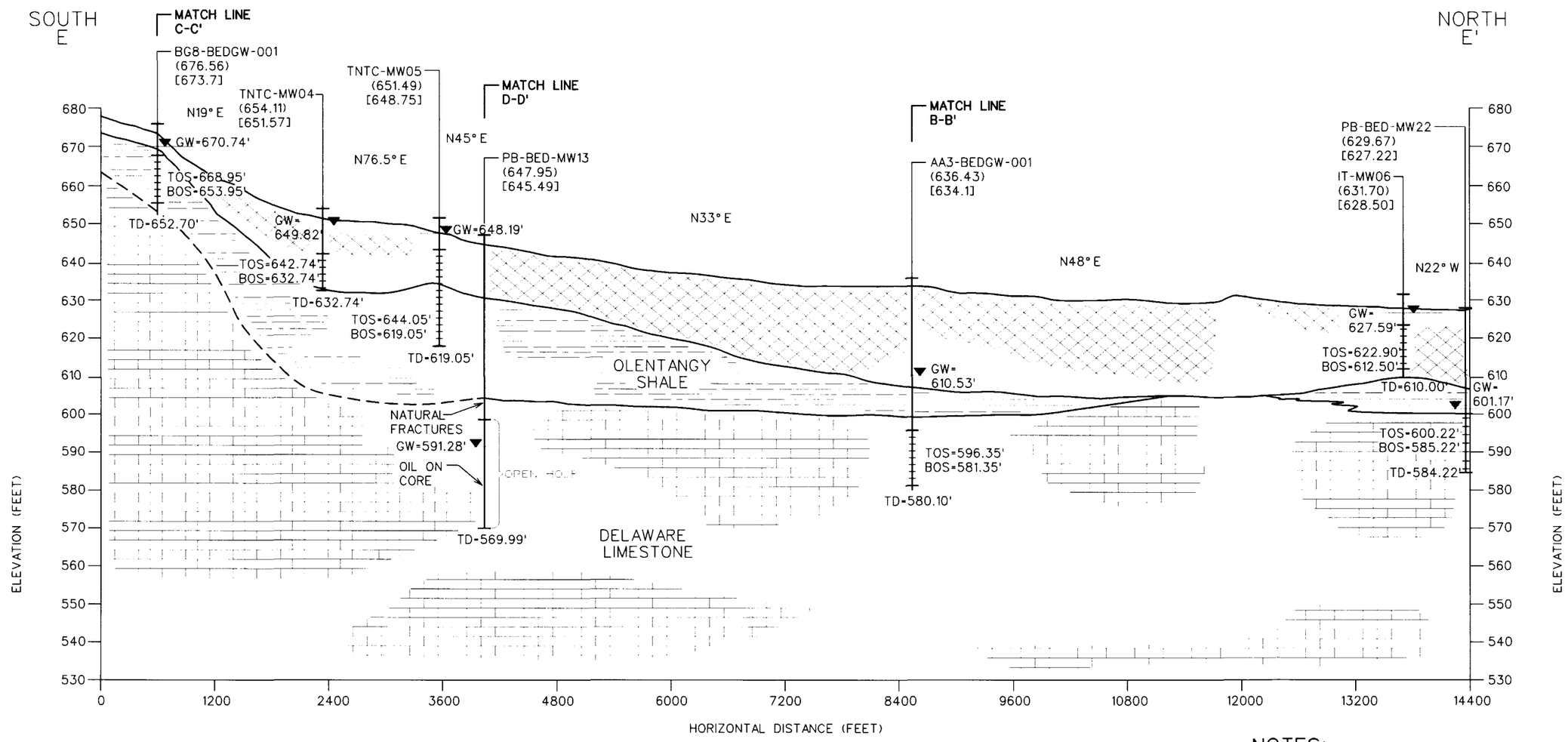
VERTICAL SCALE:

0 30 60 FEET

FIGURE 2-6
GEOLOGIC CROSS-SECTION D-D'

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.



CROSS SECTION E-E'

NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (1929).
2. REFERENCE- PRELIMINARY OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SERVICES, OPEN FILE MAP BG-D3DG

LEGEND:

OVERBURDEN	
SHALE	
LIMESTONE	
CONTACT AREA UNCERTAIN	
GW=627.68'▼	GROUNDWATER ELEVATION (MAY 4, 2002)

BED-MW15	WELL ID
(631.31)	CASING ELEVATION
[628.76]	GROUND SURFACE ELEVATION
TD=610.80'	BOTTOM OF BOREHOLE ELEVATION
TOS	TOP OF SCREEN
BOS	BOTTOM OF SCREEN
N15° E	BEARING OF CROSS-SECTION SEGMENT
	WELL SCREEN INTERVAL

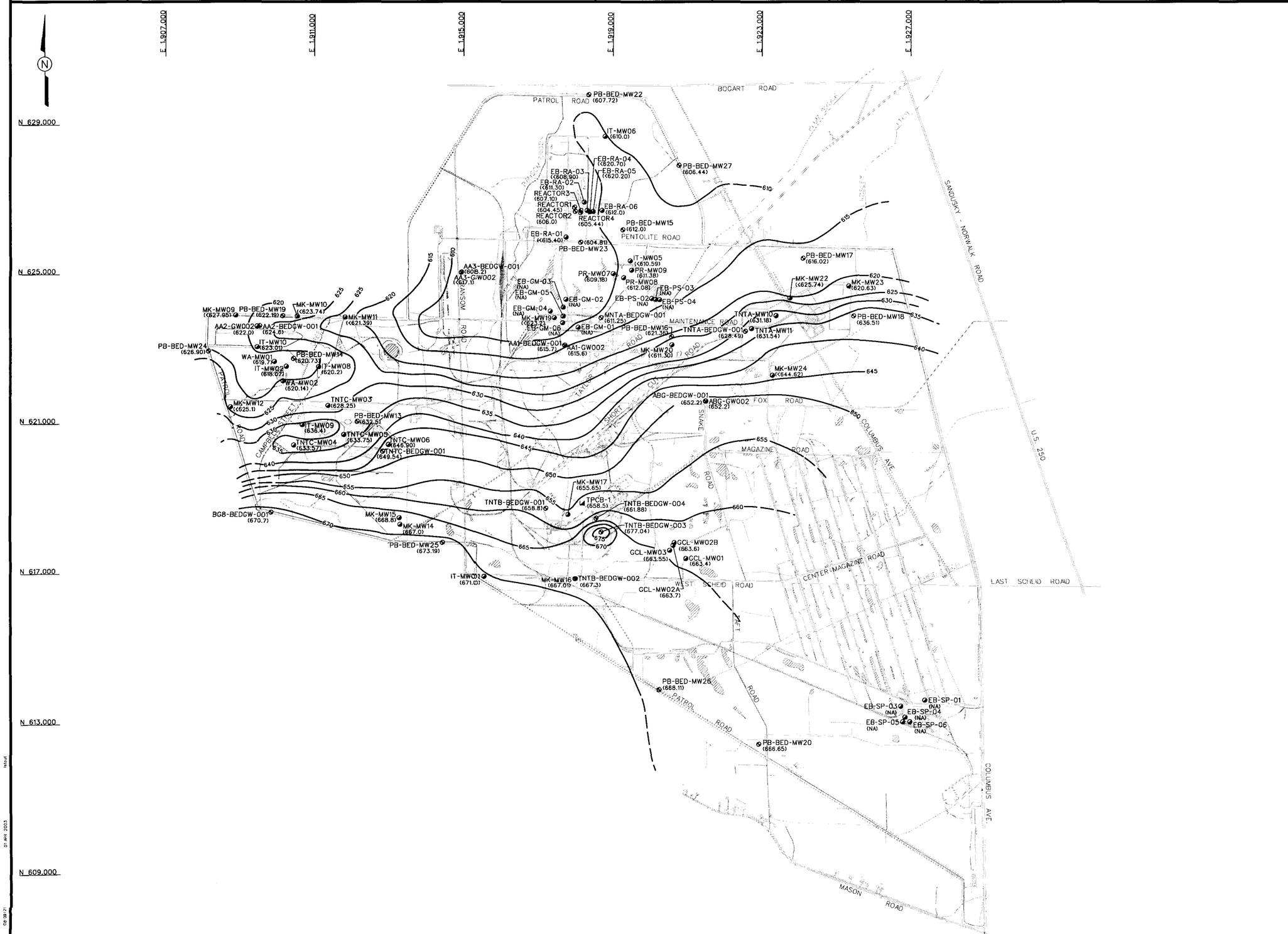
HORIZONTAL SCALE:
0 1200 2400 FEET

VERTICAL SCALE:
0 30 60 FEET

FIGURE 2-7
GEOLOGIC CROSS-SECTION E-E'

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.



LEGEND:

IT-MW06	OVERBURDEN MONITORING WELL LOCATION
ABG-BEDGW-001	BEDROCK MONITORING WELL LOCATION
TPCB-1	SOIL BORING LOCATION
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(621.36)	BEDROCK ELEVATION (FT-MSL)
670	BEDROCK ELEVATION CONTOUR (FT-MSL)
(<610.59)	LESS THAN ELEVATION INDICATED . BORING DID NOT ENCOUNTER BEDROCK.
(NA)	DRILL LOG NOT AVAILABLE

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. SOIL BORING TPCB-1 NOT SURVEYED. APPROXIMATE LOCATION BASED ON FIELD NOTES. LITHOLOGIC DEPTHS USED ONLY FOR CROSS-SECTION CONSTRUCTION.
3. TOP OF BEDROCK ELEVATION MAP BASED ON LITHOLOGY ENCOUNTERED DURING MONITORING WELL INSTALLATION ONLY.

SCALE
0 1200 2400 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APVD

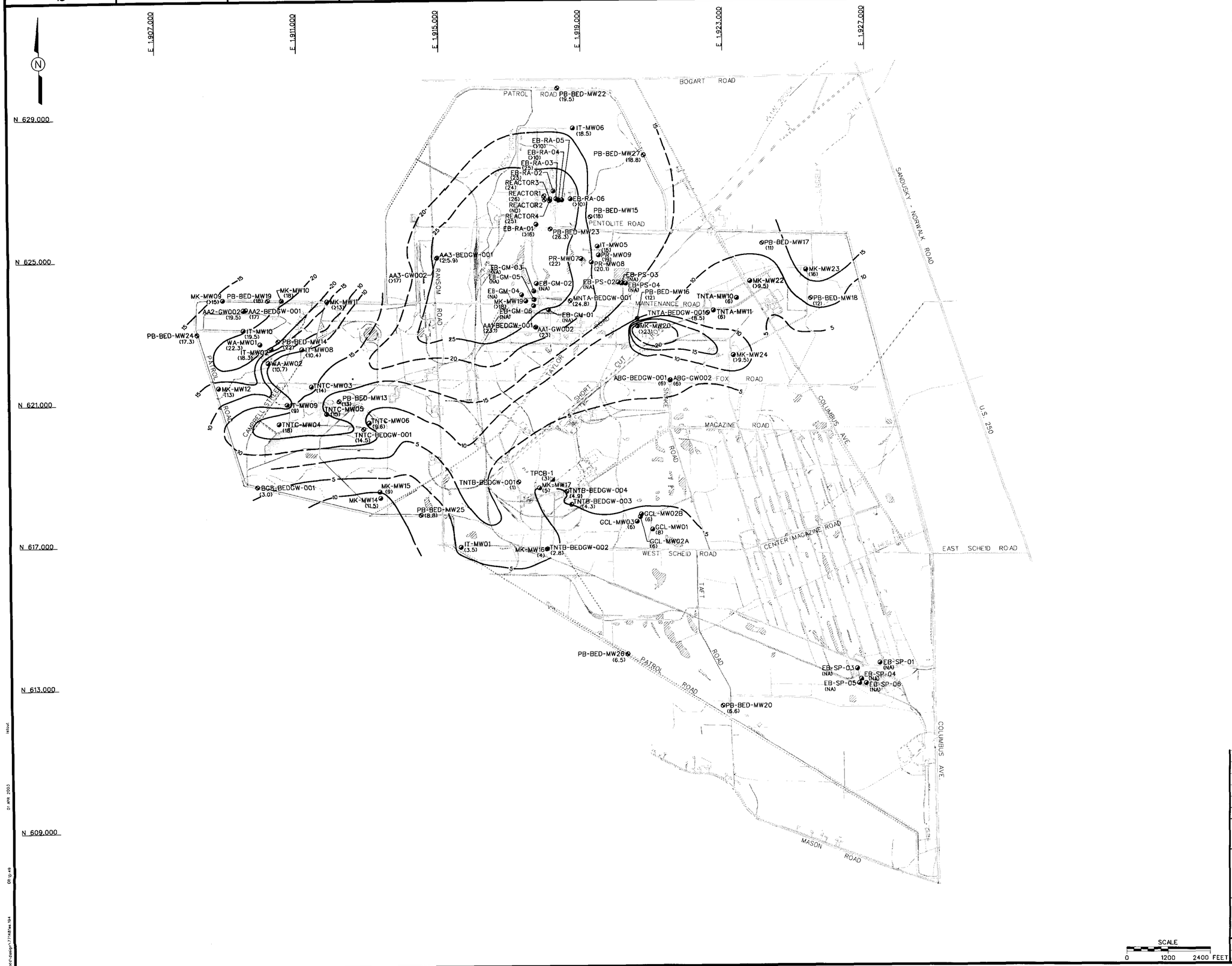
STARTING DATE	INITIATOR	CHKD	DRAWN	CHKD	PROJECT
02/22/02	D. KESSLER	KESSLER	VANDERGRIFF/ C. TUMLIN	MNGR	S. DOWNEY

Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 2-8
TOP OF BEDROCK ELEVATION CONTOUR MAP

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES.195	



LEGEND:

IT-MW06	OVERBURDEN MONITORING WELL LOCATION
ABG-BEDGW-001	BEDROCK MONITORING WELL LOCATION
TPCB-1	SOIL BORING LOCATION
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(6)	OVERBURDEN THICKNESS (FT)
10	OVERBURDEN THICKNESS CONTOUR (FT)
(>17)	GREATER THAN INDICATED THICKNESS
(NA)	DRILL LOG NOT AVAILABLE

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. SOIL BORING TPCB-1 NOT SURVEYED. APPROXIMATE LOCATION BASED ON FIELD NOTES. LITHOLOGIC DEPTHS USED ONLY FOR CROSS-SECTION CONSTRUCTION.

SCALE
0 1200 2400 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

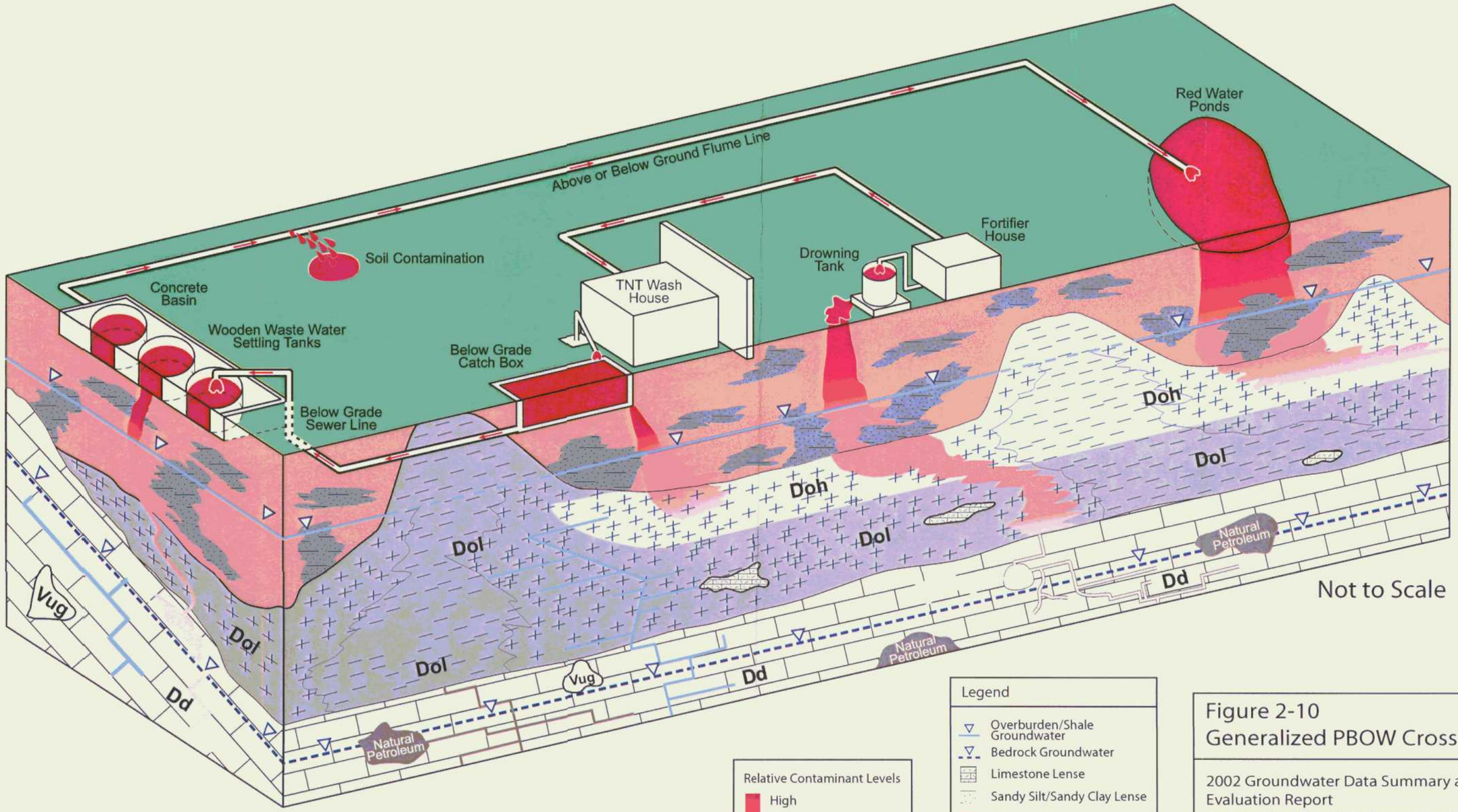
STARTING DATE	INITIATOR	CHKD	DRAWN	CHKD	PROJ CT
02/22/02	D. KESSLER	KESSLER	VANDERGRIFT	C. TUMLIN	MNGR S. DOWNEY

Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 2-9
OVERBURDEN THICKNESS CONTOUR MAP

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES.194	



Relative Contaminant Levels

High

Low

Legend

- Overburden/Shale Groundwater
- Bedrock Groundwater
- Limestone Lense
- Sandy Silt/Sandy Clay Lense
- Silt/Clay/Shale Fragments
- Weathered Shale
- Competentz Shale

Doh - Ohio Shale
Dol - Olentangy Shale (Prout and Olentangy Shale Members)
Dd- Delaware Limestone

Figure 2-10
Generalized PBOW Cross-Section

2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

plumbrook_csm_061603.ai

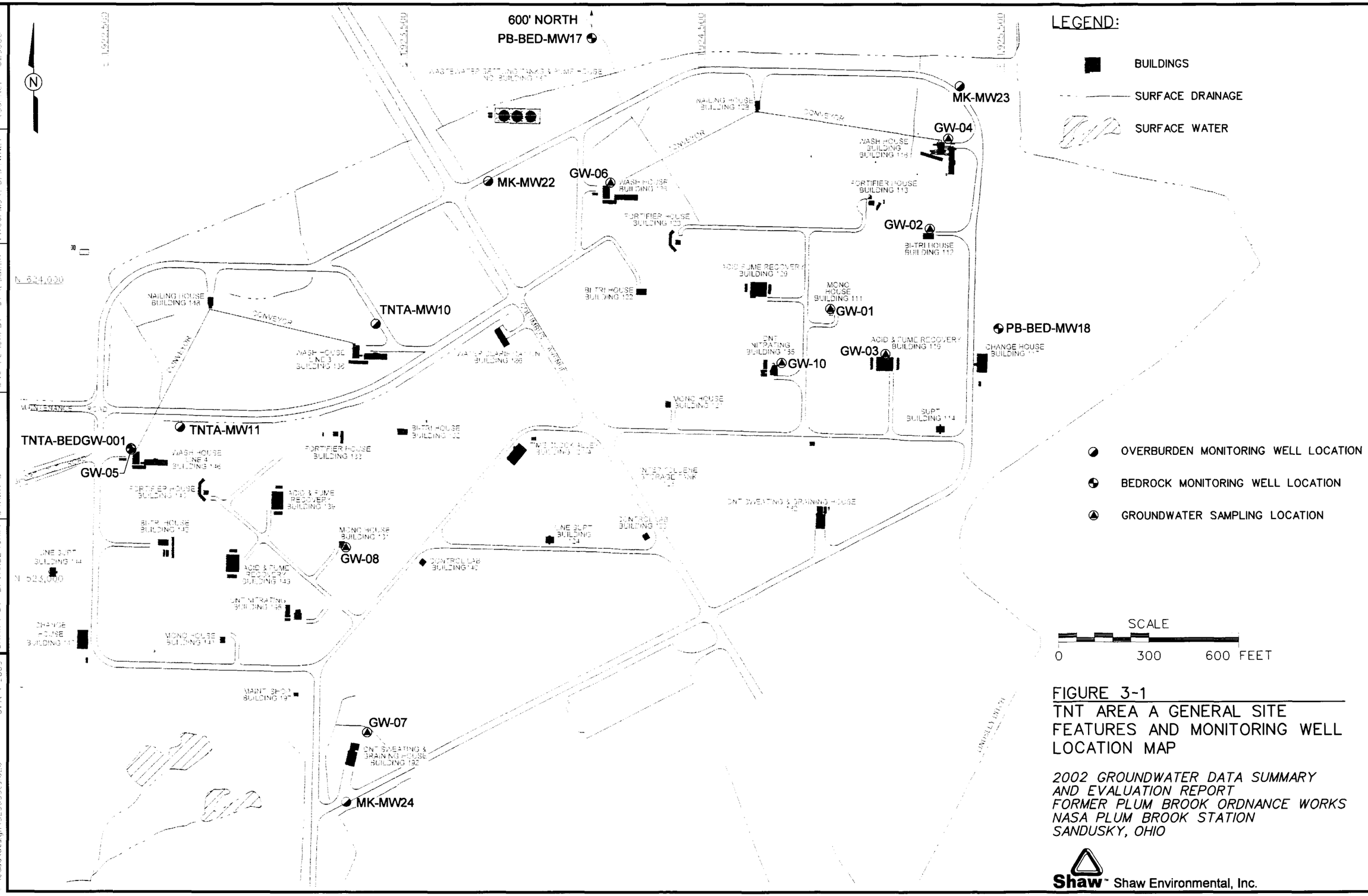


FIGURE 3-1
TNT AREA A GENERAL SITE FEATURES AND MONITORING WELL LOCATION MAP

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

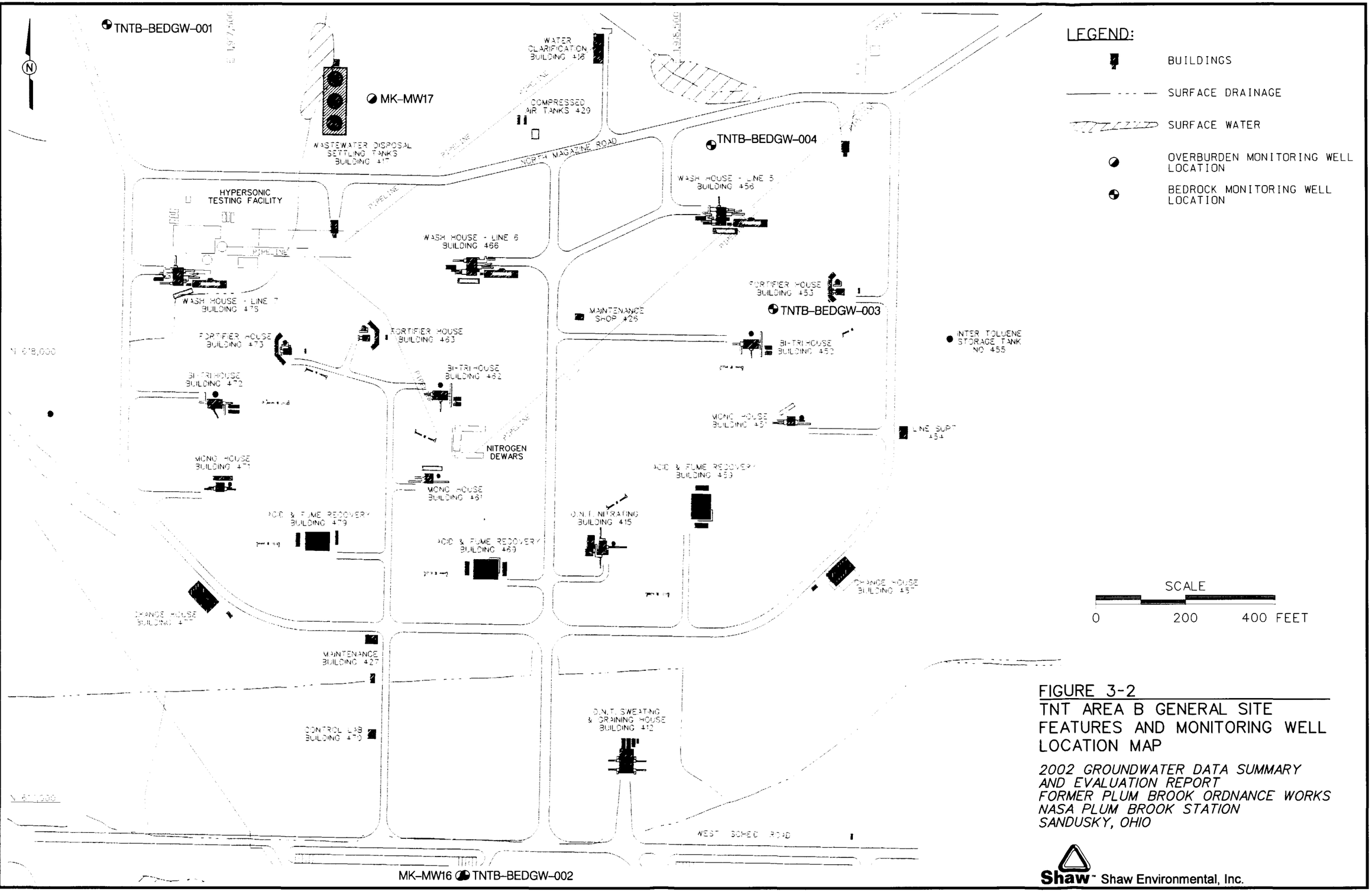


FIGURE 3-2
TNT AREA B GENERAL SITE FEATURES AND MONITORING WELL LOCATION MAP

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 02/21/02 | DATE LAST REV: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: D. KESSLER | DWG. NO.: 8246355.025
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: D. KESSLER | PROJ. MGR.: S. DRAWNEY | PROJ. NO.: 8246355
01 APR 2003 | 09:12:27
\\coldivdesign\8256355\025
Sheet

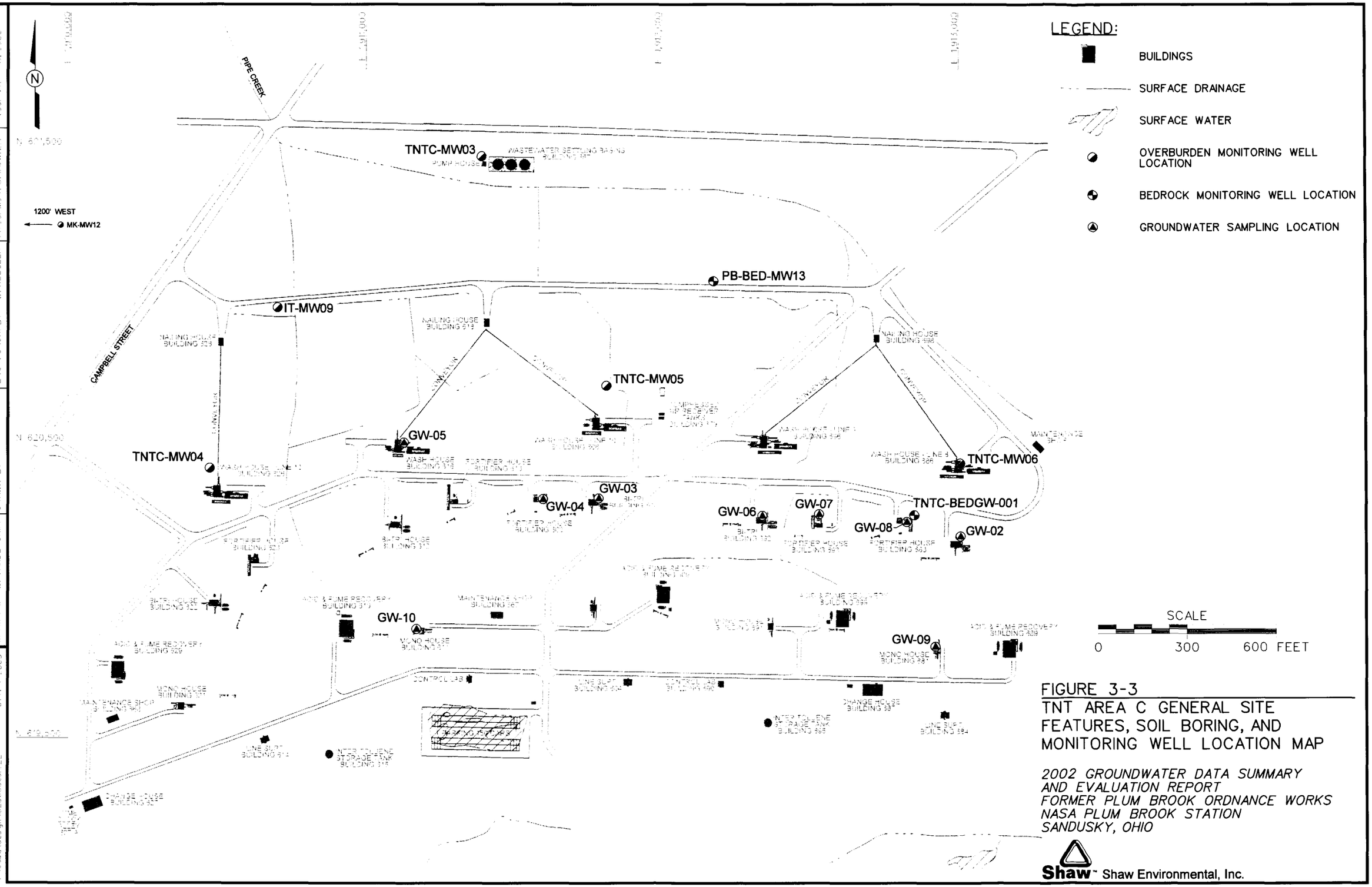
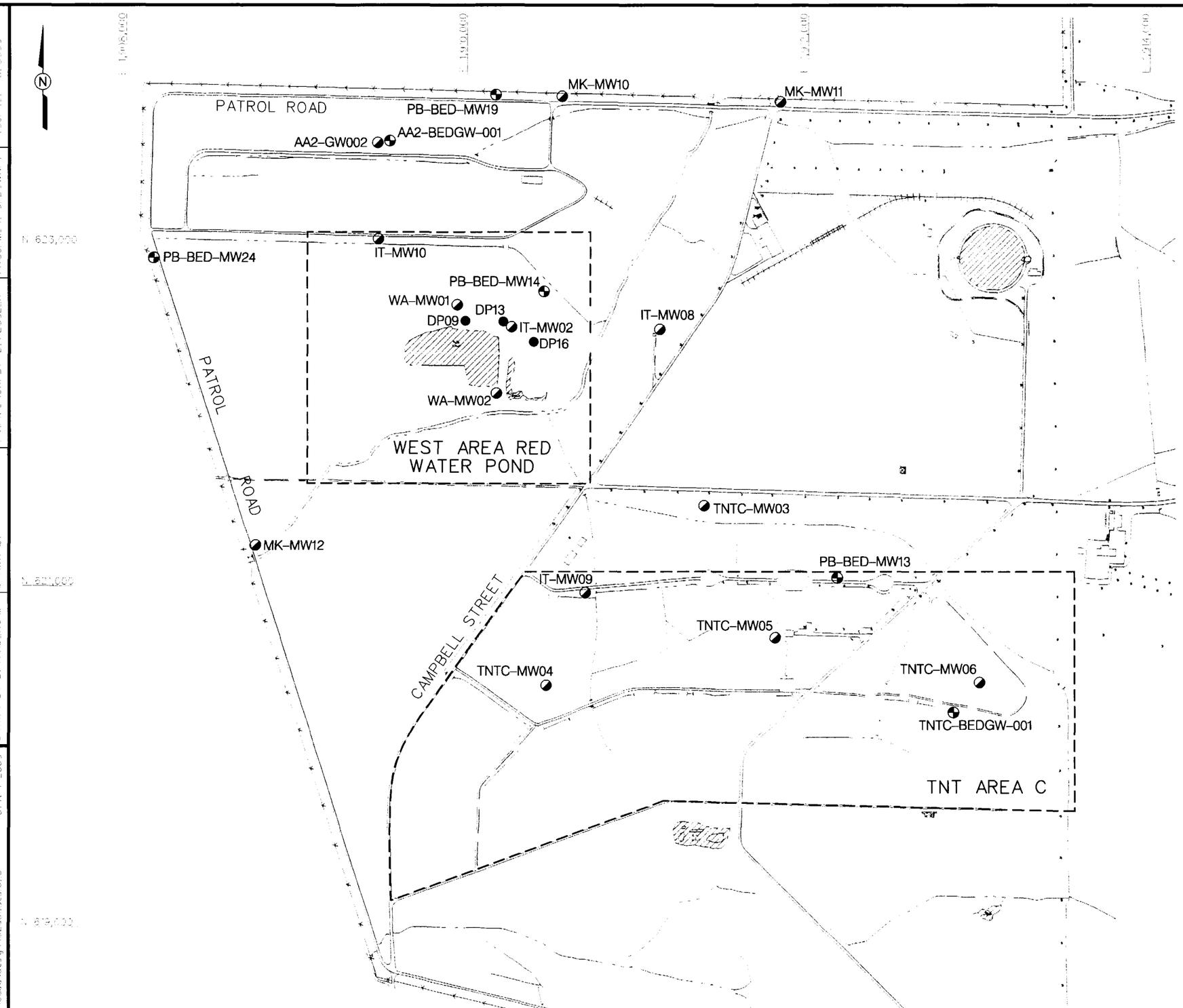


FIGURE 3-3
TNT AREA C GENERAL SITE FEATURES, SOIL BORING, AND MONITORING WELL LOCATION MAP

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.



LEGEND:

- BUILDINGS
- FENCE (PBOW BOUNDARY)
- RAILROAD
- DRAINAGE
- OVERBURDEN MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- DIRECT PUSH LOCATION
- SURFACE WATER

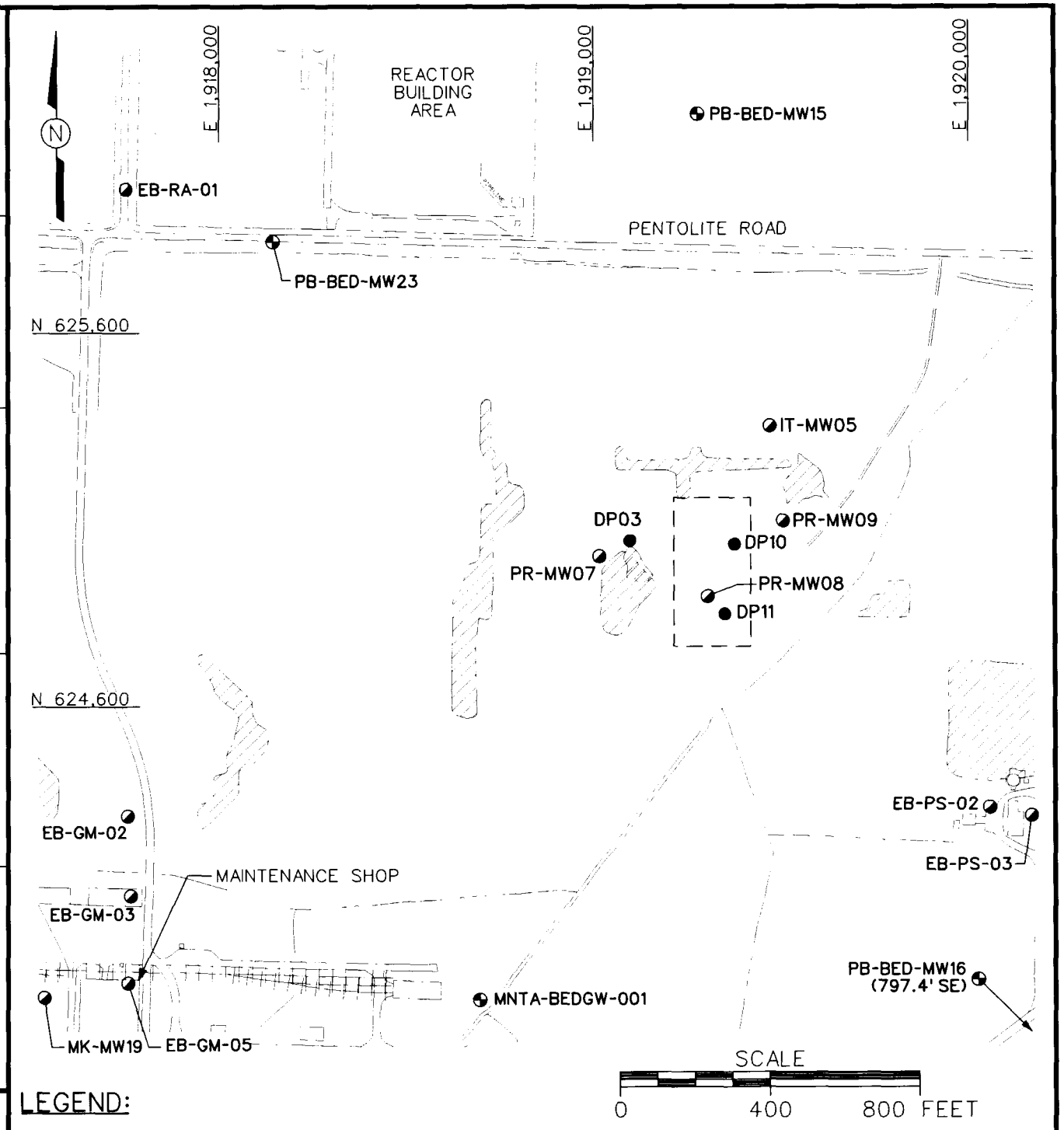
SCALE

0 600 1200 FEET

FIGURE 3-4
WEST AREA RED WATER PONDS AND TNT AREA C MONITORING WELL LOCATION MAP

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.



LEGEND:

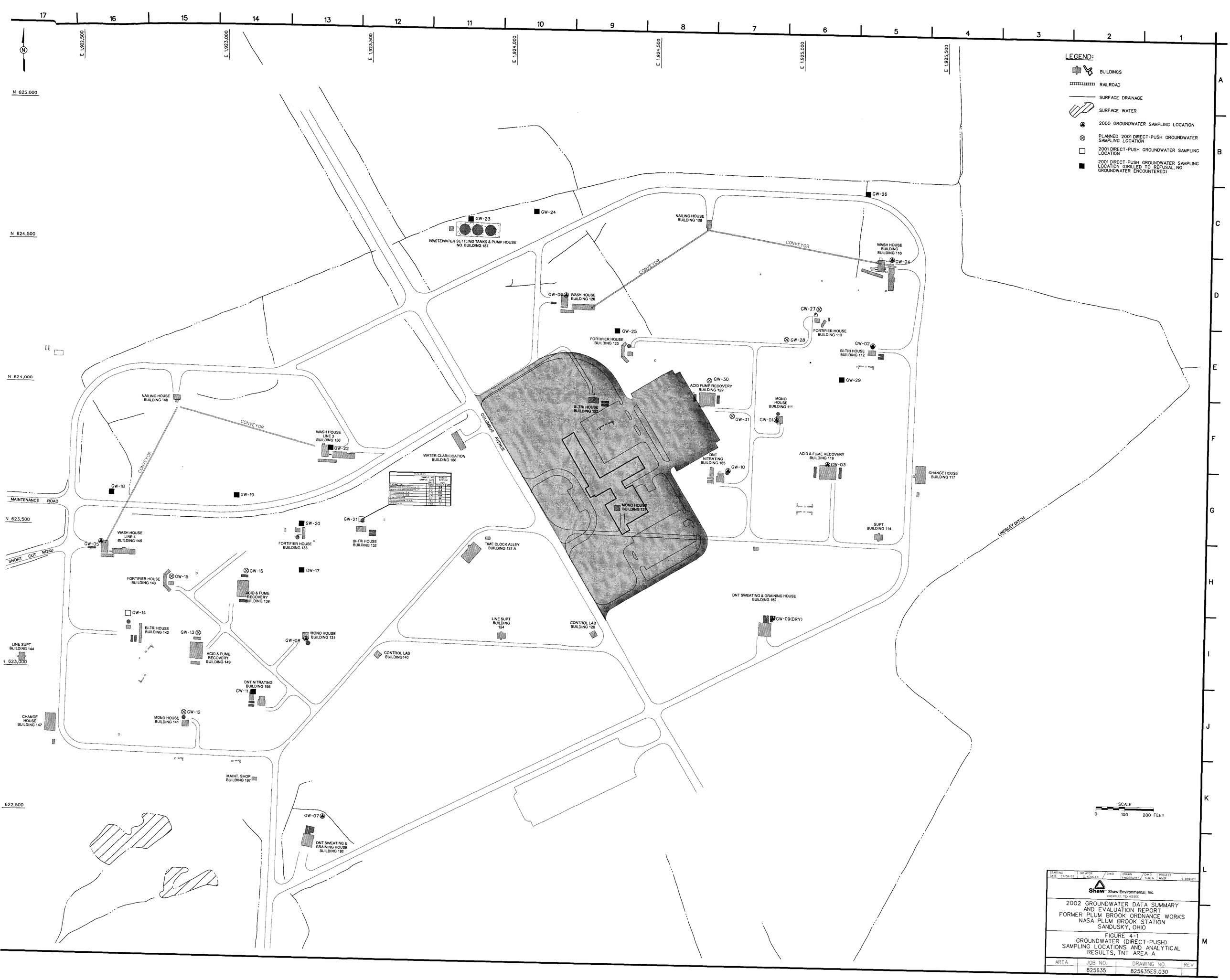
- BUILDINGS
- RAILROAD
- SURFACE WATER
- SURFACE WATER DRAINAGE
- APPROXIMATE HISTORICAL LOCATION OF PONDS
- FENCE (PBOW BOUNDARY)
- OVERBURDEN MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- DIRECT PUSH LOCATION

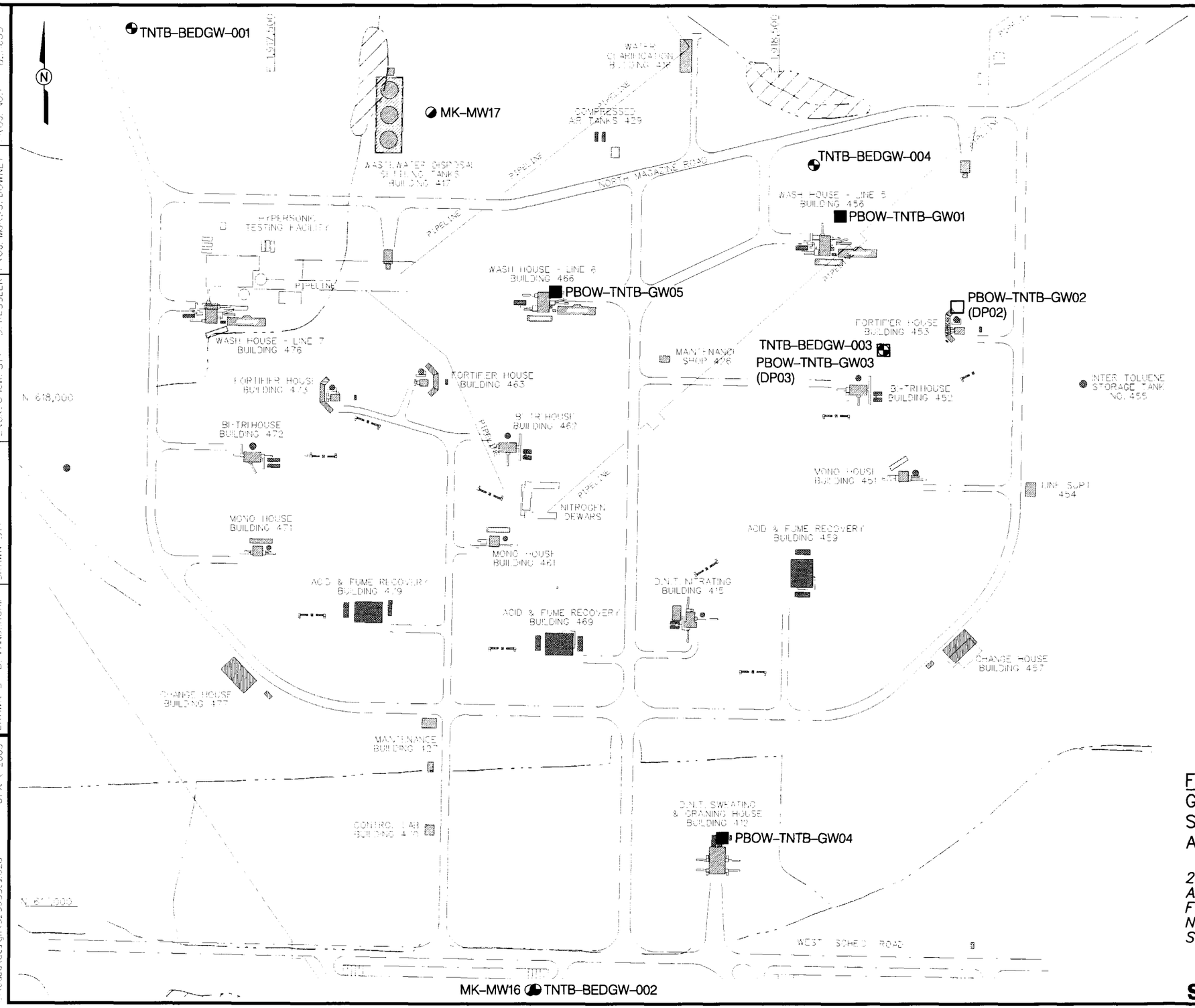
FIGURE 3-5
PENTOLITE ROAD RED WATER PONDS MONITORING WELL LOCATION MAP

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHECK BY: C. TUMLIN | INITIATOR: D. KESSLER | DWG. NO.: N0256.35ES.014
ENGR. CHECK BY: D. KESSLER | PROJ. MGR.: S. DOWNEY | PROJ. NO.: 8256.35
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 02/22/02 | DRAWN BY: B. VANDERGRIFF
02 APR 2003
C:\ACADVLESIGN\8256.35ES.014


LEGEND:
BUILDINGS
RAILROAD
SURFACE DRAINAGE
SURFACE WATER
2000 GROUNDWATER SAMPLING LOCATION
PLANNED 2001 DIRECT-PUSH GROUNDWATER SAMPLING LOCATION
2001 DIRECT-PUSH GROUNDWATER SAMPLING LOCATION
2001 DIRECT-PUSH GROUNDWATER SAMPLING LOCATION (DRILLED TO REFUSAL, NO GROUNDWATER ENCOUNTERED)
N 625,000
N 624,500
N 624,000
N 623,500
N 623,000
622,500
E 1,922,500
E 1,923,000
E 1,923,500
E 1,924,000
E 1,924,500
E 1,925,000
E 1,925,500
GW-23
WASTEWATER SETTLING TANKS & PUMP HOUSE NO. BUILDING 187
GW-24
GW-26
NAILING HOUSE BUILDING 128
CONVEYOR
WASH HOUSE BUILDING BUILDING 116
GW-04
GW-06
WASH HOUSE BUILDING 126
GW-27
FORTIFIER HOUSE BUILDING 113
GW-25
FORTIFIER HOUSE BUILDING 123
GW-28
GW-02
BI-TRI HOUSE BUILDING 112
GW-29
GW-30
ACID FUME RECOVERY BUILDING 129
BI-TRI HOUSE BUILDING 122
MONO HOUSE BUILDING 111
GW-01
GW-31
NAILING HOUSE BUILDING 148
WASH HOUSE LINE 3 BUILDING 136
GW-22
COLUMBUS AVENUE
WATER CLARIFICATION BUILDING 186
DNT NITRATING BUILDING 185
GW-10
ACID & FUME RECOVERY BUILDING 119
GW-03
CHANGE HOUSE BUILDING 117
GW-18
GW-19
MAINTENANCE ROAD
MONO HOUSE BUILDING 121
SUPT. BUILDING 114
LINDSLEY DITCH
GW-20
GW-21
FORTIFIER HOUSE BUILDING 133
BI-TRI HOUSE BUILDING 132
TIME CLOCK ALLEY BUILDING 127-A
GW-05
WASH HOUSE LINE 4 BUILDING 146
SHORT CUT ROAD
GW-16
GW-17
FORTIFIER HOUSE BUILDING 143
GW-15
ACID & FUME RECOVERY BUILDING 139
DNT SWEATING & GRAINING HOUSE BUILDING 182
GW-14
BI-TRI HOUSE BUILDING 142
GW-13
MONO HOUSE BUILDING 131
GW-08
LINE SUPT. BUILDING 124
CONTROL LAB BUILDING 120
GW-09(DRY)
LINE SUPT. BUILDING 144
ACID & FUME RECOVERY BUILDING 149
CONTROL LAB BUILDING140
DNT NITRATING BUILDING 195
GW-11
GW-12
CHANGE HOUSE BUILDING 147
MONO HOUSE BUILDING 141
MAINT. SHOP BUILDING 197
GW-07
DNT SWEATING & GRAINING HOUSE BUILDING 192
SCALE
0 100 200 FEET
STARTING DATE 07/08/02
INITIATOR C. KESSLER
CHKD
DRAWN V.WATERHOUSE
CHKD T.MILLIN
PROJECT MNGR S. DOWNEY
Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO
FIGURE 4-1
GROUNDWATER (DIRECT-PUSH) SAMPLING LOCATIONS AND ANALYTICAL RESULTS, TNT AREA A
AREA
JOB NO. 825635
DRAWING NO. 825635ES.030
REV



LEGEND:

- BUILDINGS
- SURFACE DRAINAGE
- SURFACE WATER
- OVERBURDEN MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- 2001 DIRECT-PUSH GROUNDWATER SAMPLING LOCATION
- 2001 DIRECT-PUSH GROUNDWATER SAMPLING LOCATION (DRILLED TO REFUSAL, NO GROUNDWATER ENCOUNTERED)

NOTE:

NO SHADOW BOXES FOR GROUNDWATER ANALYTICAL (DIRECT-PUSH) BECAUSE VALUES WERE BELOW RBSC LIMITS.

SCALE

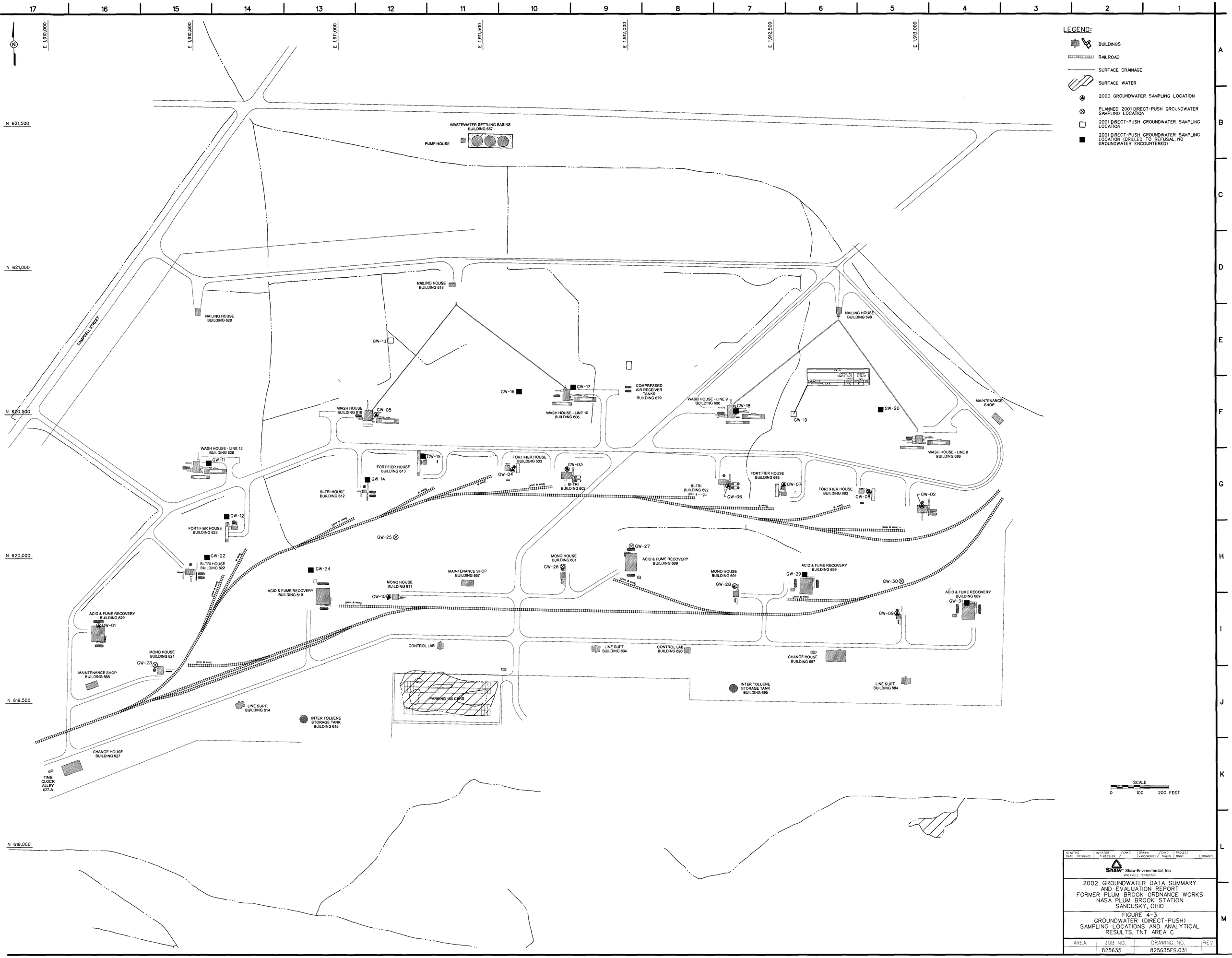
0 200 400 FEET

FIGURE 4-2

GROUNDWATER (DIRECT-PUSH) SAMPLING LOCATIONS AND ANALYTICAL RESULTS, TNT AREA B

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.



STARTING DATE 07/08/02	INITIATOR D. KESSLER	CHKD	DRAWN VANDERCRIFT	CHKD TUMLIN	PROJECT MNGR S. DOWNEY

Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 4-3
GROUNDWATER (DIRECT-PUSH)
SAMPLING LOCATIONS AND ANALYTICAL
RESULTS, TNT AREA C

AREA	JOB NO.	DRAWING NO.	REV
	825635	825635ES.031	

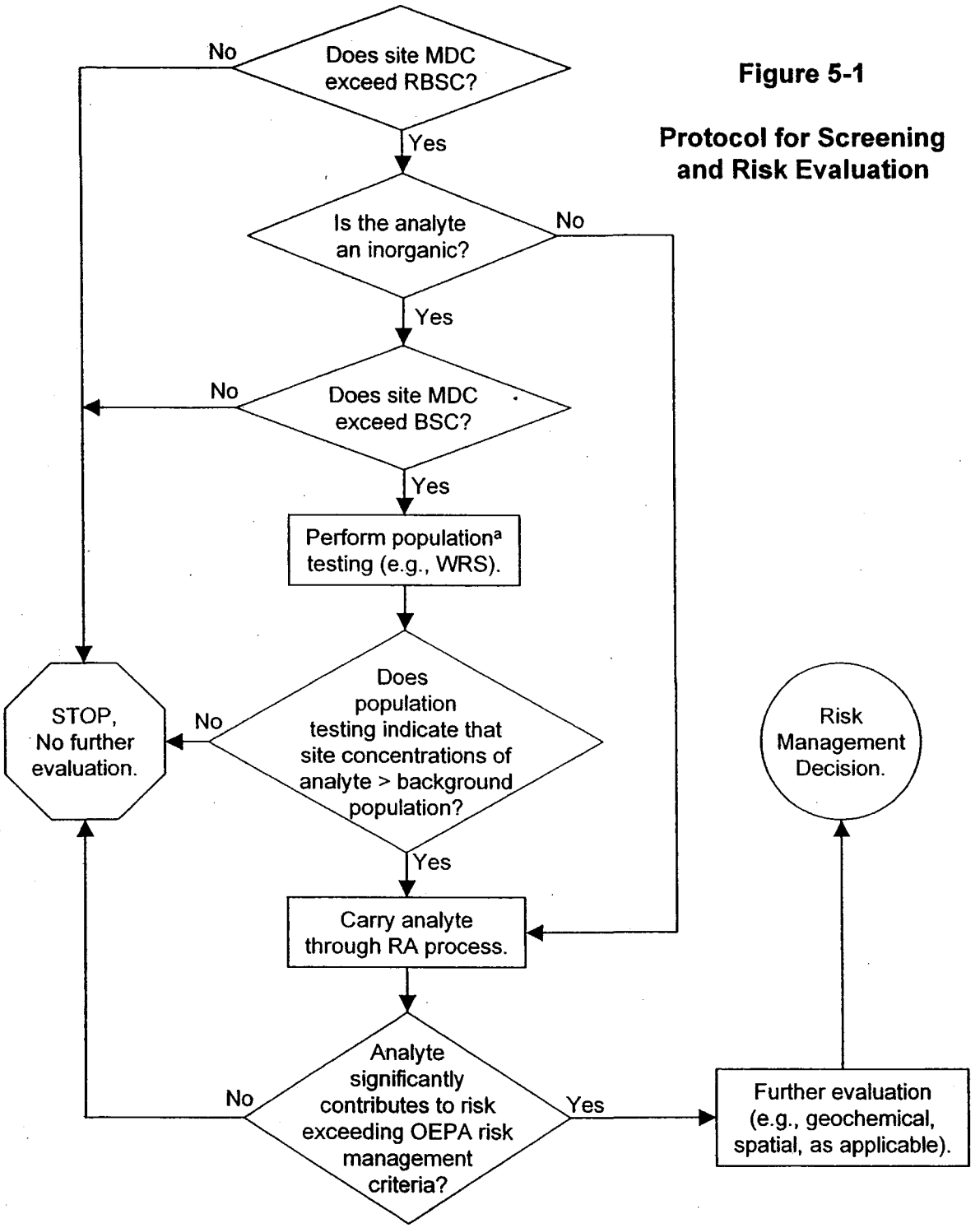


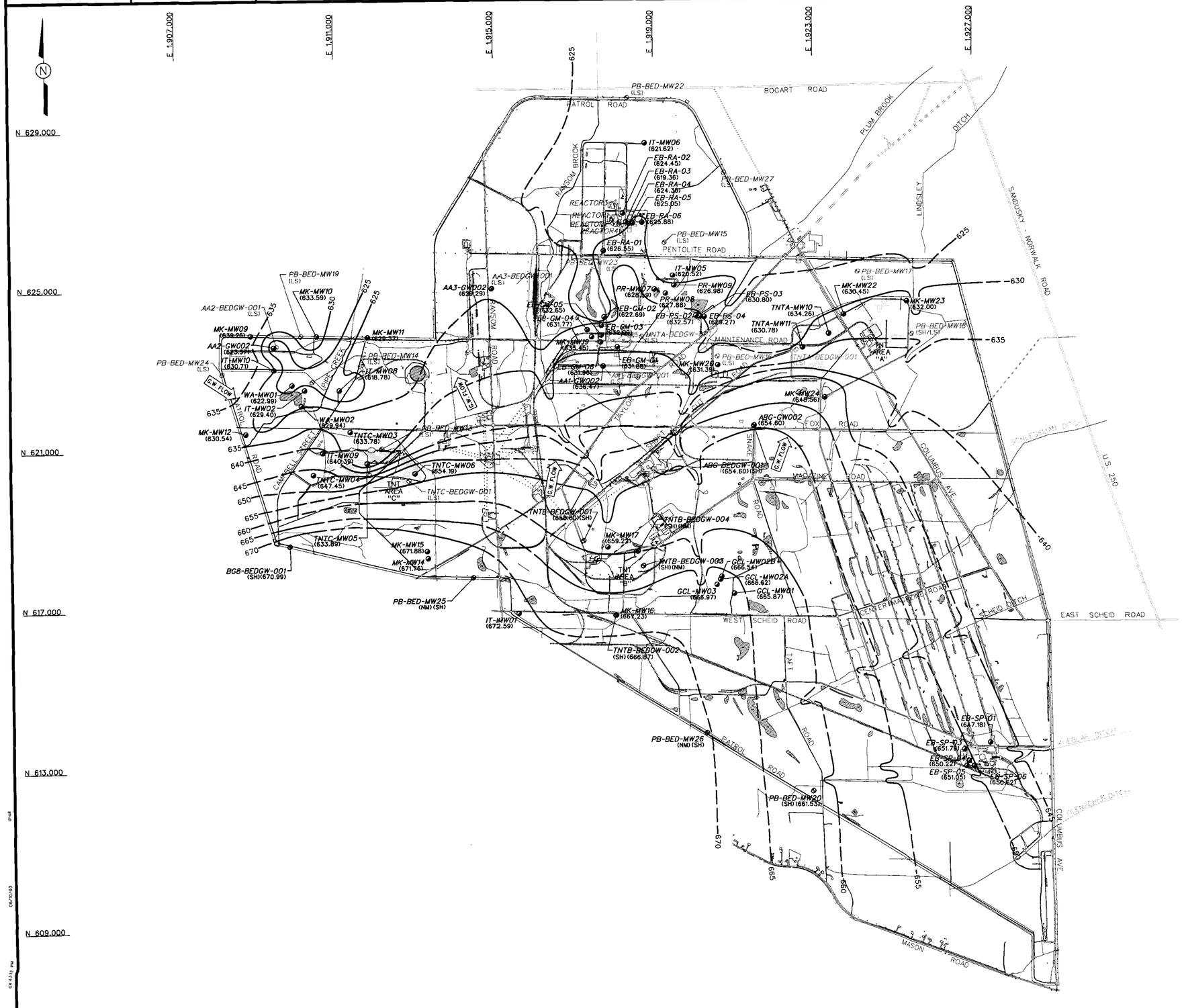
Figure 5-1

Protocol for Screening and Risk Evaluation

Notes:

[a] A judgment may be made at this step to forego or modify population testing if the site data is clearly greater than background and/or individual exceedances suggest the presence of a hot spot. In such cases, the analyte would be carried into the risk assessment process.

BSC - Background screening concentration.
MDC - Maximum detected concentration.
OEPA - Ohio Environmental Protection Agency.
RA - Risk assessment.
RBSC - Risk-based screening concentration.
WRS - Wilcoxon rank sum (test).



LEGEND:

ABG-GW002	OVERBURDEN MONITORING WELL
TNTC-BEDGW-001 (LS)	BEDROCK MONITORING WELL SCREENED IN LIMESTONE
ABG-BEDGW-001 (SH)	BEDROCK MONITORING WELL SCREENED IN SHALE
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(630.45)	GROUNDWATER ELEVATION (FT-MSL)
630	GROUNDWATER ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
G.W. FLOW	GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. GROUNDWATER ELEVATION CONTOURS REFLECT THE INFLUENCE OF TOPOGRAPHY, INCLUDING DITCHES AND STREAMS; HOWEVER, TOPOGRAPHIC ELEVATION CONTOURS HAVE BEEN OMITTED FOR CLARITY.
3. BEDROCK MONITORING WELLS WITH (SH) DESIGNATION INDICATE THAT SCREEN IS IN SHALE BEDROCK. GROUNDWATER LEVELS FROM (SH) WELLS USED IN CONTOURING.
4. LINES DASHED WHERE OVERBURDEN GROUNDWATER EXISTENCE OR LOCATION IS UNCERTAIN.

SCALE
0 1200 2400 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

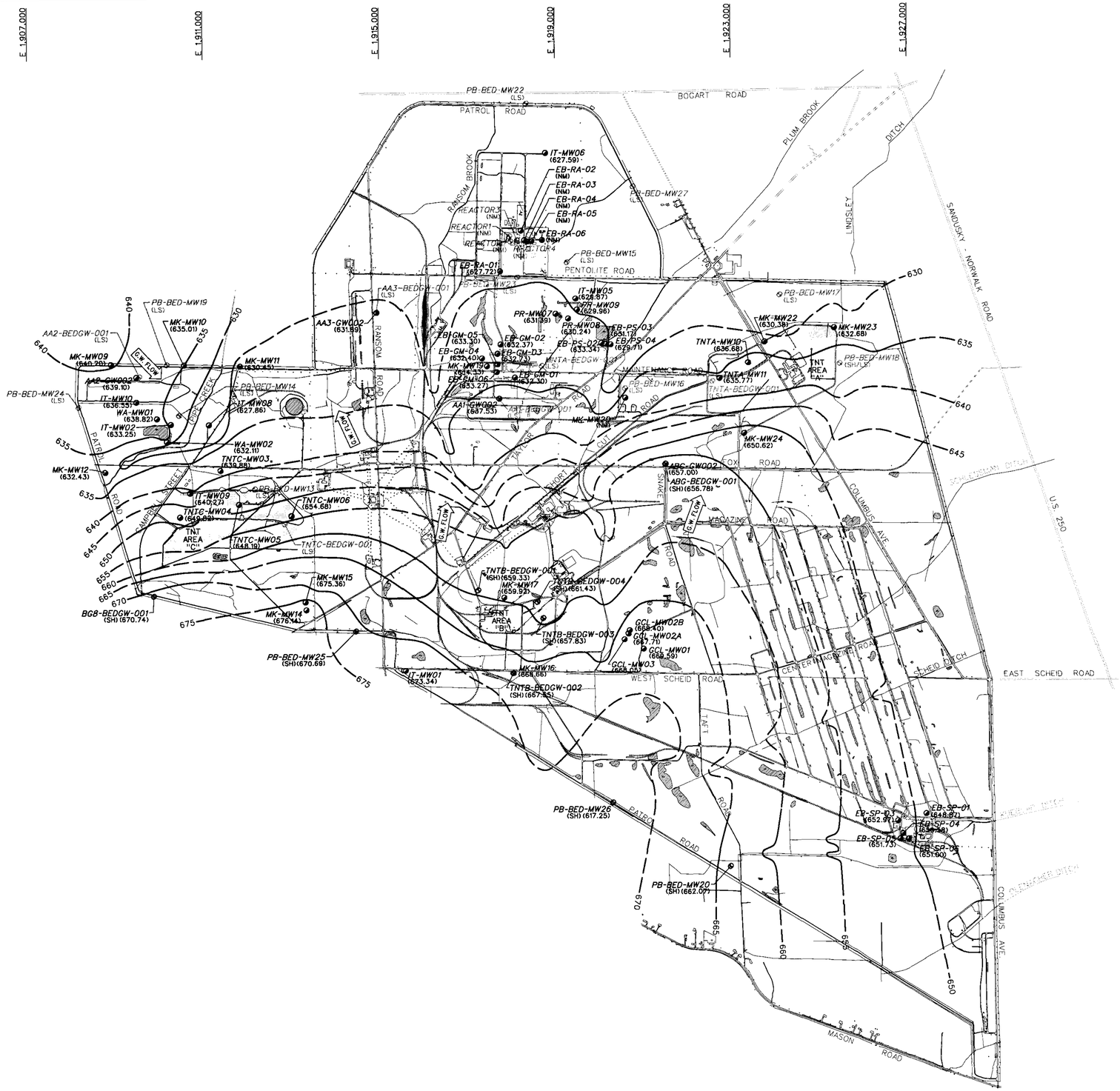
STARTING DATE 03/06/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFT | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 6-1
OVERBURDEN SHALE
GROUNDWATER ELEVATION CONTOUR MAP
(NOVEMBER 2001)

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES200A.DGN	



LEGEND:

ABG-GW002	OVERBURDEN MONITORING WELL
TNTC-BEDGW-001 (LS)	BEDROCK MONITORING WELL SCREENED IN LIMESTONE
ABG-BEDGW-001 (SH)	BEDROCK MONITORING WELL SCREENED IN SHALE
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(630.45)	GROUNDWATER ELEVATION (FT-MSL)
630	GROUNDWATER ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
C.W. FLOW	GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. GROUNDWATER ELEVATION CONTOURS REFLECT THE INFLUENCE OF TOPOGRAPHY, INCLUDING DITCHES AND STREAMS; HOWEVER, TOPOGRAPHIC ELEVATION CONTOURS HAVE BEEN OMITTED FOR CLARITY.
3. MONITORING WELL PB-BED-MW26 WAS NOT USED FOR GROUNDWATER ELEVATION CONTOURING.
4. BEDROCK MONITORING WELLS WITH (SH) DESIGNATION INDICATE THAT SCREEN IS IN SHALE BEDROCK. GROUNDWATER LEVELS FROM (SH) WELLS USED IN CONTOURING.
5. LINES DASHED WHERE OVERBURDEN GROUNDWATER EXISTENCE OR LOCATION IS UNCERTAIN.

SCALE
0 1200 2400 FEET

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 07/24/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFF | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

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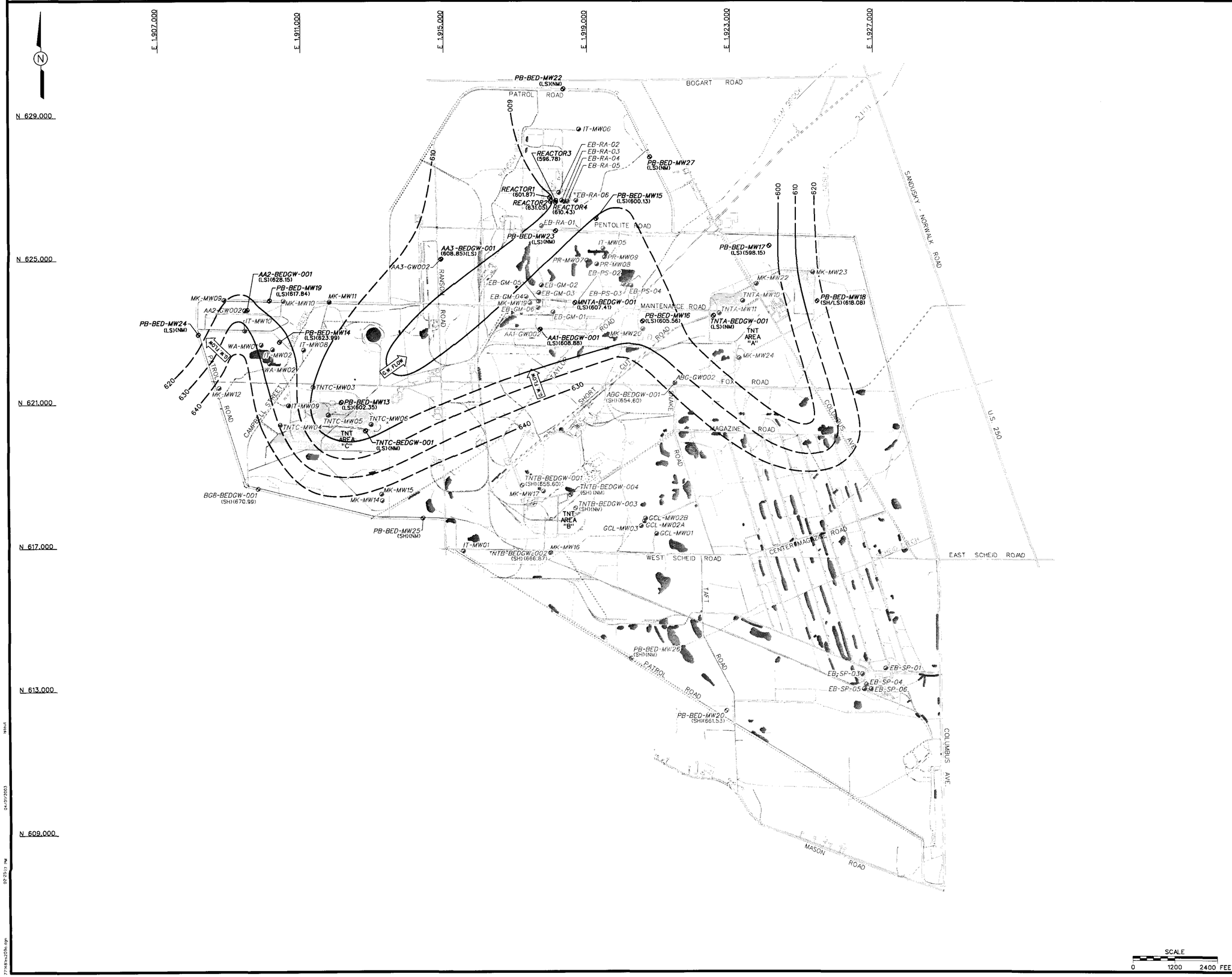
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 6-2
OVERBURDEN SHALE
GROUNDWATER ELEVATION
CONTOUR MAP (MAY 2002)

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES217.DGN	



LEGEND:

ABG-GW002	OVERBURDEN MONITORING WELL
TNTC-BEDGW-001 (LS)	BEDROCK MONITORING WELL SCREENED IN LIMESTONE
ABG-BEDGW-001 (SH)	BEDROCK MONITORING WELL SCREENED IN SHALE
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(630.45)	GROUNDWATER ELEVATION (FT-MSL)
630	GROUNDWATER ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
G.W. FLOW	GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. MONITORING WELLS REACTOR 2 AND REACTOR 4 WERE NOT USED FOR GROUNDWATER ELEVATION CONTOURING.
3. TYPE OF BEDROCK MONITORING WELLS ARE SCREENED IN IS INDICATED BY (SH) - SHALE AND (LS) - LIMESTONE.
4. MONITORING WELLS WITH (SH) DESIGNATION NOT INCLUDED IN CONTOURING.
5. DASHED LINES INDICATE UNCERTAIN GROUNDWATER LEVEL ELEVATION.
6. GROUNDWATER LEVEL ELEVATIONS FROM BEDROCK MONITORING WELLS TNTA-BEDGW-001, TNTC-BEDGW-001, PB-BED-MW22, PB-BED-MW23, PB-BED-MW24, AND PB-BED-MW27 INFERRED FROM MAY 2002 DATA.

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 03/05/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFT | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

Shaw Environmental, Inc.
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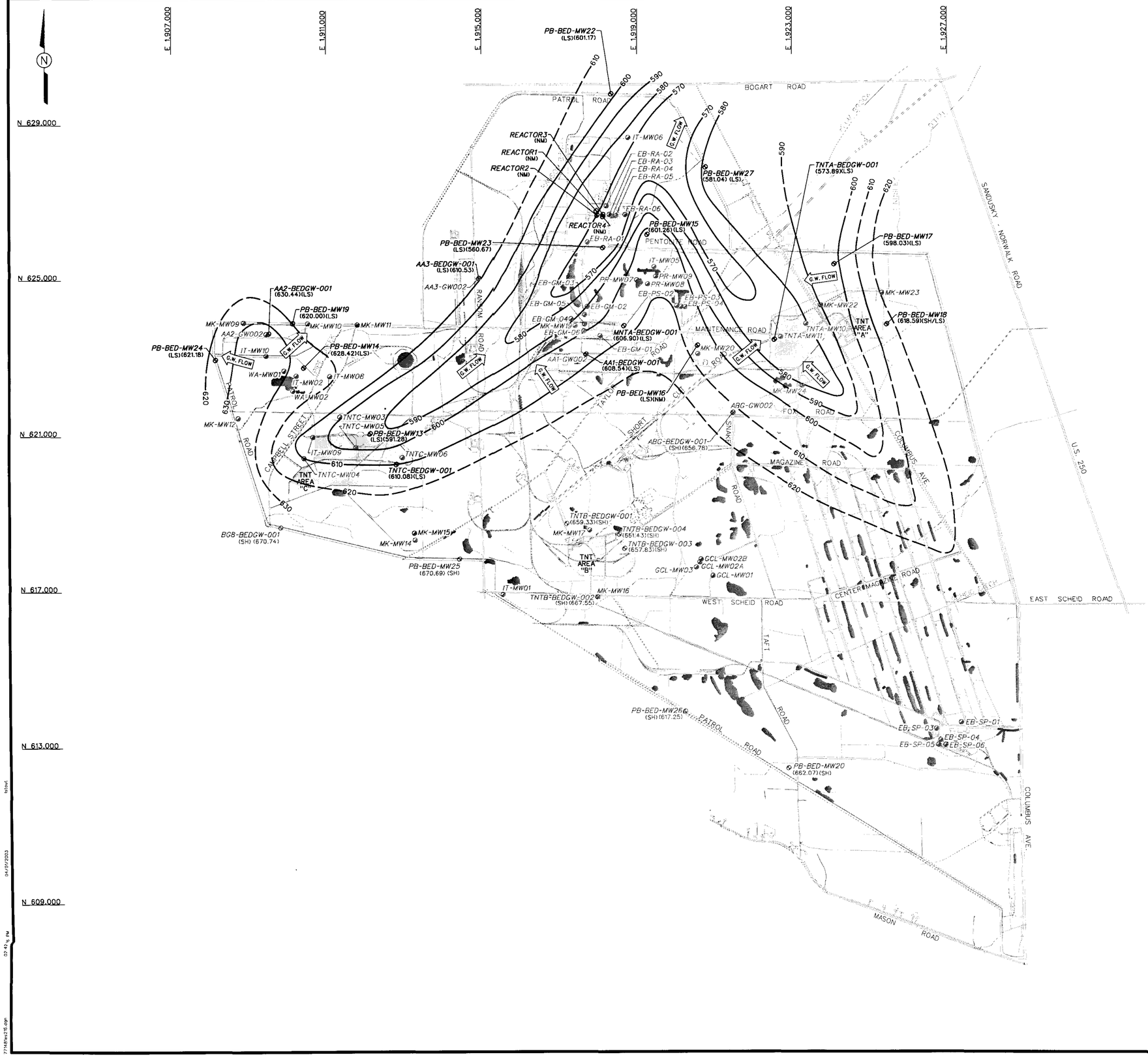
2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 6-3
DELAWARE LIMESTONE GROUNDWATER
ELEVATION CONTOUR MAP (NOVEMBER 2001)

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES209A.DGN	



LEGEND:

ABG-GW002	OVERBURDEN MONITORING WELL
TNTC-BEDGW-001 (LS)	BEDROCK MONITORING WELL SCREENED IN LIMESTONE
ABG-BEDGW-001 (SH)	BEDROCK MONITORING WELL SCREENED IN SHALE
	BUILDING
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE (PBOW BOUNDARY)
(630.45)	GROUNDWATER ELEVATION (FT-MSL)
630	GROUNDWATER ELEVATION CONTOUR (FT-MSL) (DASHED WHERE INFERRED)
G.W. FLOW	GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED

NOTES:

1. MONITORING WELLS PB-MW01, PB-MW02, PB-MW03, PB-MW04, AND REACTOR 5 ARE NOT SHOWN (SURVEY COORDINATES NOT AVAILABLE).
2. MONITORING WELLS REACTOR 1, REACTOR 2, REACTOR 3, AND REACTOR 4 WERE NOT USED FOR GROUNDWATER ELEVATION CONTOURING.
3. TYPE OF BEDROCK MONITORING WELLS ARE SCREENED IN IS INDICATED BY (SH) - SHALE AND (LS) - LIMESTONE.
4. MONITORING WELLS WITH (SH) DESIGNATION NOT INCLUDED IN CONTOURING.
5. DASHED LINES INDICATE UNCERTAIN GROUNDWATER LEVEL ELEVATION.

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

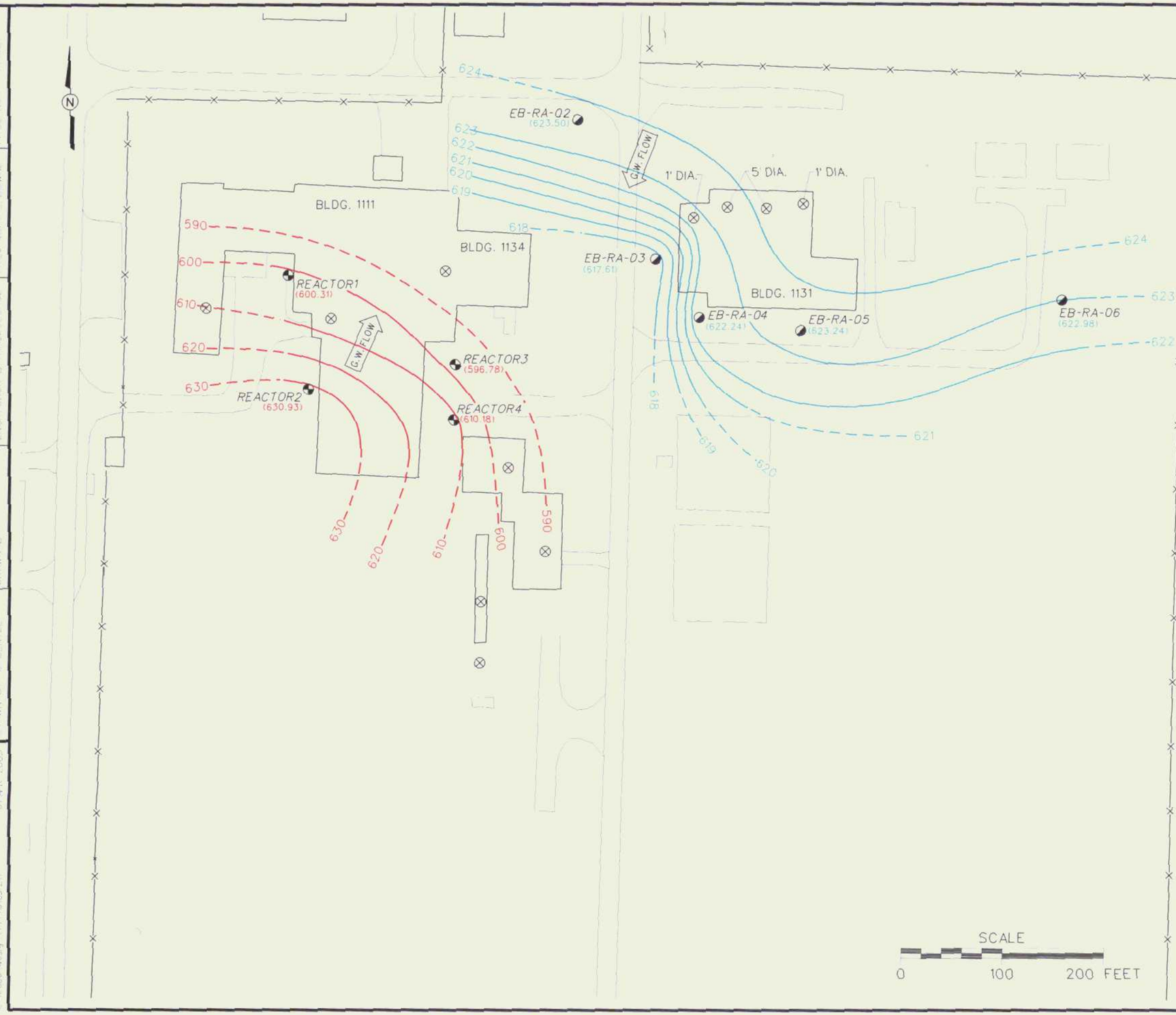
STARTING DATE 03/05/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFF | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

Shaw Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY
AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 6-4
DELAWARE LIMESTONE GROUNDWATER
ELEVATION CONTOUR MAP (MAY 2002)

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	771481	771481ES216.DGN	



LEGEND:

EB-RA-06	OVERBURDEN MONITORING WELL LOCATION
REACTOR1	BEDROCK MONITORING WELL LOCATION
⊗	SUMP WELL
(600.31)	GROUNDWATER ELEVATION (FT-MSL) IN BEDROCK MONITORING WELLS
610	GROUNDWATER ELEVATION CONTOUR IN BEDROCK MONITORING WELLS
(622.98)	GROUNDWATER ELEVATION IN OVERBURDEN MONITORING WELLS (FT-MSL)
623	GROUNDWATER ELEVATION CONTOUR IN OVERBURDEN MONITORING WELLS (FT-MSL)
G.W. FLOW	GROUNDWATER FLOW
	BUILDINGS
	FENCE

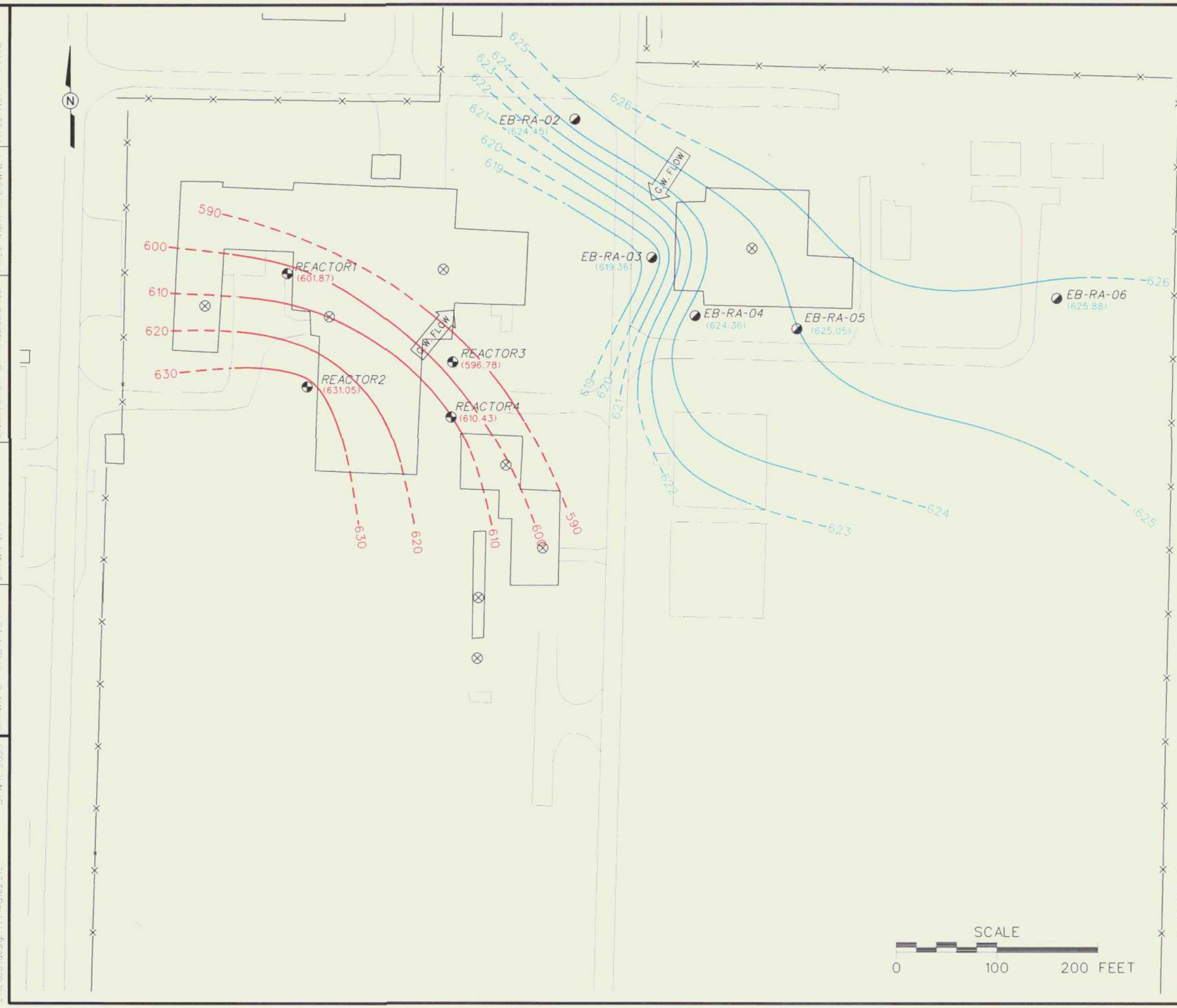
NOTES:

1. LOCATIONS OF SUMP WELLS ARE APPROXIMATE. SUMP WELLS HAVE NOT BEEN SURVEYED.

FIGURE 6-5
GROUNDWATER ELEVATION CONTOUR MAP, REACTOR FACILITY AREA (AUGUST 2001)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw Environmental, Inc.



LEGEND:

EB-RA-06	OVERBURDEN MONITORING WELL LOCATION
REACTOR1	BEDROCK MONITORING WELL LOCATION
⊗	SUMP WELL
(631.05)	GROUNDWATER ELEVATION (FT-MSL) IN BEDROCK MONITORING WELLS
600	GROUNDWATER ELEVATION CONTOUR IN BEDROCK MONITORING WELLS
(625.88)	GROUNDWATER ELEVATION IN OVERBURDEN MONITORING WELLS (FT-MSL)
624	GROUNDWATER ELEVATION CONTOUR IN OVERBURDEN MONITORING WELLS (FT-MSL)
G.W. FLOW	GROUNDWATER FLOW
	BUILDINGS
—×—	FENCE

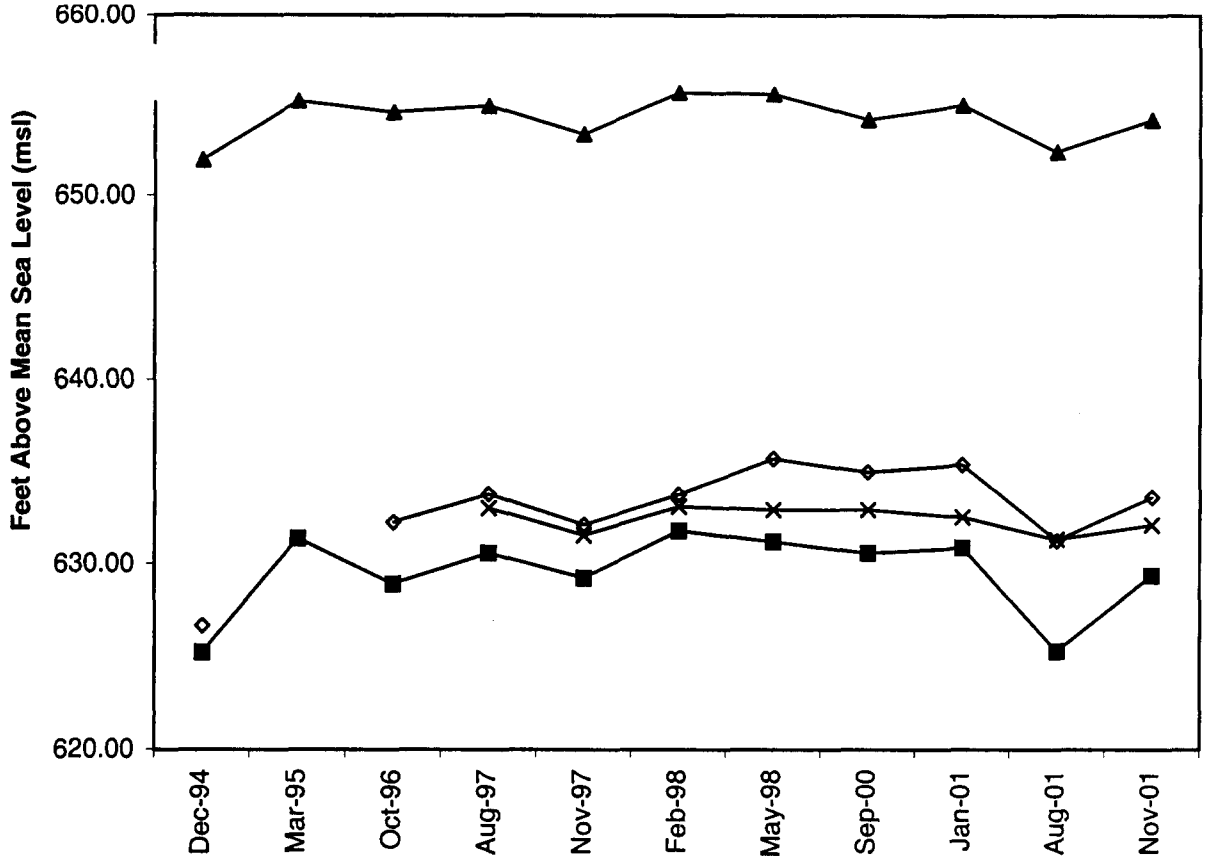
NOTES:

1. LOCATIONS OF SUMP WELLS ARE APPROXIMATE. SUMP WELLS HAVE NOT BEEN SURVEYED.

FIGURE 6-6
GROUNDWATER ELEVATION CONTOUR MAP, REACTOR FACILITY AREA (NOVEMBER 2001)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw Environmental, Inc.



Legend:

- MK-MW10
- MK-MW11
- PB-TNTC-MW06
- EB-GM-03

Figure 6-7
Typical Groundwater Elevation Fluctuation, Overburden Wells

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

KN/4379/FIGS 6-7_6-11(typob)/6/11/03(10:22 AM)

KN/4379/FIGs 6-10_6-8(Figure 6-8)/6/11/03(10:22 AM)

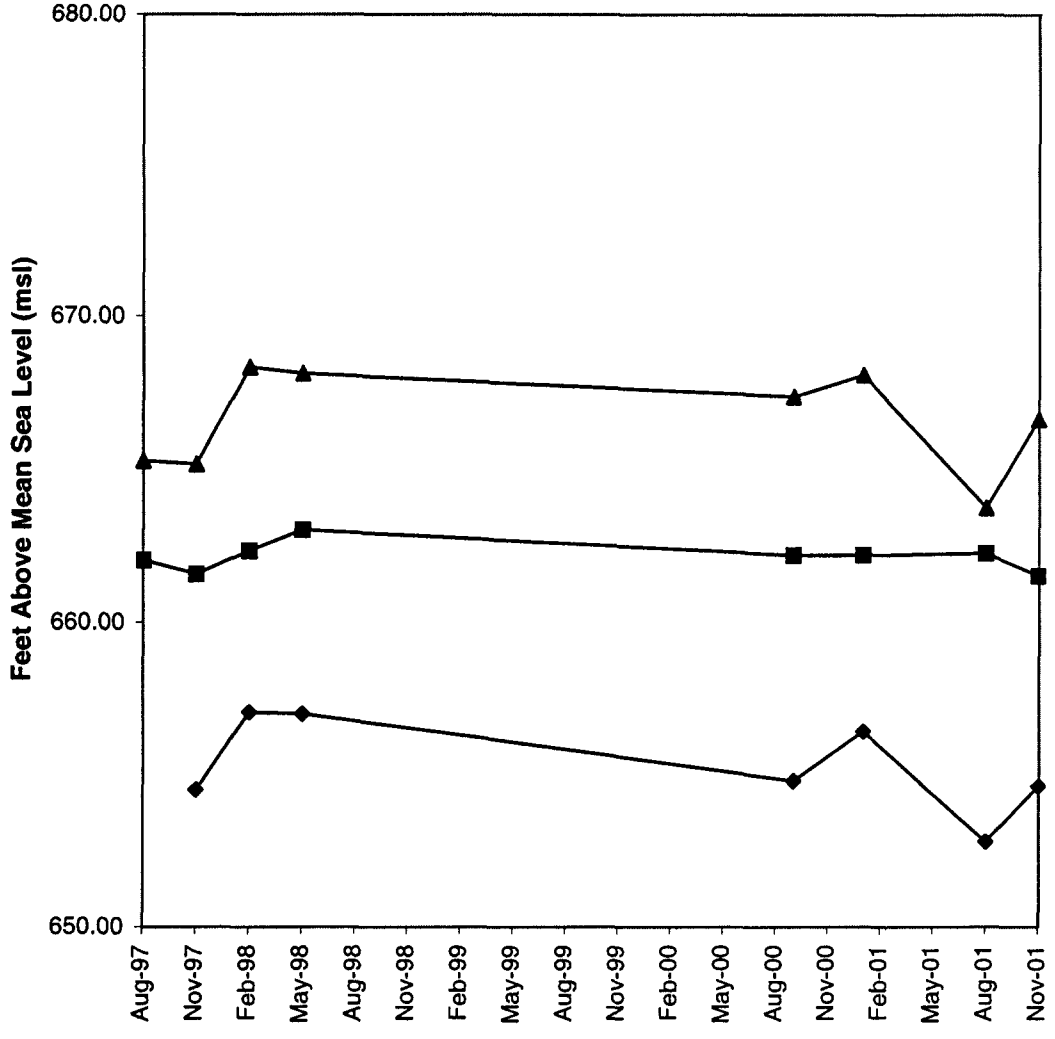
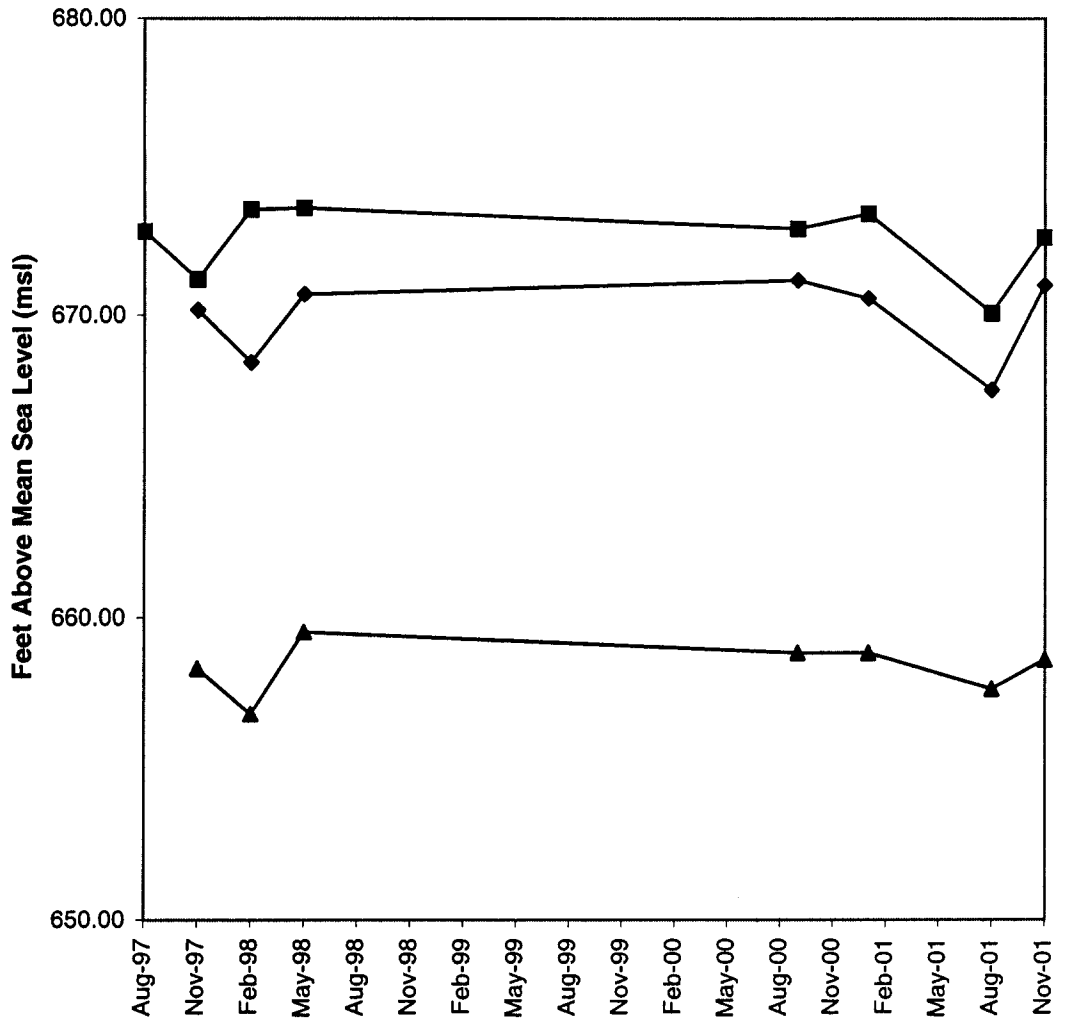


Figure 6-8
Typical Groundwater Fluctuation, Ohio Shale

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

KN/4379/FIGs 6-10_6-8(Figure 6-8)/6/11/03(10:22 AM)



Legend:

- IT-BG8-BEDGW-001
- IT-MW01
- IT-TNTB-BEDGW-001

Shaw™ Shaw Environmental, Inc.

Figure 6-9

Groundwater Fluctuation, Olentangy Shale

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

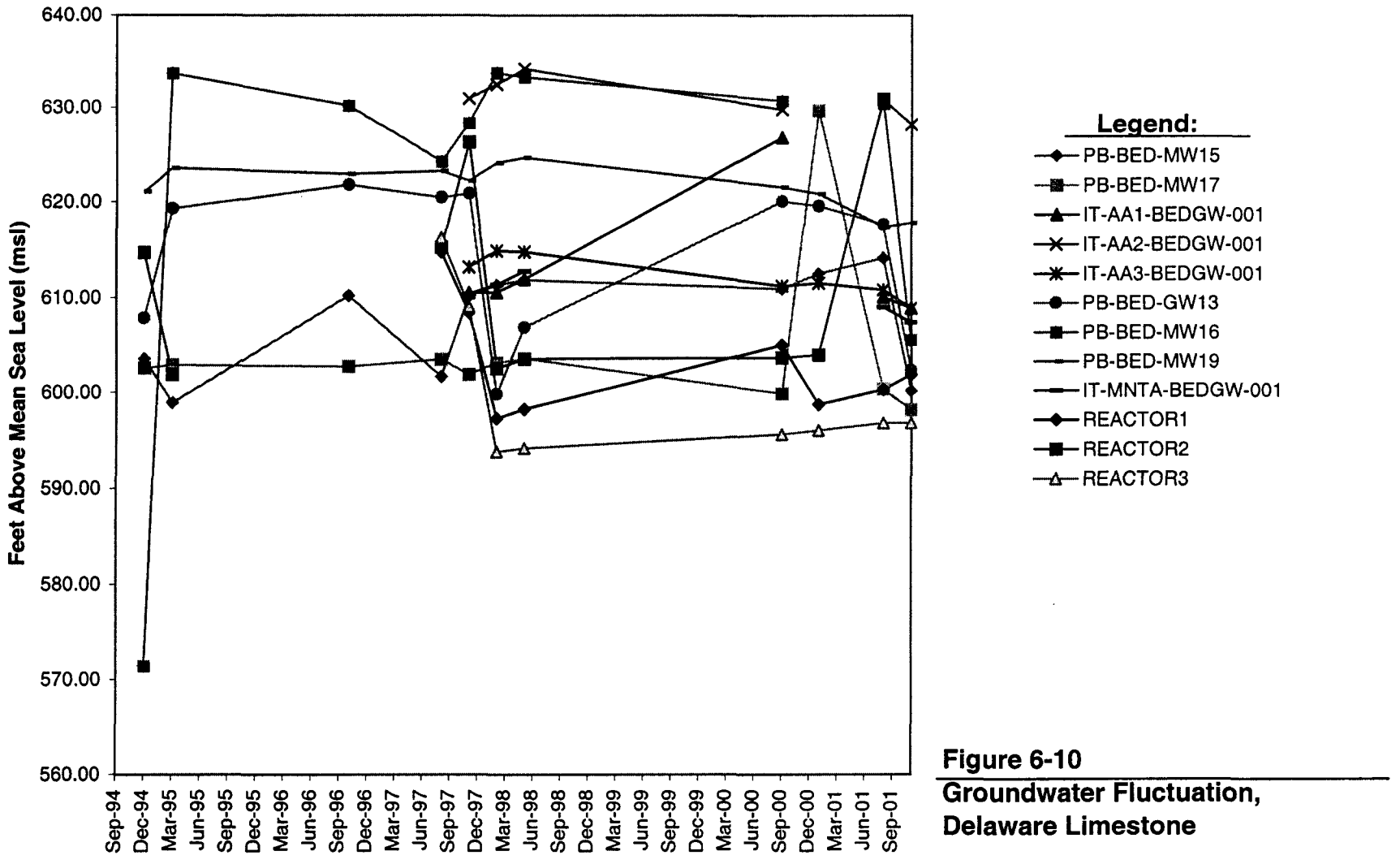


Figure 6-10

Groundwater Fluctuation, Delaware Limestone

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

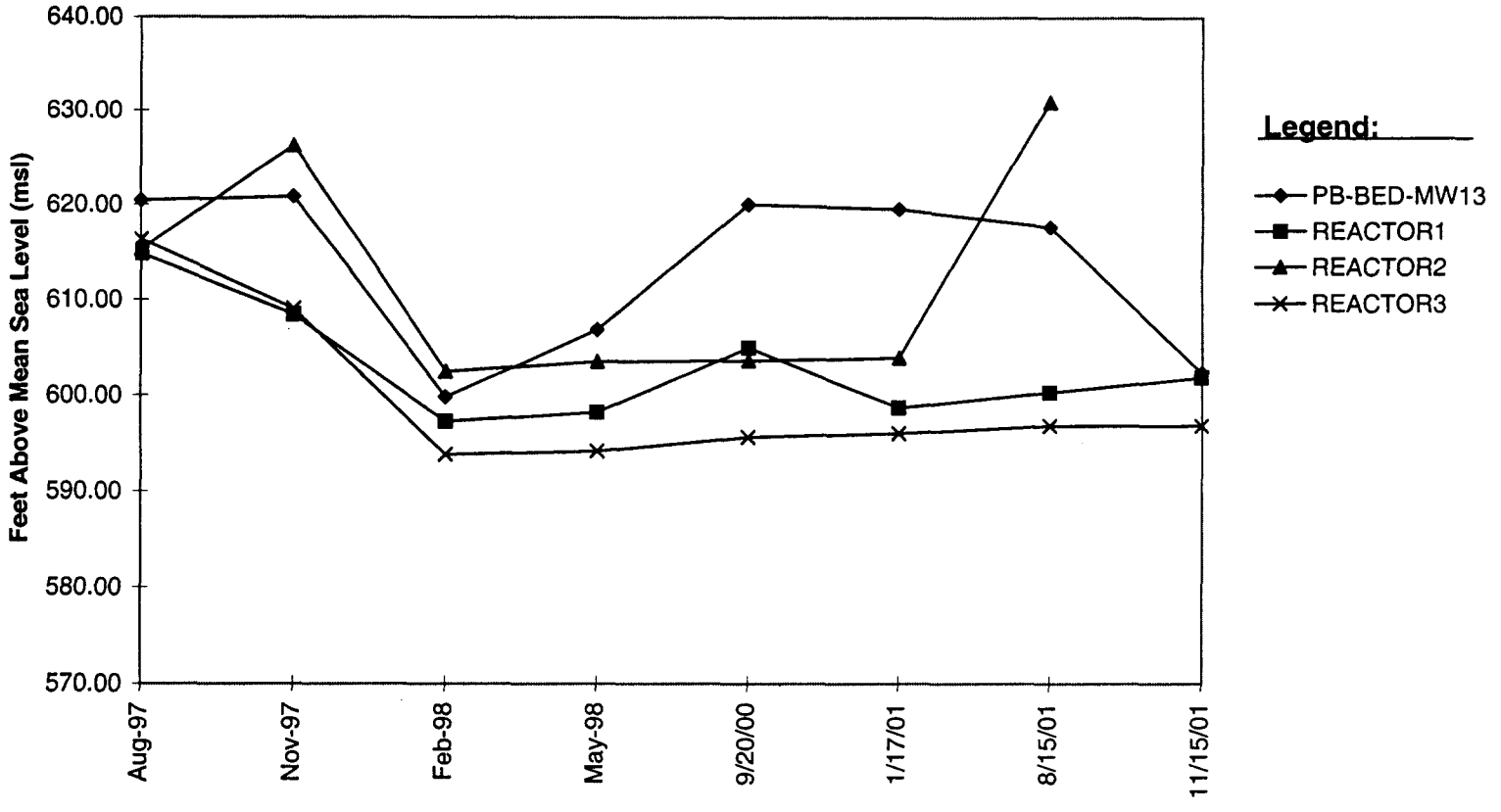


Figure 6-11
Typical Groundwater Fluctuation, Reactor Wells 1, 2, 3 and PB-BED-MW13

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

KN/4379/FIGS 6-7_6-11(reactors13)/6/11/03(10:22 AM)

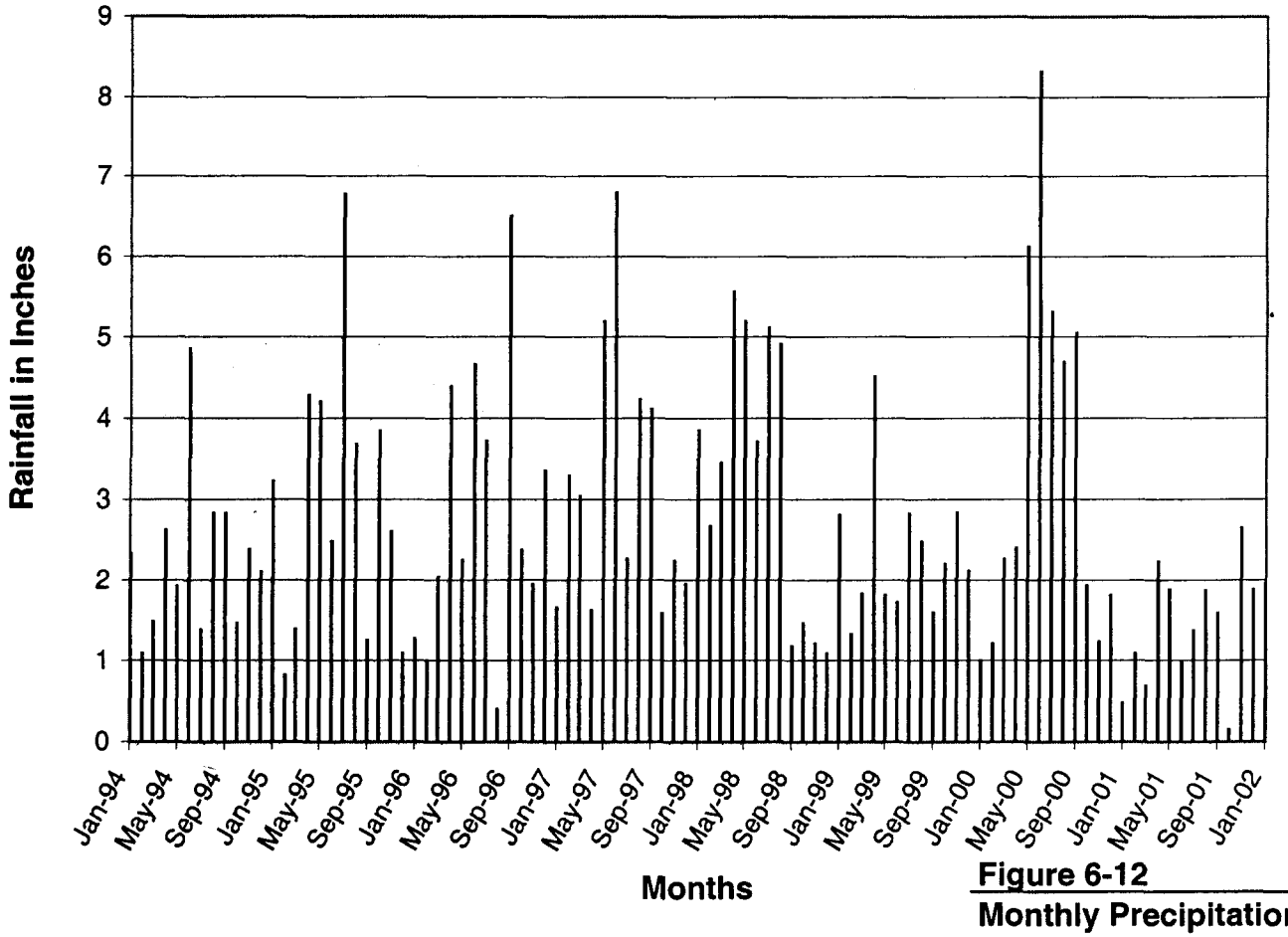


Figure 6-12

Monthly Precipitation Data,
January 1994 Through December 2001

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

Kn/4379/FIG 6-12_6-13 (Mo_rechg)(Rainfall)/6/11/03(10:23 AM)

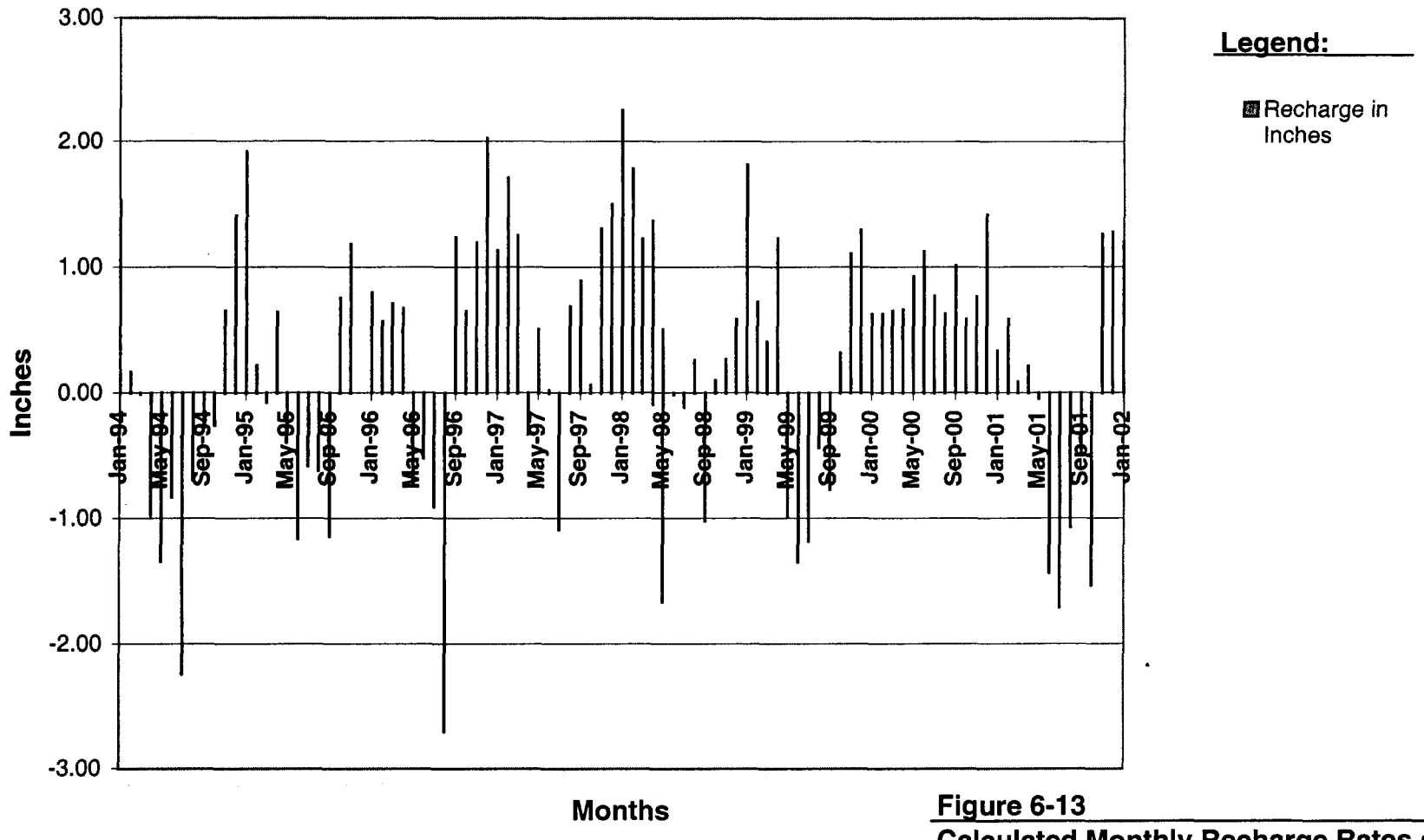


Figure 6-13
Calculated Monthly Recharge Rates at Site

Former Plum Brook Ordnance Works
NASA Plum Brook Station
Sandusky, Ohio

Shaw™ Shaw Environmental, Inc.

KN/4379/FIG 6-12_6-13 (Mo_rechg)(Recharge)/6/11/03(10:23 AM)

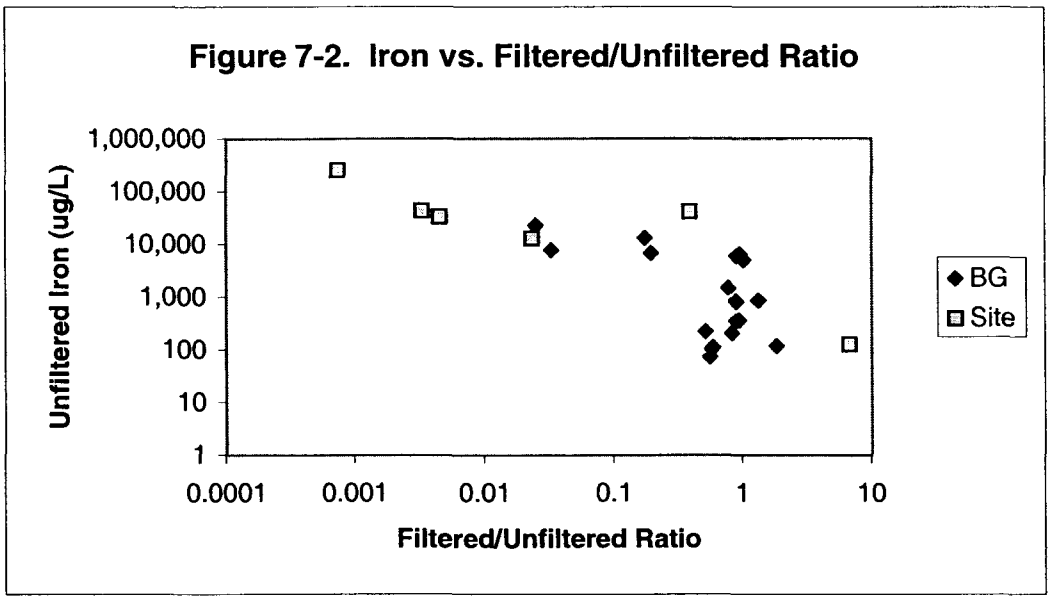


Figure 7-2. Iron vs. Filtered/Unfiltered Ratio
Unfiltered Iron (ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
0.0001
0.001
0.01
0.1
1
10
Filtered/Unfiltered Ratio
BG
Site

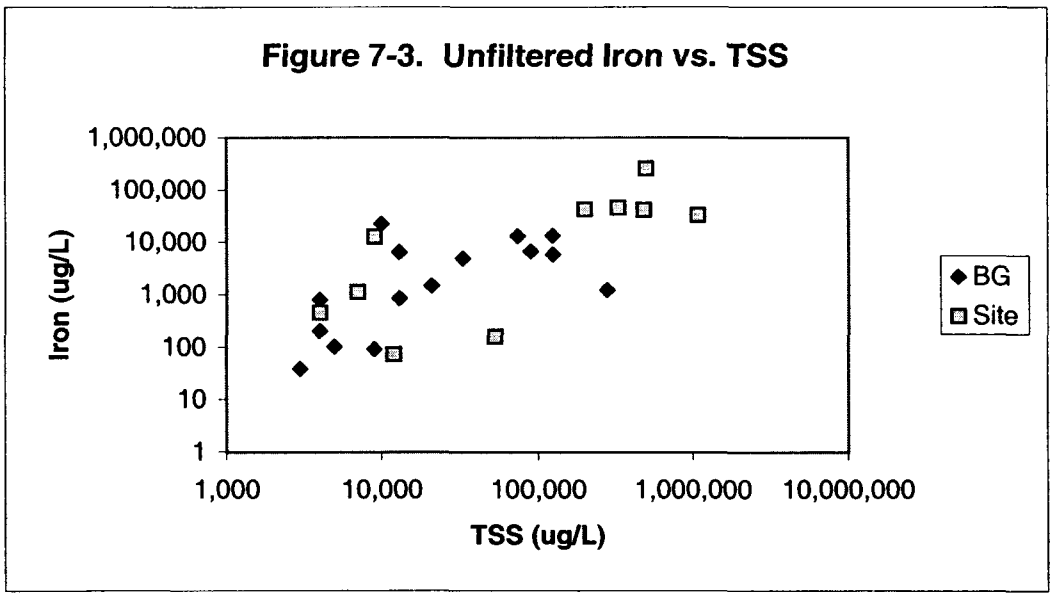


Figure 7-3. Unfiltered Iron vs. TSS
Iron (ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
1,000
10,000
100,000
1,000,000
10,000,000
TSS (ug/L)
BG
Site

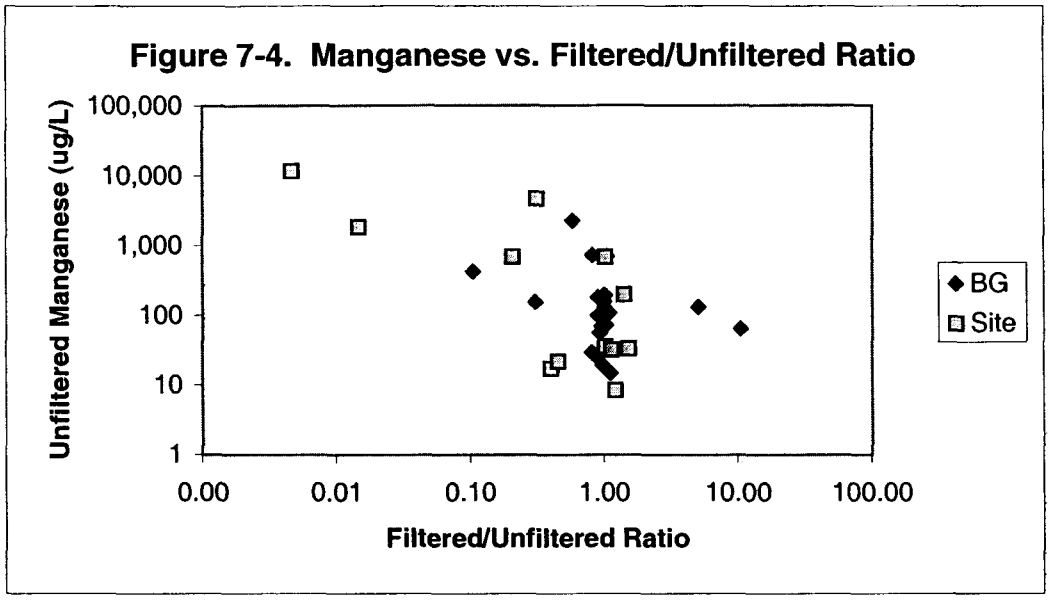


Figure 7-4. Manganese vs. Filtered/Unfiltered Ratio
Unfiltered Manganese (ug/L)
100,000
10,000
1,000
100
10
1
0.00
0.01
0.10
1.00
10.00
100.00
Filtered/Unfiltered Ratio
BG
Site

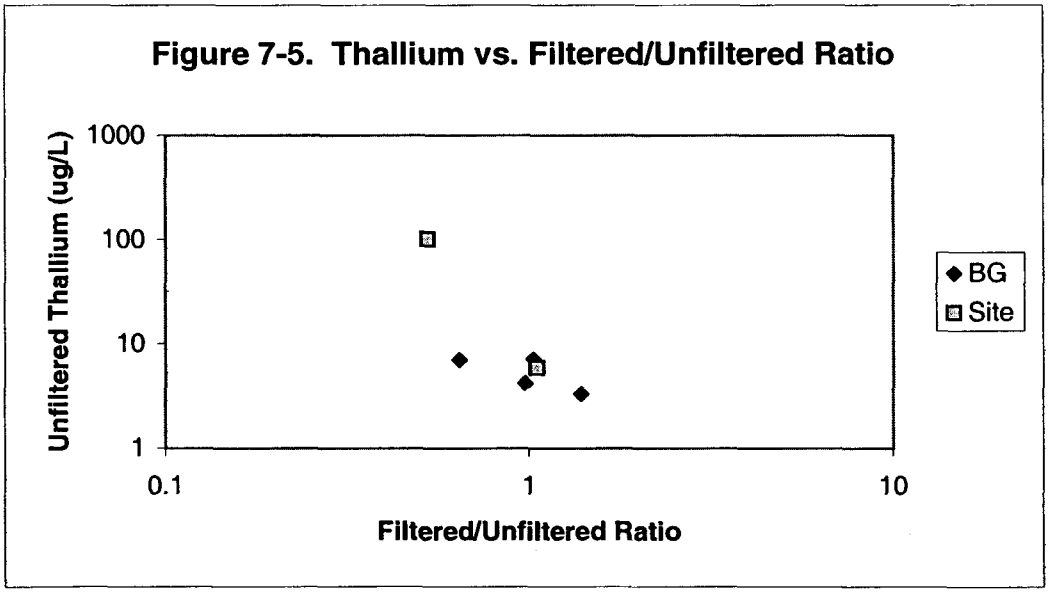


Figure 7-5. Thallium vs. Filtered/Unfiltered Ratio
Unfiltered Thallium (ug/L)
1000
100
10
1
0.1
1
10
Filtered/Unfiltered Ratio
BG
Site

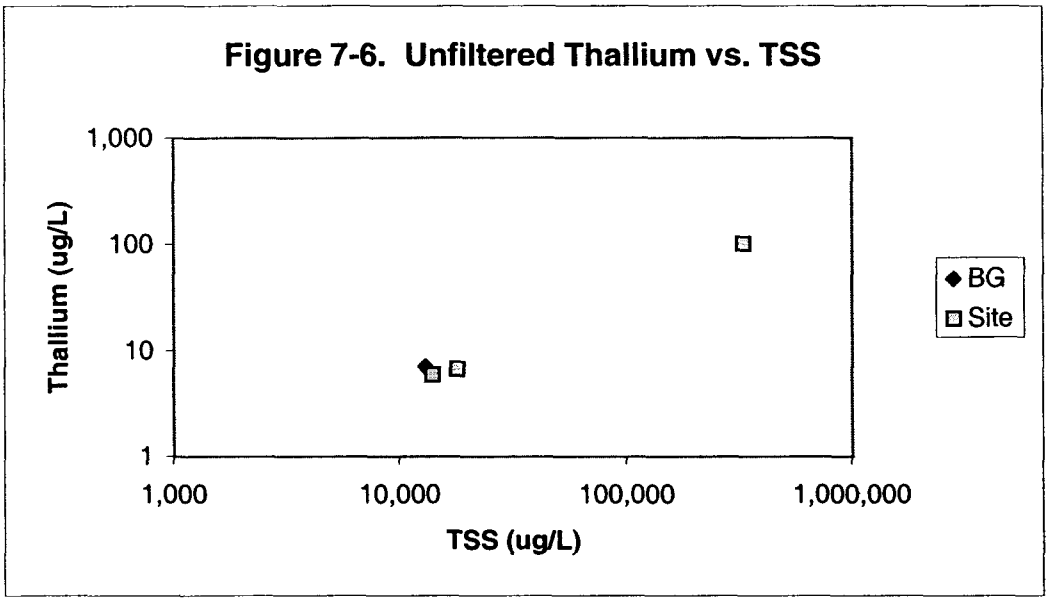


Figure 7-6. Unfiltered Thallium vs. TSS
1,000
100
10
1
Thallium (ug/L)
1,000
10,000
100,000
1,000,000
TSS (ug/L)
BG
Site

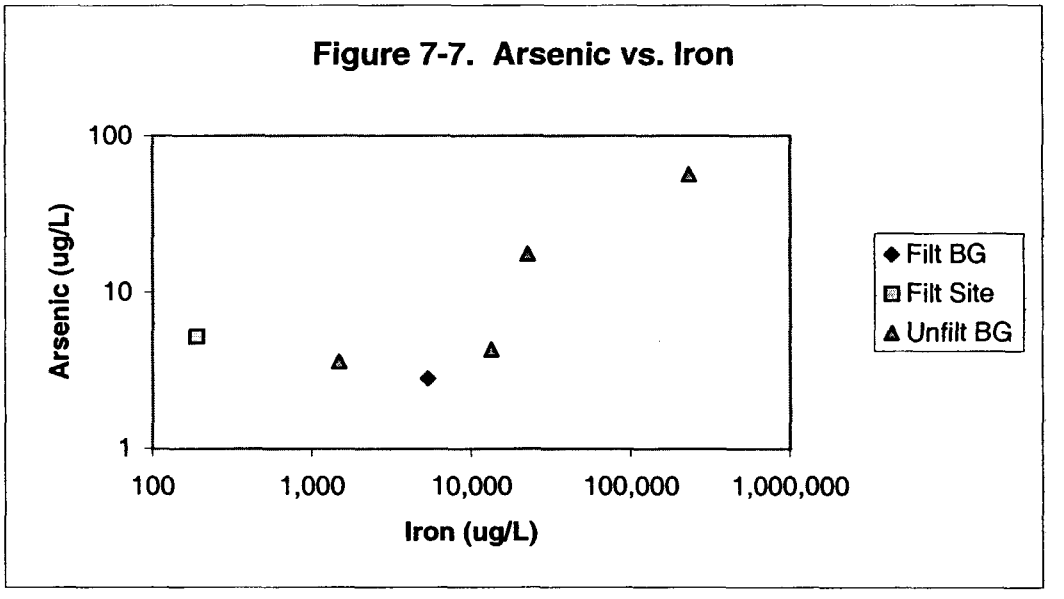
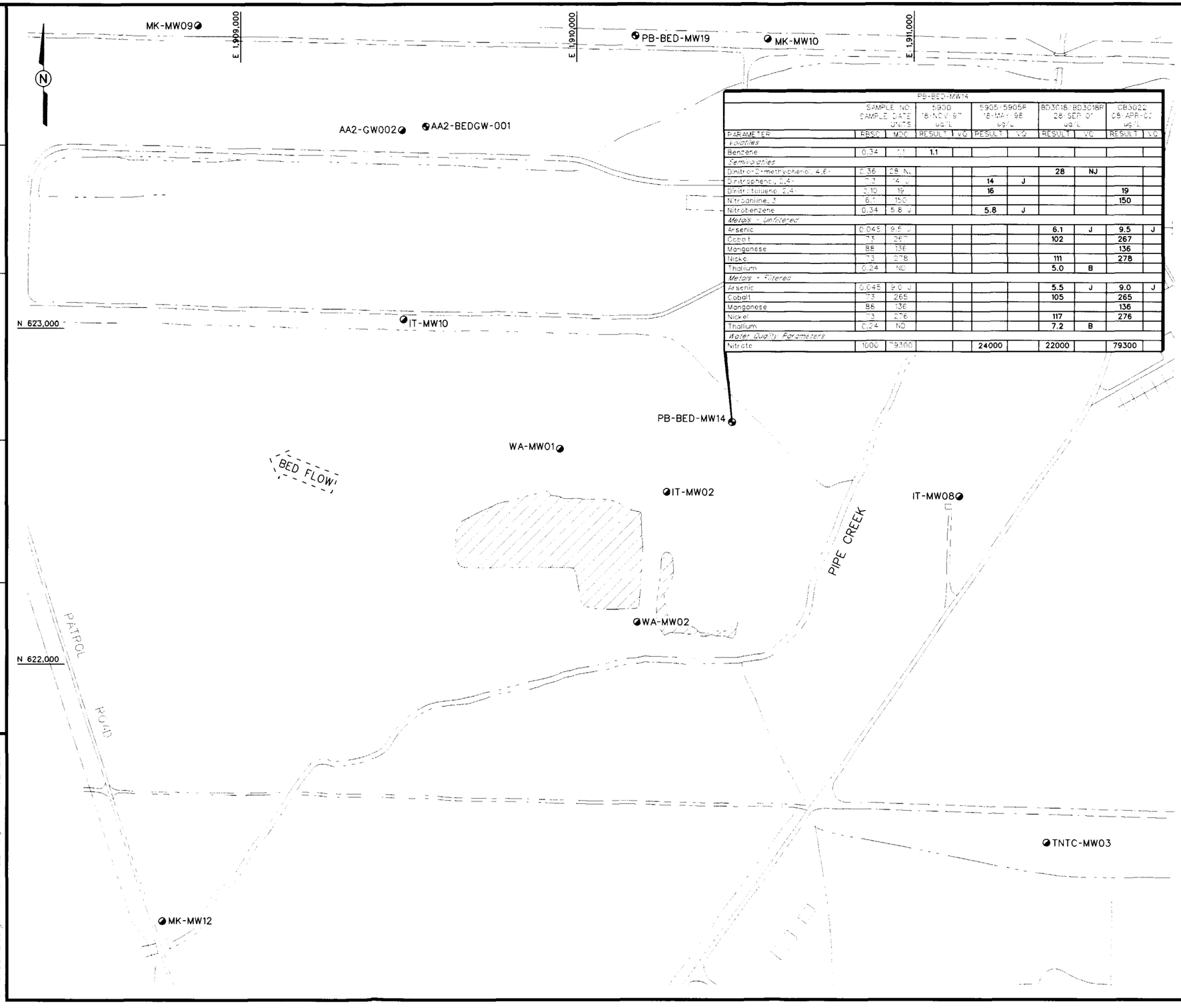


Figure 7-7. Arsenic vs. Iron
100
10
1
Arsenic (ug/L)
100
1,000
10,000
100,000
1,000,000
Iron (ug/L)
Filt BG
Filt Site
Unfilt BG



PB-BED-MW14										
	SAMPLE NO. / SAMPLE DATE / UNITS		5900 '16-NOV-97' ug/L		5905/5905R '16-MAY-98' ug/L		BD3016/BD3016R '28-SEP-01' ug/L		CB3022 '08-APR-02' ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles										
Benzene	0.34	1.1	1.1							
Semivolatiles										
Dinitro-2-methylphenol, 4,6-	0.36	28 NJ					28	NJ		
Dinitrophenol, 2,4-	7.3	14 J			14	J				
Dinitrotoluene, 2,4-	0.10	19			16				19	
Nitroaniline, 3-	6.1	150							150	
Nitrobenzene	0.34	5.8 J			5.8	J				
Metals - Unfiltered										
Arsenic	0.045	9.5 J					6.1	J	9.5	J
Cobalt	73	267					102		267	
Manganese	88	136							136	
Nickel	73	278					111		278	
Thallium	0.24	ND					5.0	B		
Metals - Filtered										
Arsenic	0.045	9.0 J					5.5	J	9.0	J
Cobalt	73	265					105		265	
Manganese	88	136							136	
Nickel	73	276					117		276	
Thallium	0.24	ND					7.2	B		
Water Quality Parameters										
Nitrate	1000	79300			24000		22000		79300	

LEGEND:

- IT-MW02 — OVERBURDEN MONITORING WELL LOCATION
- PB-BED-MW14 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- FENCE
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

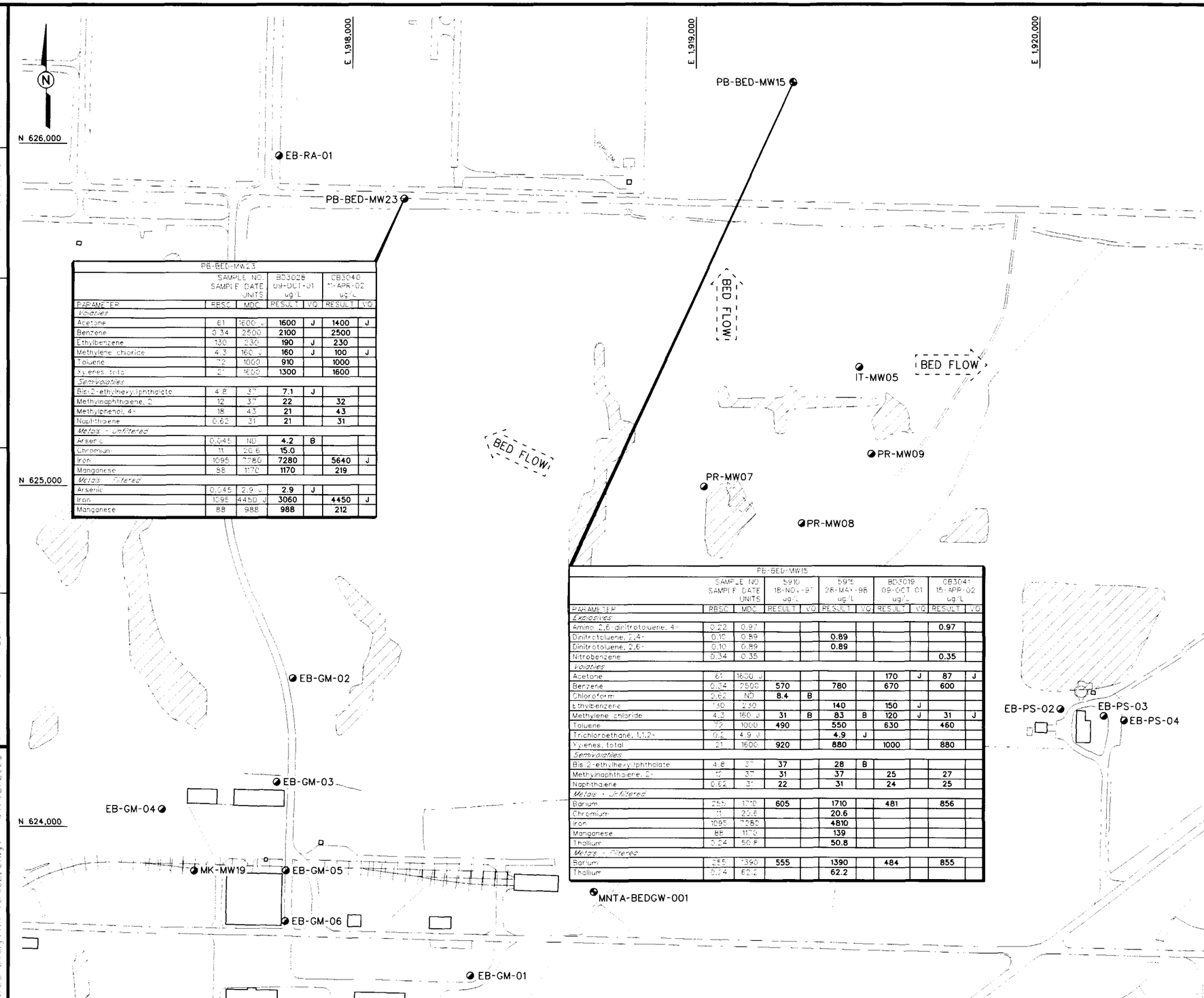
FIGURE 6-14

DETECTED CONSTITUENTS AT WEST AREA RED WATER PONDS ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, SEPTEMBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHK BY: C. TUMLIN | INITIATOR: D. KESSLER | DWG. NO.: 774187
ENGR. CHK. BY: D. KESSLER | PROJ. MGR.: S. DOWNEY | PROJ. NO.:
STARTING DATE: 08/12/02 | DATE LAST REV.:
DRAWN BY: B. VANDERGRIFF | DRAWN BY:
02:51:7 PM 04/02/2003
C:\CADD\Design\774187ies224.dgn



PB-BED-MW23

PARAMETER	RBSC	MDC	BD3028 09-OCT-01 ug/L RESULT	VQ	CB3040 15-APR-02 ug/L RESULT	VQ
Volatiles						
Acetone	61	1600 J	**1600**	J	**1400**	J
Benzene	0.34	2500	**2100**		**2500**	
Ethylbenzene	130	230	**190**	J	**230**	
Methylene chloride	4.3	160 J	**160**	J	**100**	J
Toluene	72	1000	**910**		**1000**	
Xylenes, total	21	1600	**1300**		**1600**	
Semivolatiles						
Bis(2-ethylhexyl)phthalate	4.8	37	**7.1**	J		
Methylnaphthalene, 2-	12	37	**22**		**32**	
Methylphenol, 4-	18	43	**21**		**43**	
Naphthalene	0.62	31	**21**		**31**	
Metals - Unfiltered						
Arsenic	0.045	ND	**4.2**	B		
Chromium	11	20.6	**15.0**			
Iron	1095	7280	**7280**		**5640**	J
Manganese	88	1170	**1170**		**219**	
Metals - Filtered						
Arsenic	0.045	2.9 J	**2.9**	J		
Iron	1095	4450 J	**3060**		**4450**	J
Manganese	88	988	**988**		**212**	

PB-BED-MW15

PARAMETER	RBSC	MDC	5910 18-NOV-97 ug/L RESULT	VQ	5975 28-MAY-98 ug/L RESULT	VQ	BD3019 09-OCT-01 ug/L RESULT	VQ	CB3041 15-APR-02 ug/L RESULT	VQ
Explosives										
Amino-2,6-dinitrotoluene, 4-	0.22	0.97							**0.97**	
Dinitrotoluene, 2,4-	0.10	0.89			**0.89**					
Dinitrotoluene, 2,6-	0.10	0.89			**0.89**					
Nitrobenzene	0.34	0.35							**0.35**	
Volatiles										
Acetone	61	1600 J					**170**	J	**87**	J
Benzene	0.34	2500	**570**		**780**		**670**		**600**	
Chloroform	0.62	ND	**8.4**	B						
Ethylbenzene	130	230			**140**		**150**	J		
Methylene chloride	4.3	160 J	**31**	B	**83**	B	**120**	J	**31**	J
Toluene	72	1000	**490**		**550**		**630**		**460**	
Trichloroethane, 1,1,2-	0.2	4.9 J			**4.9**	J				
Xylenes, total	21	1600	**920**		**880**		**1000**		**880**	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	37	**37**		**28**	B				
Methylnaphthalene, 2-	12	37	**31**		**37**		**25**		**27**	
Naphthalene	0.62	31	**22**		**31**		**24**		**25**	
Metals - Unfiltered										
Barium	255	1710	**605**		**1710**		**481**		**856**	
Chromium	11	20.6			**20.6**					
Iron	1095	7280			**4810**					
Manganese	88	1170			**139**					
Thallium	0.24	50.8			**50.8**					
Metals - Filtered										
Barium	255	1390	**555**		**1390**		**484**		**855**	
Thallium	0.24	62.2			**62.2**					

LEGEND:

IT-MW05	OVERBURDEN MONITORING WELL LOCATION
PB-BED-MW15	BEDROCK MONITORING WELL LOCATION
	BUILDINGS
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE
BED FLOW	BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

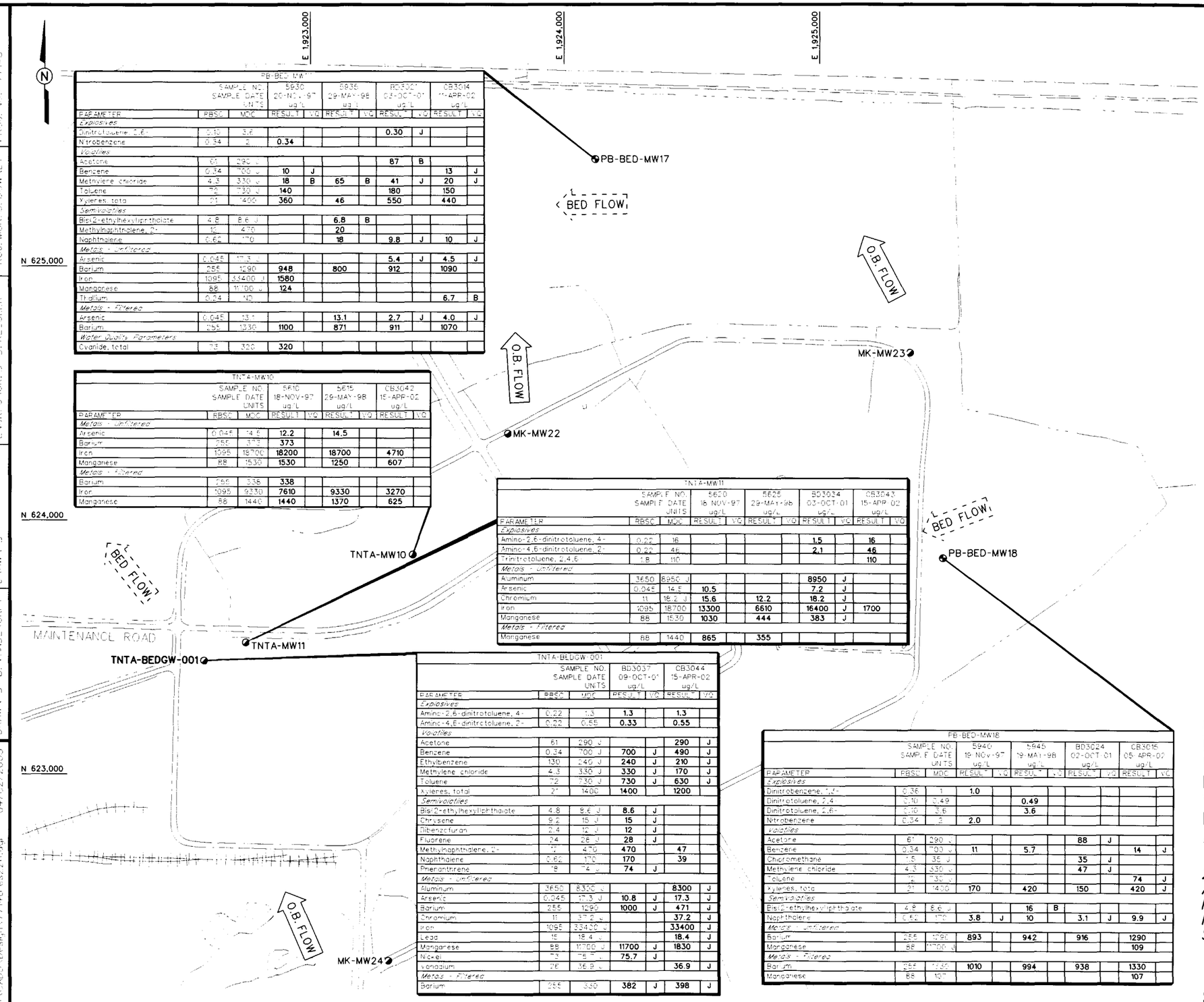
0 300 600 FEET

FIGURE 6-15
DETECTED CONSTITUENTS AT PENTOLITE ROAD RED WATER PONDS ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 08/12/02 | DATE LAST REV: | DRAFT CHECK BY: C. TUMLIN | INITIATOR: D. KESS-FR | PROJ. MGR.: K. DOWNEY | PROJ. NO.: 77148 | DWG. NO.: 77148es225.dgn
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHECK BY: D. KESSLER | PROJ. MGR.: | PROJ. NO.: | 04/02/2003 02:56:47 PM
REF: ACAD:Design:77148es225.dgn



PB-BED-MW17		SAMPLE NO.	5630		5635		BD3021		CB3014	
		SAMPLE DATE	20-NOV-97		29-MAY-98		04-OCT-01		11-APR-02	
		UNITS	ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrotoluene, 2,6-	0.10	3.6					0.30	J		
Nitrobenzene	0.34	2	0.34							
Volatiles										
Acetone	61	290 J					87	B		
Benzene	0.34	700 J	10	J					13	J
Methylene chloride	4.3	330 J	18	B	65	B	41	J	20	J
Toluene	72	730 J	140				180		150	
Xylenes, total	21	1400	360		46		550		440	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	8.6 J			6.8	B				
Methylnaphthalene, 2-	12	470			20					
Naphthalene	0.62	170			18		9.8	J	10	J
Metals - Unfiltered										
Arsenic	0.045	17.3 J					5.4	J	4.5	J
Barium	255	1290	948		800		912		1090	
Iron	1095	33400 J	1580							
Manganese	88	11700 J	124							
Thallium	0.24	10							6.7	B
Metals - Filtered										
Arsenic	0.045	13.1			13.1		2.7	J	4.0	J
Barium	255	1330	1100		871		911		1070	
Water Quality Parameters										
Cyanide, total	73	320	320							

TNTA-MW10		SAMPLE NO.	5610		5615		CB3042	
		SAMPLE DATE	18-NOV-97		29-MAY-98		15-APR-02	
		UNITS	ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ
Metals - Unfiltered								
Arsenic	0.045	14.5	12.2		14.5			
Barium	255	373	373					
Iron	1095	18700	18200		18700		4710	
Manganese	88	1530	1530		1250		607	
Metals - Filtered								
Barium	255	338	338					
Iron	1095	9330	7610		9330		3270	
Manganese	88	1440	1440		1370		625	

TNTA-MW11		SAMPLE NO.	5620		5625		BD3034		CB3043	
		SAMPLE DATE	18-NOV-97		29-MAY-98		03-OCT-01		15-APR-02	
		UNITS	ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Amino-2,6-dinitrotoluene, 4-	0.22	16					1.5		16	
Amino-4,6-dinitrotoluene, 2-	0.22	46					2.1		46	
Trinitrotoluene, 2,4,6-	1.8	110							110	
Metals - Unfiltered										
Aluminum	3650	8950 J					8950	J		
Arsenic	0.045	14.5	10.5				7.2	J		
Chromium	11	18.2 J	15.6		12.2		18.2	J		
Iron	1095	18700	13300		6610		16400	J	1700	
Manganese	88	1530	1030		444		383	J		
Metals - Filtered										
Manganese	88	1440	865		355					

TNTA-BEDGW-001		SAMPLE NO.	BD3037		CB3044	
		SAMPLE DATE	09-OCT-01		15-APR-02	
		UNITS	ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ
Explosives						
Amino-2,6-dinitrotoluene, 4-	0.22	1.3	1.3		1.3	
Amino-4,6-dinitrotoluene, 2-	0.22	0.55	0.33		0.55	
Volatiles						
Acetone	61	290 J			290	J
Benzene	0.34	700 J	700	J	490	J
Ethylbenzene	130	240 J	240	J	210	J
Methylene chloride	4.3	330 J	330	J	170	J
Toluene	72	730 J	730	J	630	J
Xylenes, total	21	1400	1400		1200	
Semivolatiles						
Bis(2-ethylhexyl)phthalate	4.8	8.6 J	8.6	J		
Chrysene	9.2	15 J	15	J		
Dibenzofuran	2.4	12 J	12	J		
Fluorene	24	28 J	28	J		
Methylnaphthalene, 2-	12	470	470		47	
Naphthalene	0.62	170	170		39	
Phenanthrene	18	74 J	74	J		
Metals - Unfiltered						
Aluminum	3650	8300 J			8300	J
Arsenic	0.045	17.3 J	10.8	J	17.3	J
Barium	255	1290	1000	J	471	J
Chromium	11	37.2 J			37.2	J
Iron	1095	33400 J			33400	J
Lead	15	18.4 J			18.4	J
Manganese	88	11700 J	11700	J	1830	J
Nickel	73	75.7 J	75.7	J		
Vanadium	28	36.9 J			36.9	J
Metals - Filtered						
Barium	255	530	382	J	398	J

PB-BED-MW18		SAMPLE NO.	5940		5945		BD3024		CB3015	
		SAMPLE DATE	19-NOV-97		19-MAY-98		02-OCT-01		05-APR-02	
		UNITS	ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrobenzene, 1,3-	0.36	1	1.0							
Dinitrotoluene, 2,4-	0.10	0.49			0.49					
Dinitrotoluene, 2,6-	0.10	3.6			3.6					
Nitrobenzene	0.34	2	2.0							
Volatiles										
Acetone	61	290 J					88	J		
Benzene	0.34	700 J	11		5.7				14	J
Chloromethane	1.5	35 J					35	J		
Methylene chloride	4.3	330 J					47	J		
Toluene	72	730 J							74	J
Xylenes, total	21	1400	170		420		150		420	J
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	8.6 J			16	B				
Naphthalene	0.62	170	3.8	J	10		3.1	J	9.9	J
Metals - Unfiltered										
Barium	255	1290	893		942		916		1290	
Manganese	88	11700 J							109	
Metals - Filtered										
Barium	255	1330	1010		994		938		1330	
Manganese	88	107							107	

LEGEND:

- MK-MW22 — OVERBURDEN MONITORING WELL LOCATION
- ABG-BEDGW-001 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- FENCE
- O.B. FLOW — OVERBURDEN/SHALE GROUNDWATER FLOW DIRECTION
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
4. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

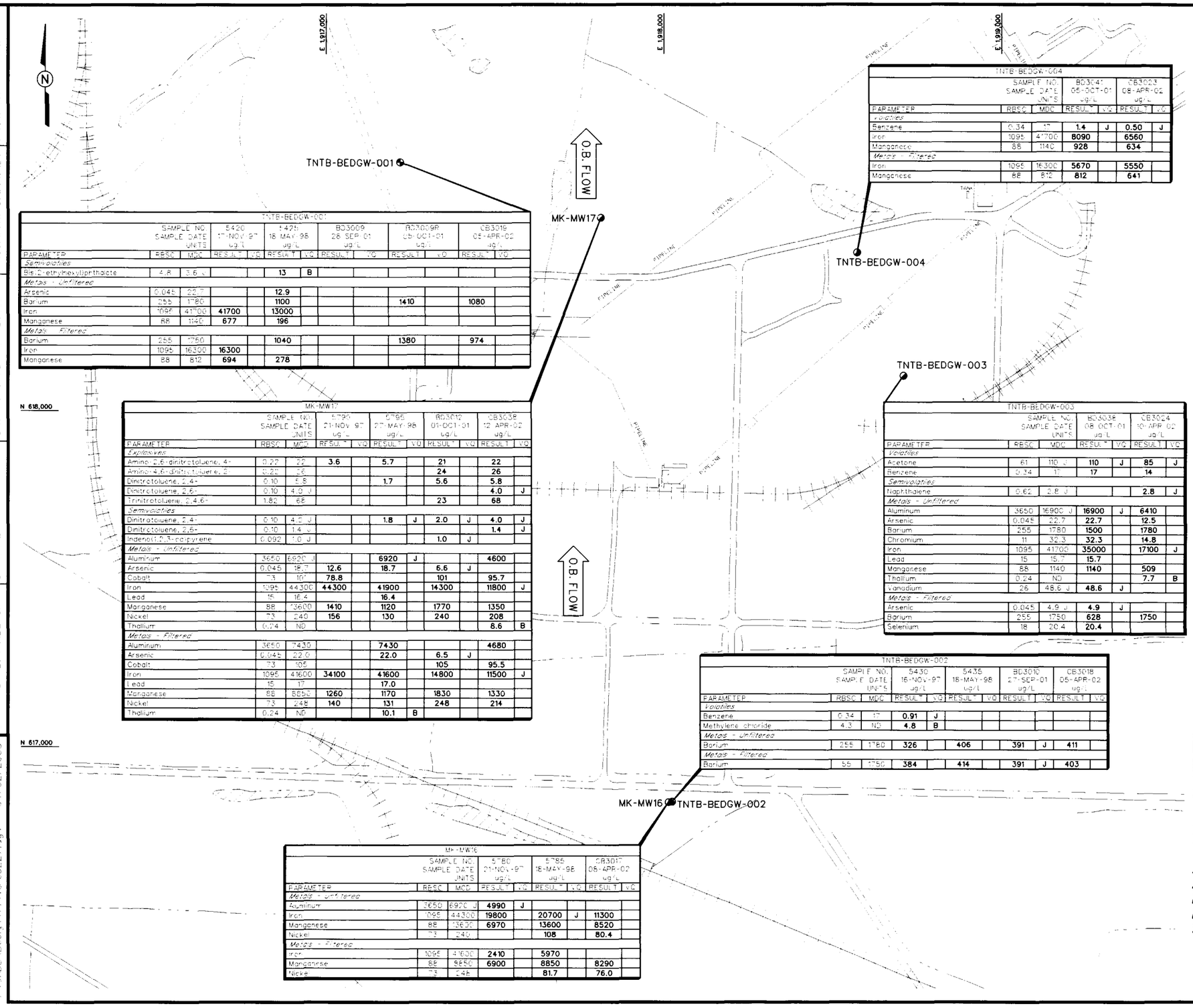
0 400 800 FEET

FIGURE 6-16
DETECTED CONSTITUENTS AT TNT MANUFACTURING AREA A ABOVE RBSCs IN OVERBURDEN/BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHCK BY: C. TUMIN
ENGR CHCK BY: D. KESSLER
INITIATOR: D. KESSLER
PROJ. MGR: S. DOWNEY
STARTING DATE: 08/12/02
DRAWN BY: B. VANDERGRIFF
DWG. NO.: 7-481es226.dgn
PROJ. NO.: 771481
DATE LAST REV.:
DRAWN BY:
06:11:15 PM 04/02/2003
stout
C:\CADD\Design\771481es226.dgn



TNTB-BEDGW-001

PARAMETER	RBSC	MDC	5420 17-NOV-97 ug/L RESULT	VQ	5421 18-MAY-98 ug/L RESULT	VQ	BD3009 28-SEP-01 ug/L RESULT	VQ	BD3009R 05-OCT-01 ug/L RESULT	VQ	CB3019 05-APR-02 ug/L RESULT	VQ
Semivolatiles												
Bis(2-ethylhexyl)phthalate	4.8	3.6 J			13	B						
Metals - Unfiltered												
Arsenic	0.045	22.7			12.9							
Barium	255	1780			1100				1410		1080	
Iron	1095	41700	41700		13000							
Manganese	88	1140	677		196							
Metals - Filtered												
Barium	255	1750			1040				1380		974	
Iron	1095	16300	16300									
Manganese	88	812	694		278							

TNTB-BEDGW-004

PARAMETER	RBSC	MDC	BD3041 05-OCT-01 ug/L RESULT	VQ	CB3023 08-APR-02 ug/L RESULT	VQ
Volatiles						
Benzene	0.34	17	1.4	J	0.50	J
Iron	1095	41700	8090		6560	
Manganese	88	1140	928		634	
Metals - Filtered						
Iron	1095	16300	5670		5550	
Manganese	88	812	812		641	

MK-MW17

PARAMETER	RBSC	MDC	5790 21-NOV-97 ug/L RESULT	VQ	5795 27-MAY-98 ug/L RESULT	VQ	BD3012 01-OCT-01 ug/L RESULT	VQ	CB3038 12-APR-02 ug/L RESULT	VQ
Explosives										
Amino-2,6-dinitrotoluene, 4-	0.22	22	3.6		5.7		21		22	
Amino-4,6-dinitrotoluene, 2-	0.22	26					24		26	
Dinitrotoluene, 2,4-	0.10	5.8			1.7		5.6		5.8	
Dinitrotoluene, 2,6-	0.10	4.0 J							4.0	J
Trinitrotoluene, 2,4,6-	1.82	68					23		68	
Semivolatiles										
Dinitrotoluene, 2,4-	0.10	4.0 J			1.8	J	2.0	J	4.0	J
Dinitrotoluene, 2,6-	0.10	1.4 J							1.4	J
Indeno(1,2,3-cd)pyrene	0.092	1.0 J					1.0	J		
Metals - Unfiltered										
Aluminum	3650	6920 J			6920	J			4600	
Arsenic	0.045	18.7	12.6		18.7		6.6	J		
Cobalt	73	107	78.8				101		95.7	
Iron	1095	44300	44300		41900		14300		11800	J
Lead	15	16.4			16.4					
Manganese	88	13600	1410		1120		1770		1350	
Nickel	73	240	156		130		240		208	
Thallium	0.24	ND							8.6	B
Metals - Filtered										
Aluminum	3650	7430			7430				4680	
Arsenic	0.045	22.0			22.0		6.5	J		
Cobalt	73	105					105		95.5	
Iron	1095	41600	34100		41600		14800		11500	J
Lead	15	17			17.0					
Manganese	88	8850	1260		1170		1830		1330	
Nickel	73	248	140		131		248		214	
Thallium	0.24	ND			10.1	B				

TNTB-BEDGW-003

PARAMETER	RBSC	MDC	BD3036 08-OCT-01 ug/L RESULT	VQ	CB3024 10-APR-02 ug/L RESULT	VQ
Volatiles						
Acetone	61	110 J	110	J	85	J
Benzene	0.34	17	17		14	
Semivolatiles						
Naphthalene	0.62	2.8 J			2.8	J
Metals - Unfiltered						
Aluminum	3650	16900 J	16900	J	6410	
Arsenic	0.045	22.7	22.7		12.5	
Barium	255	1780	1500		1780	
Chromium	11	32.3	32.3		14.8	
Iron	1095	41700	35000		17100	J
Lead	15	15.7	15.7			
Manganese	88	1140	1140		509	
Thallium	0.24	ND			7.7	B
Vanadium	26	48.6 J	48.6	J		
Metals - Filtered						
Arsenic	0.045	4.9 J	4.9	J		
Barium	255	1750	628		1750	
Selenium	18	20.4	20.4			

TNTB-BEDGW-002

PARAMETER	RBSC	MDC	5430 16-NOV-97 ug/L RESULT	VQ	5435 18-MAY-98 ug/L RESULT	VQ	BD3010 27-SEP-01 ug/L RESULT	VQ	CB3018 05-APR-02 ug/L RESULT	VQ
Volatiles										
Benzene	0.34	17	0.91	J						
Methylene chloride	4.3	ND	4.8	B						
Metals - Unfiltered										
Barium	255	1780	326		406		391	J	411	
Metals - Filtered										
Barium	55	1750	384		414		391	J	403	

MK-MW16

PARAMETER	RBSC	MDC	5780 21-NOV-97 ug/L RESULT	VQ	5785 18-MAY-98 ug/L RESULT	VQ	CB3017 05-APR-02 ug/L RESULT	VQ
Metals - Unfiltered								
Aluminum	3650	6920 J	4990	J				
Iron	1095	44300	19800		20700	J	11300	
Manganese	88	13630	6970		13600		8520	
Nickel	73	240			108		80.4	
Metals - Filtered								
Iron	1095	41600	2410		5970			
Manganese	88	8850	6900		8850		8290	
Nickel	73	248			81.7		76.0	

LEGEND:

- MK-MW16 — OVERBURDEN MONITORING WELL LOCATION
- TNTB-BEDGW-002 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- O.B. FLOW — OVERBURDEN/SHALE GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

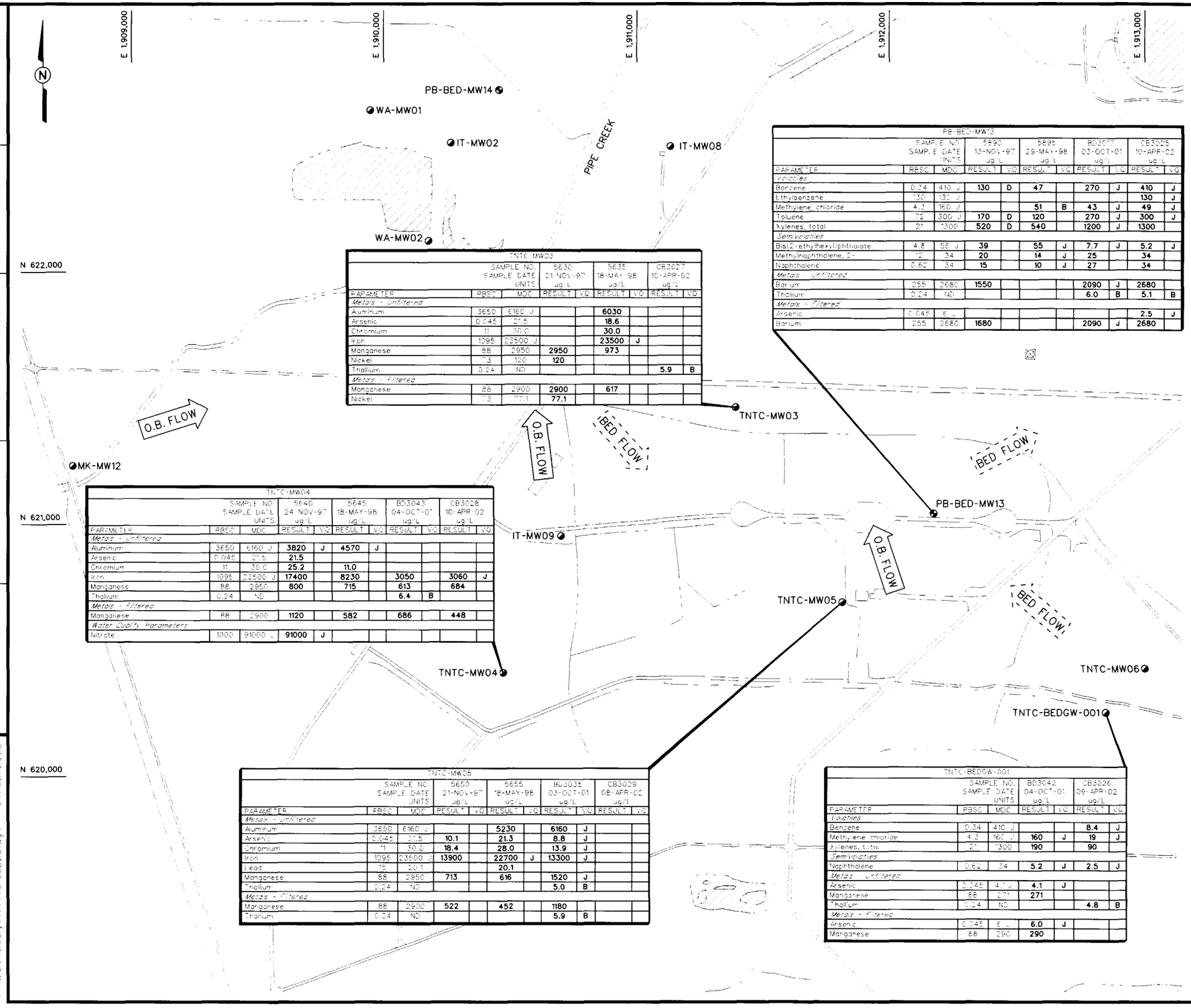
0 300 600 FEET

FIGURE 6-17
DETECTED CONSTITUENTS AT TNT MANUFACTURING AREA B ABOVE RBSCs IN OVERBURDEN/BEDROCK WELLS (NOVEMBER 1997, MAY 1998, SEPTEMBER-OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHKD. BY: C. T. MILLER
ENGR. CHK. BY: D. KESSLER
DATE LAST REVISED
DRAWN BY:
DWG. NO.: ...81es227.dgn
PROJ. NO.: 771148
INITIATOR: D. KESSLER
PROJ. MGR.: S. DOWNEY
STARTING DATE: 08/12/02
DRAWN BY: B. VANDERGRIFF
06:06:41 PM 04/02/2003
stout
FAC-ADD\Design\771148\es227.dgn



TNTC-MW03								
	SAMPLE NO.		5630		5635		CB3027	
	SAMPLE DATE		21-NOV-97		18-MAY-98		10-APR-02	
	UNITS		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ
Metals - Unfiltered								
Aluminum	3650	6160 J			**6030**			
Arsenic	0.045	21.5			**18.6**			
Chromium	11	30.0			**30.0**			
Iron	1095	23500 J			**23500**	J		
Manganese	88	2950	**2950**		**973**			
Nickel	13	120	**120**					
Thallium	0.24	ND					**5.9**	B
Metals - Filtered								
Manganese	88	2900	**2900**		**617**			
Nickel	13	77.1	**77.1**					

TNTC-MW04										
	SAMPLE NO.		5640		5645		BD3043		CB3028	
	SAMPLE DATE		24-NOV-97		18-MAY-98		04-OCT-01		10-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Metals - Unfiltered										
Aluminum	3650	6160 J	**3820**	J	**4570**	J				
Arsenic	0.045	21.5	**21.5**							
Chromium	11	30.0	**25.2**		**11.0**					
Iron	1095	23500 J	**17400**		**8230**		**3050**		**3060**	J
Manganese	88	2950	**800**		**715**		**613**		**684**	
Thallium	0.24	ND					**6.4**	B		
Metals - Filtered										
Manganese	88	2900	**1120**		**582**		**686**		**448**	
Water Quality Parameters										
Nitrate	1000	91000 J	**91000**	J						

PB-BED-MW13										
	SAMPLE NO.		5690		5695		BD3017		CB3025	
	SAMP. E DATE		13-NOV-97		29-MAY-98		03-OCT-01		10-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles										
Benzene	0.34	410 J	**130**	D	**47**		**270**	J	**410**	J
Ethylbenzene	130	130 J							**130**	J
Methylene chloride	4.3	160 J			**51**	B	**43**	J	**49**	J
Toluene	72	300 J	**170**	D	**120**		**270**	J	**300**	J
Xylenes, total	21	1300	**520**	D	**540**		**1200**	J	**1300**	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	55 J	**39**		**55**	J	**7.7**	J	**5.2**	J
Methylnaphthalene, 2-	72	34	**20**		**14**	J	**25**		**34**	
Naphthalene	0.62	34	**15**		**10**	J	**27**		**34**	
Metals - Unfiltered										
Barium	255	2680	**1550**				**2090**	J	**2680**	
Thallium	0.24	ND					**6.0**	B	**5.1**	B
Metals - Filtered										
Arsenic	0.045	6.0 J							**2.5**	J
Barium	255	2680	**1680**				**2090**	J	**2680**	

TNTC-MW05										
	SAMPLE NO.		5650		5655		BD3035		CB3029	
	SAMPLE DATE		21-NOV-97		18-MAY-98		03-OCT-01		08-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Metals - Unfiltered										
Aluminum	3650	6160 J			**5230**		**6160**	J		
Arsenic	0.045	21.5	**10.1**		**21.3**		**8.8**	J		
Chromium	11	30.0	**18.4**		**28.0**		**13.9**	J		
Iron	1095	23500 J	**13900**		**22700**	J	**13300**	J		
Lead	15	20.1			**20.1**					
Manganese	88	2950	**713**		**616**		**1520**	J		
Thallium	0.24	ND					**5.0**	B		
Metals - Filtered										
Manganese	88	2900	**522**		**452**		**1180**			
Thallium	0.24	ND					**5.9**	B		

TNTC-BEDGW-001						
	SAMPLE NO.		BD3042		CB3026	
	SAMPLE DATE		04-OCT-01		09-APR-02	
	UNITS		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ
Volatiles						
Benzene	0.34	410 J			**8.4**	J
Methylene chloride	4.3	160 J	**160**	J	**19**	J
Xylenes, total	21	1300	**190**		**90**	
Semivolatiles						
Naphthalene	0.62	34	**5.2**	J	**2.5**	J
Metals - Unfiltered						
Arsenic	0.045	4.1 J	**4.1**	J		
Manganese	88	271	**271**			
Thallium	0.24	ND			**4.8**	B
Metals - Filtered						
Arsenic	0.045	6.0 J	**6.0**	J		
Manganese	88	290	**290**			

LEGEND:

- TNTC-MW03 — OVERBURDEN MONITORING WELL LOCATION
- PB-BED-MW13 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- FENCE
- O.B. FLOW — OVERBURDEN/SHALE GROUNDWATER FLOW DIRECTION
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

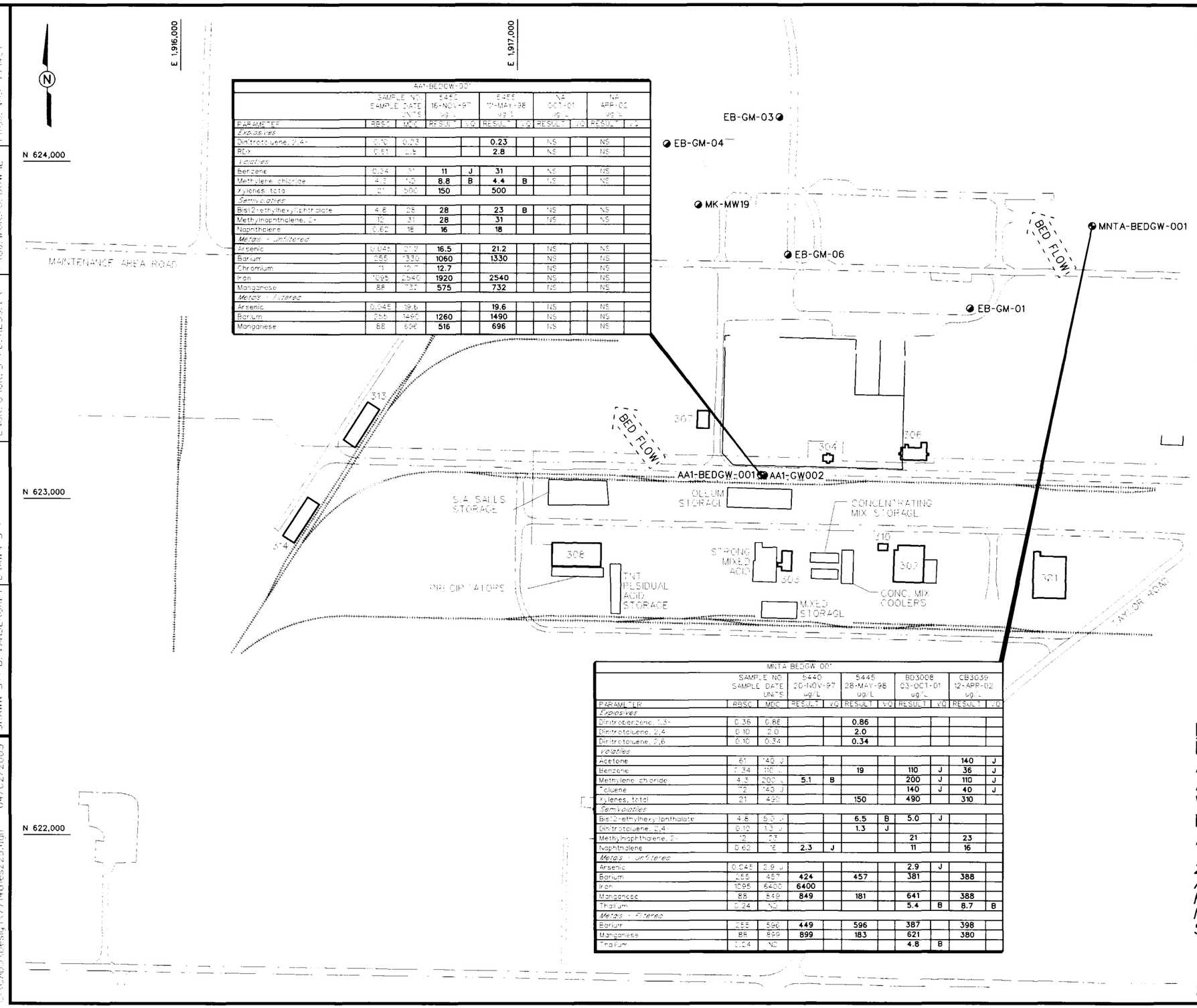
0 400 800 FEET

FIGURE 6-18
DETECTED CONSTITUENTS AT TNT MANUFACTURING AREA C ABOVE RBSCs IN OVERBURDEN/BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT CHCK. BY: C. TUMLIN | DWG. NO. 771481es228.cgn
ENGR CHCK. BY: D. KESSLER | PROJ. NO.: 771461
STARTING DATE: 08/22/02 | DATE LAST REV.:
DRAWN BY: B. VANDERGRIFF | DRAWN BY:
04/02/2003 07:35 PM



AA1-BEDGW-001

	SAMPLE NO. SAMPLE DATE UNITS		5460 16-NOV-97 ug/L		5460 19-MAY-98 ug/L		NA 03-OCT-01 ug/L		NA 12-APR-02 ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrotoluene, 2,4-	0.10	0.23			0.23		NS		NS	
RDX	0.61	2.8			2.8		NS		NS	
Volatiles										
Benzene	0.34	31	11	J	31		NS		NS	
Methylene chloride	4.3	ND	8.8	B	4.4	B	NS		NS	
Xylenes, total	21	500	150		500					
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	28	28		23	B	NS		NS	
Methylnaphthalene, 2-	12	31	28		31		NS		NS	
Naphthalene	0.62	18	16		18					
Metals - Unfiltered										
Arsenic	0.045	21.2	16.5		21.2		NS		NS	
Barium	255	1330	1060		1330		NS		NS	
Chromium	11	12.7	12.7				NS		NS	
Iron	1095	2540	1920		2540		NS		NS	
Manganese	88	732	575		732		NS		NS	
Metals - Filtered										
Arsenic	0.045	19.6			19.6		NS		NS	
Barium	255	1490	1260		1490		NS		NS	
Manganese	88	696	516		696		NS		NS	

MNTA-BEDGW-001

	SAMPLE NO. SAMPLE DATE UNITS		5440 20-NOV-97 ug/L		5445 28-MAY-98 ug/L		BD3008 03-OCT-01 ug/L		CB3039 12-APR-02 ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrobenzene, 1,3-	0.36	0.86			0.86					
Dinitrotoluene, 2,4	0.10	2.0			2.0					
Dinitrotoluene, 2,6	0.10	0.34			0.34					
Volatiles										
Acetone	61	140 J							140	J
Benzene	0.34	110 J			19		110	J	36	J
Methylene chloride	4.3	200 J	5.1	B			200	J	110	J
Toluene	72	140 J					140	J	40	J
Xylenes, total	21	490			150		490		310	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	5.0 J			6.5	B	5.0	J		
Dinitrotoluene, 2,4-	0.10	1.3 J			1.3	J				
Methylnaphthalene, 2-	12	23					21		23	
Naphthalene	0.62	18	2.3	J			11		16	
Metals - Unfiltered										
Arsenic	0.045	2.9 J					2.9	J		
Barium	255	457	424		457		381		388	
Iron	1095	6400	6400							
Manganese	88	849	849		181		641		388	
Thallium	0.24	ND					5.4	B	8.7	B
Metals - Filtered										
Barium	255	596	449		596		387		398	
Manganese	88	899	899		183		621		380	
Thallium	0.24	ND					4.8	B		

LEGEND:

MK-MW19	OVERBURDEN MONITORING WELL LOCATION
AA1-BEDGW-001	BEDROCK MONITORING WELL LOCATION
	BUILDINGS
	RAILROAD
	SURFACE WATER
	DITCH
	FENCE
BED FLOW	BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. NS - NOT SAMPLED.
5. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
6. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

FIGURE 6-19
DETECTED CONSTITUENTS AT ACID AREA NO. 1/MAINTENANCE SHOP AREA ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 08/12/02 | DATE LAST REV: | DWG. No: 771481
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | PROJ. No: 771481
DRAFT CHCK. BY: C. TUMLIN | PROJ. MGR.: S. DOWNE
ENGR. CHCK. BY: D. KESSLER | DRAWN BY: D. KESSLER
04/02/2003 07:47:02 PM
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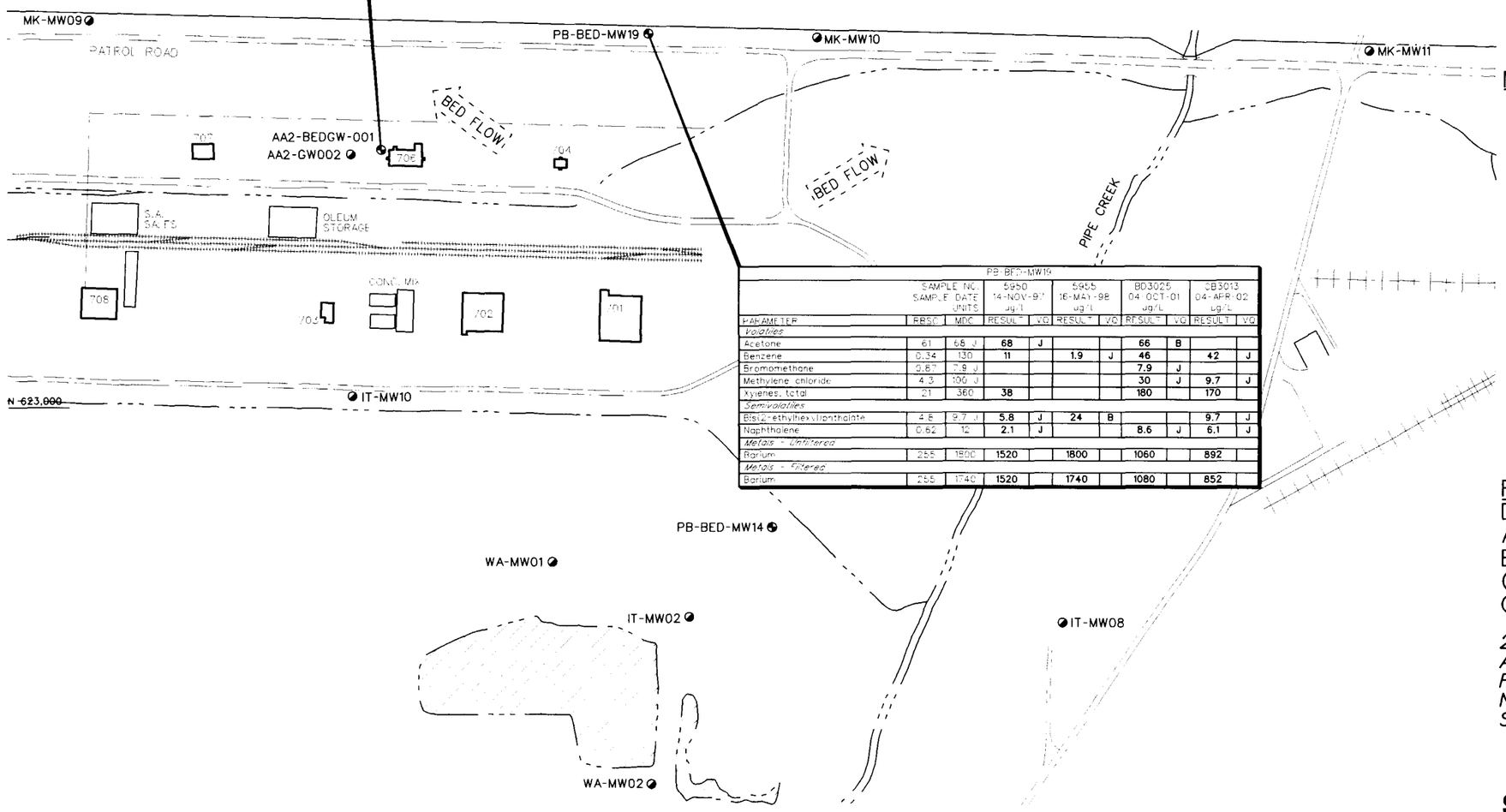
AA2-BEDGW-001										
	SAMPLE NO.		5460		5465		BD3004		CB3030	
	SAMPLE DATE		20-NOV-97		18-MAY-98		08-OCT-01		10-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrobenzene, 1,3-	0.36	0.81			**0.81**					
Dinitrotoluene, 2,4-	0.10	2.5			**2.5**					
Dinitrotoluene, 2,6-	0.10	1.2			**1.2**					
Volatiles										
Benzene	0.34	130	**33**		**130**		**45**	J	**4.8**	J
Chlorobenzene	11	21 J	**21**	J						
Chloromethane	1.5	30 J			**10**		**30**	J		
Methylene chloride	4.3	100 J	**7.4**	B			**100**	J		
Xylenes, total	21	360	**200**		**220**		**360**		**98**	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	9.7 J			**5.6**	B				
Naphthalene	0.62	12			**8.1**	J	**12**		**2.5**	J
Metals - Unfiltered										
Aluminum	3650	10200			**10200**					
Arsenic	0.045	34.2			**34.2**		**9.1**	J	**6.6**	J
Barium	255	1800			**645**		**843**		**368**	
Chromium	11	307			**307**					
Iron	1095	51600	**5240**		**51600**		**7210**		**2020**	J
Lead	15	38.6			**38.6**					
Manganese	88	5130	**522**		**5130**		**1030**		**228**	
Nickel	73	238			**238**					
Thallium	0.24	ND					**5.3**	B	**5.2**	B
Vanadium	26	108			**108**					
Metals - Filtered										
Arsenic	0.04	9					**3.7**	J	**9.0**	J
Barium	255	1740			**279**		**724**		**336**	
Iron	1095	1300					**1300**			
Manganese	68	995	**351**		**995**		**946**		**207**	

PB-BED-MW19										
	SAMPLE NO.		5950		5955		BD3025		SB3013	
	SAMPLE DATE		14-NOV-97		18-MAY-98		04-OCT-01		04-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles										
Acetone	61	68 J	**68**	J			**66**	B		
Benzene	0.34	130	**11**		**1.9**	J	**46**		**42**	J
Bromomethane	0.87	7.9 J					**7.9**	J		
Methylene chloride	4.3	100 J					**30**	J	**9.7**	J
Xylenes, total	21	360	**38**				**180**		**170**	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	9.7 J	**5.8**	J	**24**	B			**9.7**	J
Naphthalene	0.62	12	**2.1**	J			**8.6**	J	**6.1**	J
Metals - Unfiltered										
Barium	255	1800	**1520**		**1800**		**1060**		**892**	
Metals - Filtered										
Barium	255	1740	**1520**		**1740**		**1080**		**852**	



LEGEND:

- MK-MW10 — OVERBURDEN MONITORING WELL LOCATION
- AA2-BEDGW-001 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- AREA OF STORAGE TANKS
- RAILROAD
- ABANDONED RAILROAD
- SURFACE WATER
- DITCH
- FENCE
- NATURAL GAS
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

FIGURE 6-20
DETECTED CONSTITUENTS AT ACID AREA NO. 2 ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 08/12/02 DATE LAST REV:
DRAWN BY: B. VANDERGRIFF DRAWN BY:
DRAFT CHK BY: C. TUMLIN
ENGR CHK BY: D. KESSLER
INITIATOR: D. KESSLER
PROJ MGR: K. DOWNEY
DWG NO: 7/148e2A0.dgn
PROJ. NO: 7148
08:04:28 PM 04/02/2003
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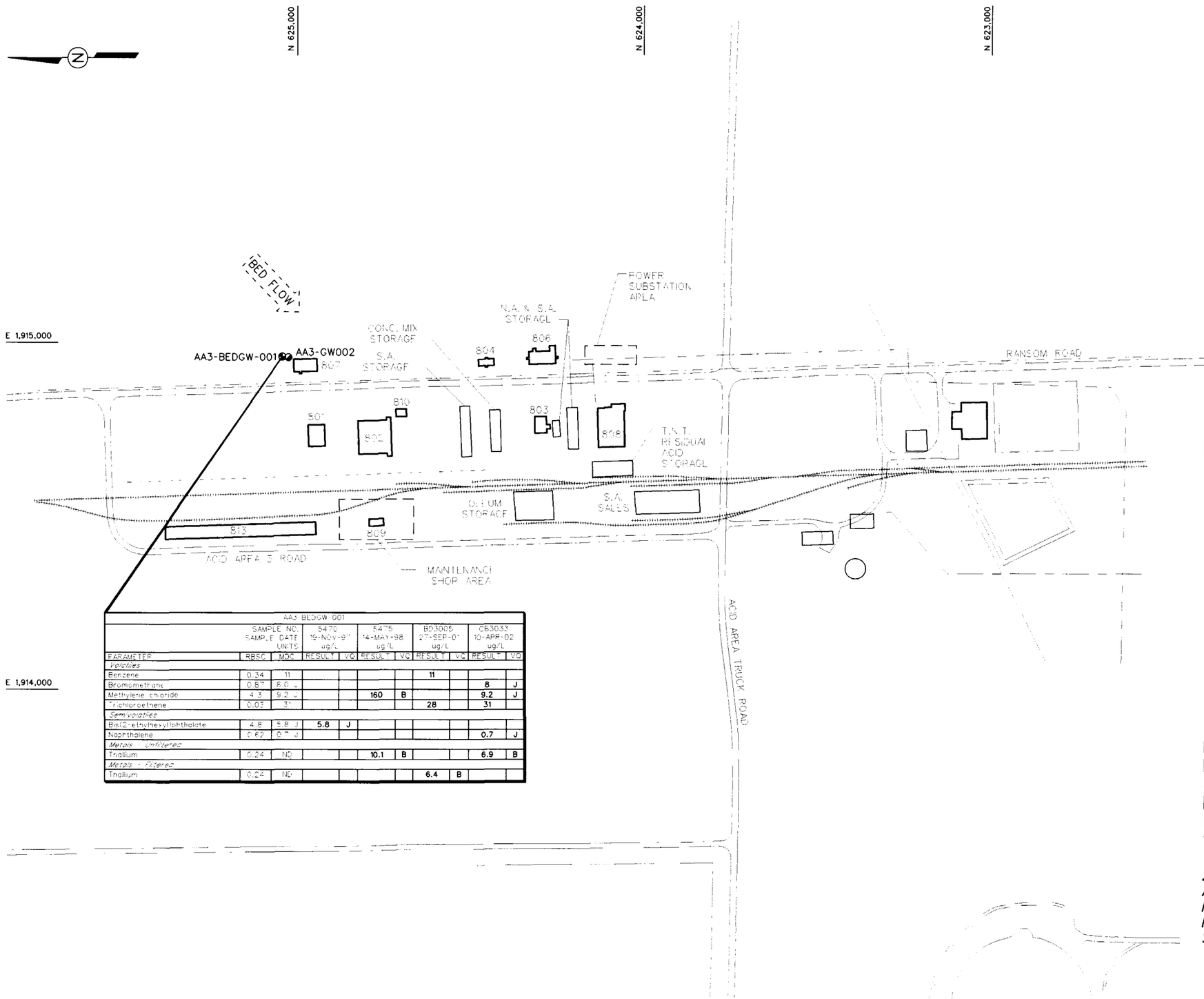

AA3-BEDGW-001										
	SAMPLE NO.		5470		5475		BD3005		CB3033	
	SAMPLE DATE		19-NOV-97		14-MAY-98		27-SEP-01		10-APR-02	
	UNITS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles										
Benzene	0.34	11					11			
Bromomethane	0.87	8.0 J							8	J
Methylene chloride	4.3	9.2 J			160	B			9.2	J
Trichloroethene	0.03	31					28		31	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.8	5.8 J	5.8	J						
Naphthalene	0.62	0.7 J							0.7	J
Metals - Unfiltered										
Thallium	0.24	ND			10.1	B			6.9	B
Metals - Filtered										
Thallium	0.24	ND					6.4	B		

LEGEND:

- AA3-GW002 — OVERBURDEN MONITORING WELL LOCATION
- AA3-BEDGW-001 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- AREA OF STORAGE TANKS
- RAILROAD
- ABANDONED RAILROAD
- SURFACE WATER
- DITCH
- FENCE
- NATURAL GAS
- RAW WATER
- EVAPORATOR LINES
- FORMER SEWER LINE
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOE NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

FIGURE 6-21
DETECTED CONSTITUENTS AT ACID AREA NO. 3 ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, SEPTEMBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 08/12/02 | DATE LAST K V: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: D. FESSLER | DWG NO.: 481es231.cgr
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: D. KESSLER | PROJ. MGR.: S. DOWNEY | PROJ. NO.: 77148
04/02/2003 08:13:29 PM | stout
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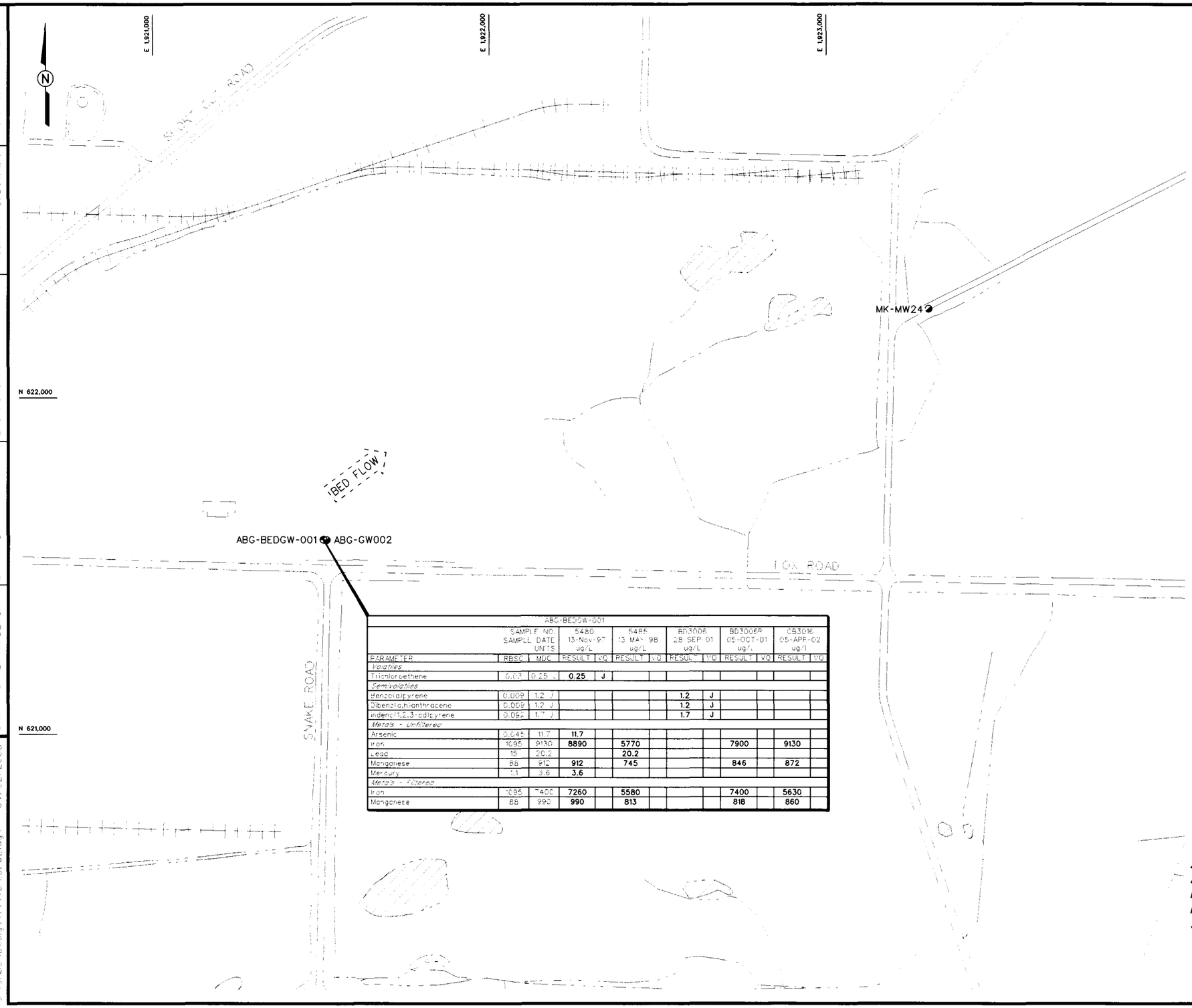

ABG-BEDGW-001													
	SAMPLE NO.		5480		5485		BD3006		BD3006R		CB3016		
	SAMPLE DATE		13-Nov-97		13-MAY-98		28-SEP-01		05-OCT-01		05-APR-02		
	UNITS		ug/L		ug/L		ug/L		ug/L		ug/L		
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	
Volatiles													
Trichloroethene	0.03	0.25 J	**0.25**	J									
Semivolatiles													
Benzo(a)pyrene	0.009	1.2 J					**1.2**	J					
Dibenz(a,h)anthracene	0.009	1.2 J					**1.2**	J					
Indeno(1,2,3-cd)pyrene	0.092	1.7 J					**1.7**	J					
Metals - Unfiltered													
Arsenic	0.045	11.7	**11.7**										
Iron	10.95	9130	**8890**		**5770**				**7900**		**9130**		
Lead	15	20.2			**20.2**								
Manganese	88	912	**912**		**745**				**846**		**872**		
Mercury	1.1	3.6	**3.6**										
Metals - Filtered													
Iron	10.95	7400	**7260**		**5580**				**7400**		**5630**		
Manganese	88	990	**990**		**813**				**818**		**860**		

LEGEND:

ABG-GW002	OVERBURDEN MONITORING WELL LOCATION
ABG-BEDGW-001	BEDROCK MONITORING WELL LOCATION
	BUILDINGS
	RAILROAD
	SURFACE WATER
	DITCH
BED FLOW	BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
4. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

FIGURE 6-22
DETECTED CONSTITUENTS AT ADDITIONAL BURNING GROUND AREA ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, SEPTEMBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFTING DATE: 08/12/02 | DATE LAST IN VAULT: | DRAFT. CHCK. BY: C. LUMPIN | INITIATOR: D. KLESS | DWG. NO.: 77148
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: D. KESSLER | PROJ. MGR.: S. DOWNEY | PROJ. NO.: 77148
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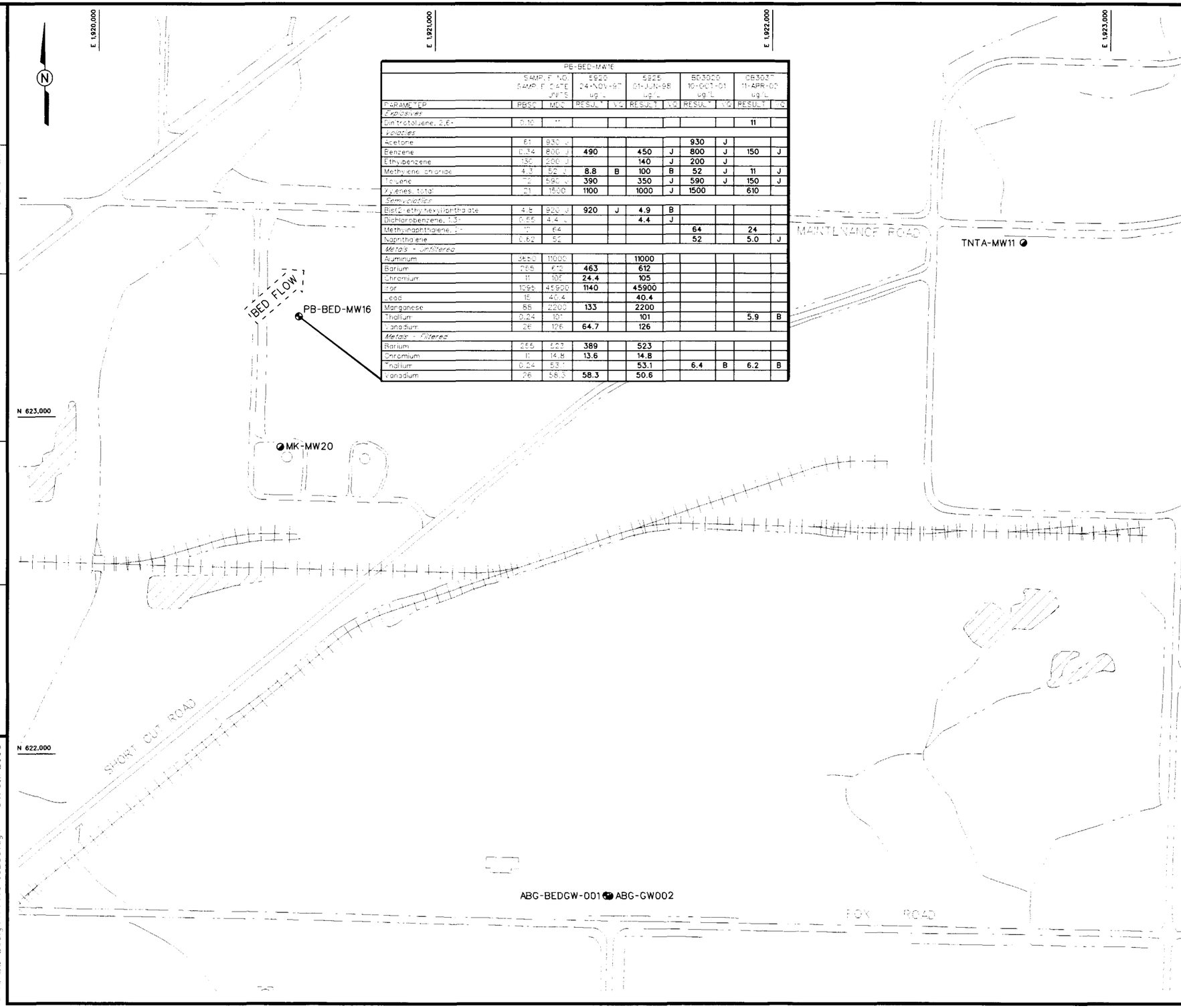


PB-BED-MW16										
	SAMP. F NO		5920		5925		603000		063027	
	SAMP. F DATE		24-NOV-97		01-JUN-98		10-OCT-01		11-APR-02	
	JWTS		ug/L		ug/L		ug/L		ug/L	
PARAMETER	PBSC	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrotoluene, 2,6-	0.10	**							11	
Volatiles										
Acetone	61	930 J					930	J		
Benzene	0.34	800 J	490		450	J	800	J	150	J
Ethylbenzene	130	200 J			140	J	200	J		
Methylene chloride	4.3	52 J	8.8	B	100	B	52	J	11	J
Toluene	72	590 J	390		350	J	590	J	150	J
Xylenes, total	21	1500	1100		1000	J	1500		610	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	4.5	920 J	920	J	4.9	B				
Dichlorobenzene, 1,3-	0.55	4.4 J			4.4	J				
Methylnaphthalene, 2-	17	64					64		24	
Naphthalene	0.62	52					52		5.0	J
Metals - Unfiltered										
Aluminum	3550	11000			11000					
Barium	265	612	463		612					
Chromium	11	105	24.4		105					
Iron	1095	45900	1140		45900					
Lead	15	40.4			40.4					
Manganese	88	2200	133		2200					
Thallium	0.24	101			101				5.9	B
Vanadium	26	126	64.7		126					
Metals - Filtered										
Barium	265	523	389		523					
Chromium	11	14.8	13.6		14.8					
Thallium	0.24	53.1			53.1		6.4	B	6.2	B
Vanadium	26	58.3	58.3		50.6					

LEGEND:

- MK-MW20 — OVERBURDEN MONITORING WELL LOCATION
- PB-BED-MW16 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
4. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QAULIFIED DATA).

SCALE

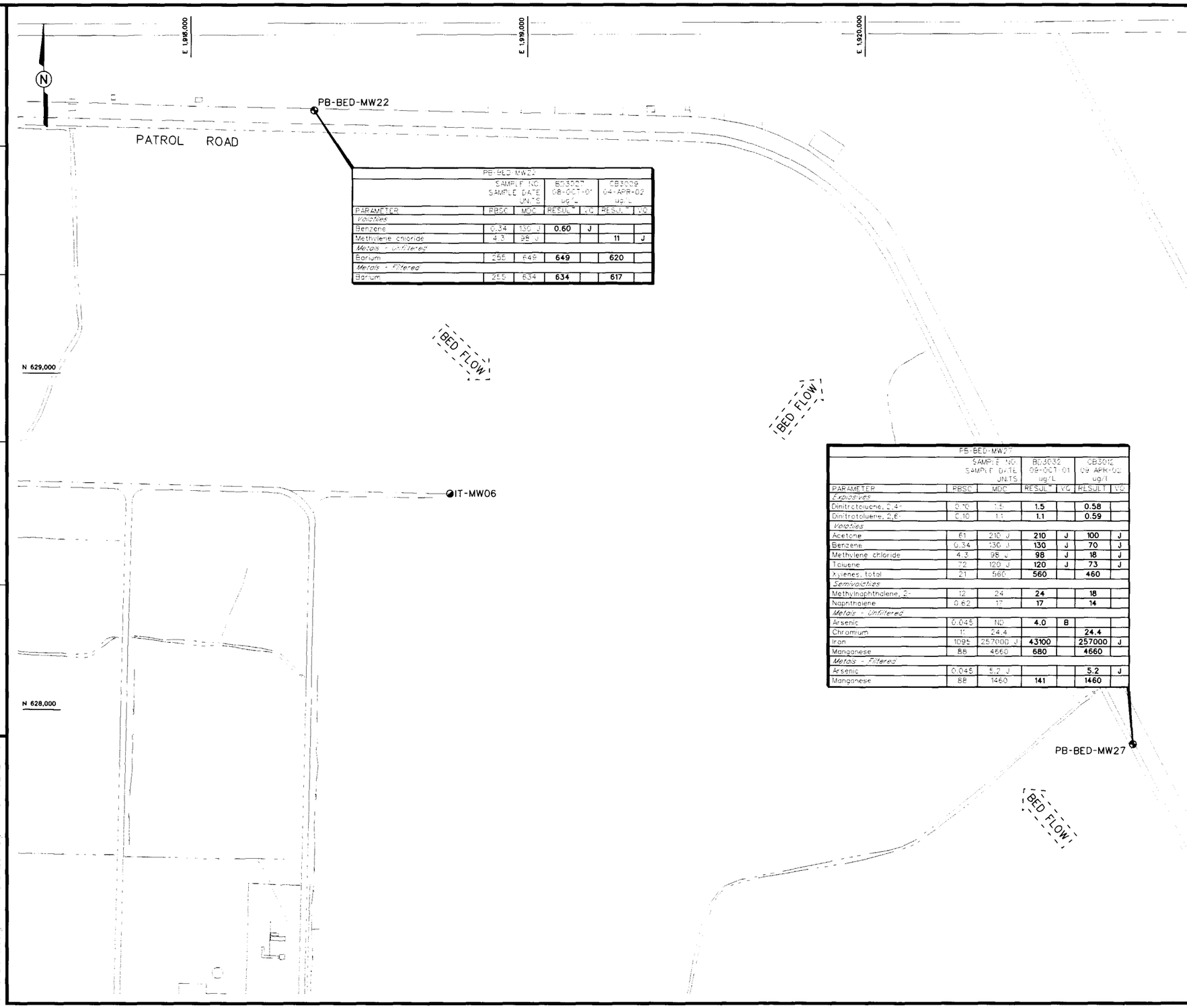
0 300 600 FEET

FIGURE 6-23
DETECTED CONSTITUENTS AT UPPER TOLUENE TANKS AREA ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

DRAFT. CHCK. BY: C. TIM. N | DATE LAST R.V.: | STARTING DATE: 08/12/02 | DRAWN BY: B. VANDERGRIFF | NITIATOR: D. KESSLER | DWG. NO.: 77148 | PROJ. NO.: 777148 | PROJ. MGR: S. DOWNEY | ENGR. CHCK. BY: D. KESSLER | DRAWN BY: | 04/02/2003 | 08:34:18 PM | ENCADD:\Design\77148\es233.dgn



PB-BED-MW22						
	SAMPLE NO.		BD3007		OB3009	
	SAMPLE DATE		08-OCT-01		04-APR-02	
	UNITS		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ
Volatiles						
Benzene	0.34	130 J	**0.60**	J		
Methylene chloride	4.3	98 J			**11**	J
Metals - Unfiltered						
Barium	255	649	**649**		**620**	
Metals - Filtered						
Barium	255	634	**634**		**617**	

PB-BED-MW27						
	SAMPLE NO.		BD3032		OB3012	
	SAMPLE DATE		09-OCT-01		09-APR-02	
	UNITS		ug/L		ug/L	
PARAMETER	RBSC	MDC	RESULT	VQ	RESULT	VQ
Explosives						
Dinitrotoluene, 2,4-	0.10	1.5	**1.5**		**0.58**	
Dinitrotoluene, 2,6-	0.10	1.1	**1.1**		**0.59**	
Volatiles						
Acetone	61	210 J	**210**	J	**100**	J
Benzene	0.34	130 J	**130**	J	**70**	J
Methylene chloride	4.3	98 J	**98**	J	**18**	J
Toluene	72	120 J	**120**	J	**73**	J
Xylenes, total	21	560	**560**		**460**	
Semivolatiles						
Methylnaphthalene, 2-	12	24	**24**		**18**	
Naphthalene	0.62	17	**17**		**14**	
Metals - Unfiltered						
Arsenic	0.045	ND	**4.0**	B		
Chromium	11	24.4			**24.4**	
Iron	1095	257000 J	**43100**		**257000**	J
Manganese	88	4660	**680**		**4660**	
Metals - Filtered						
Arsenic	0.045	5.2 J			**5.2**	J
Manganese	88	1460	**141**		**1460**	

LEGEND:

- IT-MW06 — OVERBURDEN MONITORING WELL LOCATION
- PB-BED-MW22 — BEDROCK MONITORING WELL LOCATION
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- BED FLOW — BEDROCK GROUNDWATER FLOW DIRECTION

NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. NE - NOT ESTABLISHED.
3. ND - NOT DETECTED.
4. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).

SCALE

0 300 600 FEET

FIGURE 6-24
DETECTED CONSTITUENTS AT DOWNGRADIENT PERIMETER WELLS ABOVE RBSCs IN BEDROCK WELLS (NOVEMBER 1997, MAY 1998, OCTOBER 2001 AND APRIL 2002)

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw™ Shaw Environmental, Inc.

STARTING DATE: 08/12/02 | DATE LAST REV.:
DRAWN BY: B. VANDERGRIFF | DRAWN BY:
PROJ MGR: S. DOWNEY | PROJ. NO.: 777148
NF ATTOR: D. KESSLER | DWG. NO.: 777148es234.dgn
ENGR CHCK. BY: D. KESSLER | DRAFT. CHCK. BY: C. TUM
DRAWN BY: 04/02/2003 08:50:24 PM
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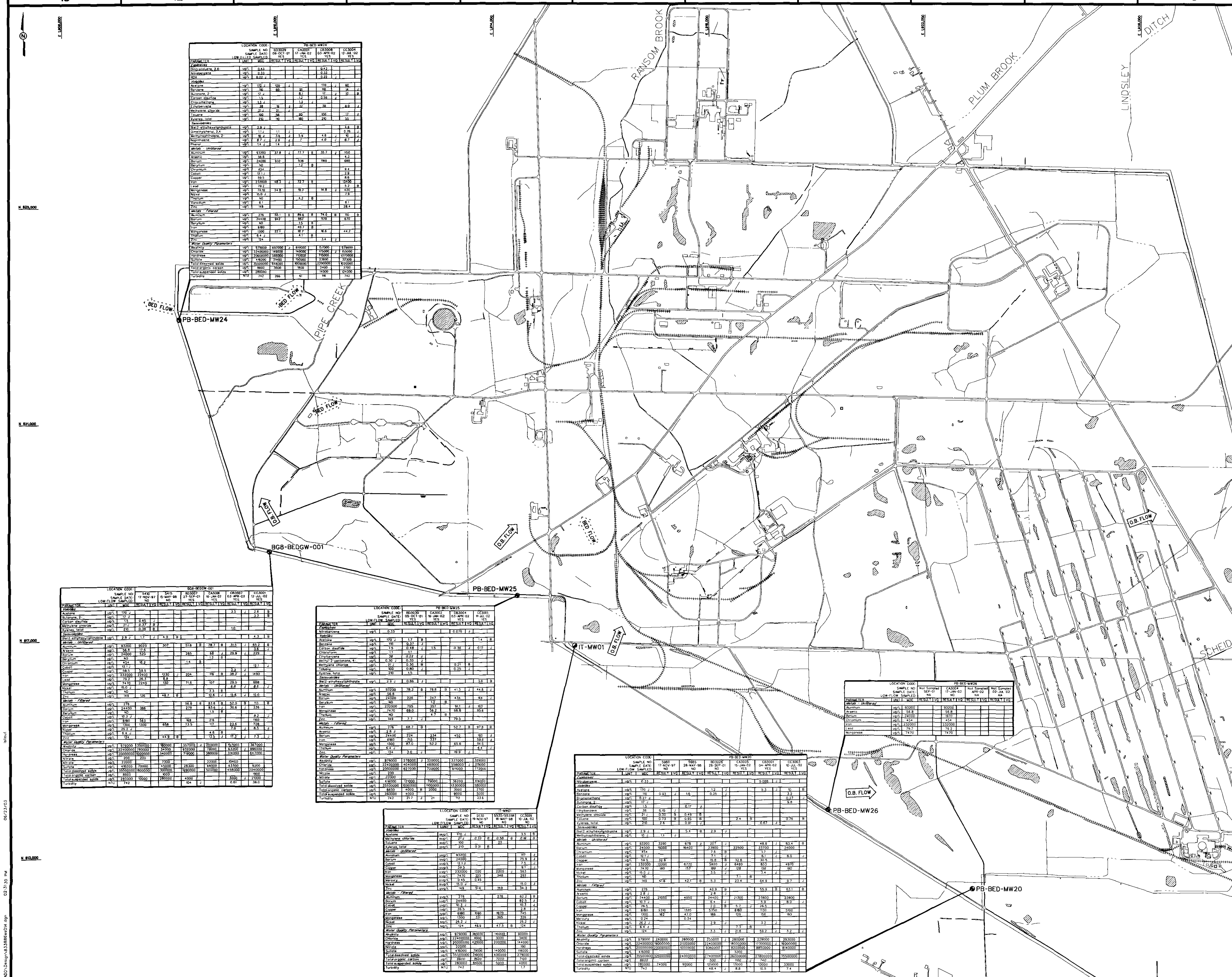


NOTES:

1. GROUNDWATER FLOW DIRECTION ON MAY 4, 2002.
2. UNABLE TO SAMPLE IT-MW01 IN SEPTEMBER 2001, JANUARY OR APRIL 2002. PVC CASING WAS DAMAGED AND PREVENTED ACCESS.
3. NE - NOT ESTABLISHED.
4. ND - NOT DETECTED.
5. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).
6. NA - NOT APPLICABLE.

		LOCATION CODE:	PB-BED-MW24							
		SAMPLE NO:	BD3029		CA3001		CB3008		CC3004	
		SAMPLE DATE:	09-OCT-01		17-JAN-02		03-APR-02		12-JUL-02	
		LOW-FILLED SAMPLED:	YES		YES		YES		YES	
PARAMETER	UNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Dinitrotoluene, 2,6-	ug/L	0.43					0.43			
Nitrobenzene	ug/L	0.33					0.33			
RDX	ug/L	0.22 J					0.22	J		
Volatiles										
Acetone	ug/L	170 J	120	J			170	J	60	
Benzene	ug/L	110	60		91		110		14	J
Butanone, 2-	ug/L	17 J			8.1		17	J	12	B
Carbon disulfide	ug/L	1.5			1.2		0.59	J		
Chloromethane	ug/L	1.3 J			1.3	J				
Ethylbenzene	ug/L	38	19	J	32		38		8.0	J
Methylene chloride	ug/L	21 J	21	J						
Toluene	ug/L	100	58		90		100		17	J
Xylenes, total	ug/L	210	110		180		210		55	
Semivolatiles										
Bis(2-ethylhexyl)phthalate	ug/L	2.9 J							4.6	B
Dimethylphenol, 2,4-	ug/L	1.1 J	1.1	J					0.76	J
Methylnaphthalene, 2-	ug/L	10 J	3.6	J	5.6		4.6	J	10	J
Naphthalene	ug/L	8.7 J	2.9	J	7		4.0	J	6.7	J
Phenol	ug/L	1.4 J	1.4	J						
Metals - Unfiltered										
Aluminum	ug/L	93200	37.8	J	77.7	B	35.7	J	1150	
Arsenic	ug/L	56.8							4.5	
Barium	ug/L	24000	932		938		1160		680	
Beryllium	ug/L	ND			1.2	B				
Chromium	ug/L	454							9.4	
Cobalt	ug/L	17.1 J							2.9	
Copper	ug/L	59.5							8.6	
Iron	ug/L	232000	48.3	J	72.7	B			13400	
Lead	ug/L	79.2							5.2	B
Manganese	ug/L	7470	24.8		19.2		14.8	J	420	
Nickel	ug/L	15.0 J							7.9	
Thallium	ug/L	ND			4.2	B				
Vanadium	ug/L	6.1							6.1	
Zinc	ug/L	149							28.4	
Metals - Filtered										
Aluminum	ug/L	276	55.1	B	89.6	B	74.0	B	110	B
Barium	ug/L	24400	942		962		1170		670	
Beryllium	ug/L	ND			1.5	B				
Iron	ug/L	6180			40.7	B				
Manganese	ug/L	1300	22.1		18.7		16.6		44.2	
Thallium	ug/L	6.4 J			4.1	B				
Zinc	ug/L	124					3.4	J		
Water Quality Parameters										
Alkalinity	ug/L	979000	697000	J	810000		157000		979000	
Chloride	ug/L	22400000	149000		140000		175000	J	155000	
Hardness	ug/L	20000000	566000		710000		715000		1370000	
Sulfate	ug/L	416000	21400		150000		23600		32300	
Total dissolved solids	ug/L	35500000	948000		1000000		2200000		1020000	
Total organic carbon	ug/L	8600	3000		1800		2400		3700	
Total suspended solids	ug/L	280000					14000		124000	
Turbidity	NTU	742	266		61		116		742	

		LOCATION CODE:	BG8-BEDGW-001											
		SAMPLE NO:	5410		5415		BD3007		CA3006		CB3007		CC3001	
		SAMPLE DATE:	17-NOV-97		15-MAY-98		27-SEP-01		16-JAN-02		03-APR-02		12-JUL-02	
		LOW-FLOW SAMPLED:	NO		NO		YES		YES		YES		YES	
PARAMETER	UNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles														
Acetone	ug/L	170 J									3.5	J	2.6	B
Butanone, 2-	ug/L	17 J											3.2	B
Carbon disulfide	ug/L	1.5	0.65	J										
Methylene chloride	ug/L	21 J	0.37	B										
Xylenes, total	ug/L	210	0.38	B							1.0			
Semivolatiles														
Bis(2-ethylhexyl)phthalate	ug/L	2.9 J	1.7	J	4.0	B							4.3	B
Metals - Unfiltered														
Aluminum	ug/L	93200	9020		307		51.6	B	78.7	B	31.5	J	65.2	B
Arsenic	ug/L	56.8	17.6										3.6	J
Barium	ug/L	24000	520				285		68	J	29.9	J	229	
Beryllium	ug/L	ND							1.2	B				
Chromium	ug/L	454	18.2				1.4	B						
Cobalt	ug/L	12.1 J											12.1	J
Copper	ug/L	59.5	59.5								3.3	J		
Iron	ug/L	232000	22600		1230	J	204		116	B	38.2	J	1490	
Lead	ug/L	79.2	26.3		6.8									
Manganese	ug/L	7470	2240		130		71.6		107		29.0		688	
Nickel	ug/L	15.0 J									6.8	J	8.6	J
Thallium	ug/L	ND							3.3	B				
Zinc	ug/L	149	126		49.7	B			12.6	J	15.6	J	10.0	
Metals - Filtered														
Aluminum	ug/L	276					56.6	B	83.6	B	52.0	B	113	B
Barium	ug/L	24400	366				279		83.6	J	30.6	J	236	
Beryllium	ug/L	ND							1.5	B				
Cobalt	ug/L	10.3 J											8.2	J
Iron	ug/L	6180	563				169		216				1160	
Manganese	ug/L	1300	1300		658		73.5		117		23.6		728	
Nickel	ug/L	26.2 J									7.0	J	8.5	J
Thallium	ug/L	6.4 J							4.6	B				
Zinc	ug/L	124			44.9	B			13.5	J	17.3	J	7.3	J
Water Quality Parameters														
Alkalinity	ug/L	979000	350000		180000		357000	J	200000		157000		367000	
Chloride	ug/L	22400000	780000		34000		832000		78000		63200	J	896000	
Hardness	ug/L	20000000	1000000		340000		719000		380000		314000		647000	
Nitrate	ug/L	200	200											
Nitrate	ug/L	22000			7300				22000		10400			
Sulfate	ug/L	416000	70000		45000		28300		68000		63300		9200	
Total dissolved solids	ug/L	35500000	1800000		300000		1990000		500000		458000		2040000	
Total organic carbon	ug/L	8500			1000								1900	
Total suspended solids	ug/L	280000	10000		280000		4000				3000	J	21000	
Turbidity	NTU	742					104	J			0.61		39.0	

		LOCATION CODE:	PB-BED-MW25							
		SAMPLE NO:	BD3030		CA3002		CB3004		CC3005	
		SAMPLE DATE:	05-OCT-01		16-JAN-02		03-APR-02		11-JUL-02	
		LOW-FLOW SAMPLED:	YES		YES		YES		YES	
PARAMETER	UNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives										
Nitrobenzene	ug/L	0.33					0.076	J		
Volatiles										
Acetone	ug/L	170 J	1.7	B					14	B
Benzene	ug/L	110	0.37	J						
Carbon disulfide	ug/L	1.5	0.48	J	1.5		0.36	J	0.17	J
Chloroform	ug/L	1.1	1.1							
Ethylbenzene	ug/L	38	0.22	J						
Methyl-2-pentanone, 4-	ug/L	0.30 J	0.30	J						
Methylene chloride	ug/L	21 J	0.30	B			0.21	B		
Toluene	ug/L	100	0.80	J			0.25	J		
Xylenes, total	ug/L	210	1.5							
Semivolatiles										
Bis(2-ethylhexyl)phthalate	ug/L	2.9 J	0.86	J					3.0	B
Metals - Unfiltered										
Aluminum	ug/L	93200	78.2	B	79.8	B	41.3	J	44.6	J
Arsenic	ug/L	56.8								
Barium	ug/L	24000	226		247		434		164	J
Beryllium	ug/L	ND			1.2	B				
Iron	ug/L	232000	795		357		91.1	J	103	
Manganese	ug/L	7470	89.0		56.2		68.8		95.6	
Thallium	ug/L	ND			4.7	B				
Zinc	ug/L	149	7.7	J			79.5			
Metals - Filtered										
Aluminum	ug/L	276	68.7	B			52.7	B	97.8	B
Arsenic	ug/L	2.8 J								
Barium	ug/L	24400	224		234		452		160	J
Iron	ug/L	6180	713		337				59.8	J
Manganese	ug/L	1300	87.0		52.2		65.6		94.0	
Thallium	ug/L	6.4 J							6.4	J
Zinc	ug/L	124	3.0	J			19.9	J		
Water Quality Parameters										
Alkalinity	ug/L	979000	278000	J	320000		337000		329000	
Chloride	ug/L	22400000	404000		460000		558000	J	219000	
Hardness	ug/L	20000000	627000		720000		611000		772000	
Nitrate	ug/L	200								
Nitrate	ug/L	22000								
Sulfate	ug/L	416000	121000		79000		36200		416000	
Total dissolved solids	ug/L	35500000	1000000		1100000		1330000		1180000	
Total organic carbon	ug/L	8600	4000	B	2000		3000		2700	
Total suspended solids	ug/L	280000	4000				9000		5000	
Turbidity	NTU	742	21.7	J	21		112		23.6	

		LLOCATION CODE:	IT-MW01					
		SAMPLE NO:	5530		5535/5535R		CC3009	
		SAMPLE DATE:	19-NOV-97		16-MAY-98		10-JUL-02	
		LOW-FFLOW SAMPLED:	NO		NO		NO	
PARAMETER	LUNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ
Volatiles								
Acetone	uug/L	170 J					3.5	B
Methylene chloride	uug/L	21 J	0.33	B	0.58	B	0.19	B
Toluene	uug/L	100			22			
Xylenes, total	uug/L	210	0.31	B				
Metals - Unfiltered								
Aluminum	uug/L	93200					117	J
Barium	uug/L	24000					75.9	J
Cobalt	uug/L	12.1 J					7.5	J
Copper	uug/L	59.5					9.1	J
Iron	uug/L	232000	1320		2200	J	563	
Manganese	uug/L	7470	323		348		292	
Mercury	uug/L	0.45	0.45					
Nickel	uug/L	15.0 J					15.0	J
Zinc	uug/L	149	51.6		149		34.3	
Metals - Filtered								
Aluminum	uug/L	276			276		62.2	B
Barium	Lug/L	24400					82.5	J
Cobalt	Lug/L	10.3 J					10.3	J
Copper	Lug/L	26.5					2.8	J
Iron	ug/L	6180	1090		1970		745	
Manganese	ug/L	1300	331		395		326	
Nickel	ug/L	26.2 J					26.2	J
Zinc	ug/L	124	46.9		47.5	B	124	
Water Quality Parameters								
Alkalinity	ug/L	979000	360000		110000		90000	
Chloride	ug/L	22400000	4000		3000		3400	
Hardness	ug/L	20000000	420000		200000		144000	
Nitrate	ug/L	22000					190	
Sulfate	ug/L	416000	79000		140000		118000	
Total dissolved solids	ug/L	35500000	310000		400000		279000	
Total organic carbon	ug/L	8600	8600		7000		7100	
Total suspended solids	ug/L	280000	84000		5000		4000	
Turbidity	NTU	742					1.7	

		LOCATION CODE:	PB-BED-MW20											
		SAMPLE NO:	5960		5965		BD3026		CA3005		CB3001		CC3003	
		SAMPLE DATE:	17-NOV-97		28-MAY-98		26-SEP-01		15-JAN-02		04-APR-02		10-JUL-02	
		LOW-FLOW SAMPLED:	NO		NO		NO		YES		YES		YES	
PARAMETER	UNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Explosives														
Nitrobenzene	ug/L	0.33									0.088	J		
Volatiles														
Acetone	ug/L	170 J					1.2	J			5.3	J	10	B
Benzene	ug/L	110	0.93	J	1.6		0.25	J					3.2	
Bromomethane	ug/L	0.27 J											0.27	J
Butanone, 2-	ug/L	17 J											9.8	
Carbon disulfide	ug/L	1.5			0.17	J								
Ethylbenzene	ug/L	38	0.15	J										
Methylene chloride	ug/L	21 J	0.30	B	0.49	B								
Toluene	ug/L	100	0.73	B	0.95	B			2.4	B			0.76	B
Xylenes, total	ug/L	210	2.6		0.91	J					0.67	J		
Semivolatiles														
Bis(2-ethylhexyl)phthalate	ug/L	2.9 J			5.4	B	2.9	J						
Methylnaphthalene, 2-	ug/L	10 J	1.1	J										
Metals - Unfiltered														
Aluminum	ug/L	93200	3290		678	J	207	J			48.6	J	83.4	B
Barium	ug/L	24000	19000		16400		23900		22500		23700		24000	
Chromium	ug/L	454					7.6	B			1.7	J		
Cobalt	ug/L	12.1 J					7.1	J			6.1	J	6.0	J
Copper	ug/L	59.5	32.8				15.8	B	32.8		30.5			
Iron	ug/L	232000	13200		6770		5920	J	6480		853		4970	
Manganese	ug/L	7470	180		153		189	J	128		156		190	
Nickel	ug/L	15.0 J					3.5	J			3.4	J		
Thallium	ug/L	ND							7.1	B				
Zinc	ug/L	149	41.6		42.1	B	5.3		23.4		64.9		9.7	J
Metals - Filtered														
Aluminum	ug/L	276					40.9	B			55.9	B	63.1	B
Arsenic	ug/L	2.8 J					2.8	J						
Barium	ug/L	24400	21000		4950		24400		21300		23800		23900	
Cobalt	ug/L	10.3 J					6.4	J			5.9	J	8.0	J
Copper	ug/L	26.5					2.0	B	5.7	J	26.5			
Iron	ug/L	6180	2310		1320		5350		6180		1130		5100	
Manganese	ug/L	1300	162		47.0		188		129		156		193	
Mercury	ug/L	0.24			0.24									
Nickel	ug/L	26.2 J					2.9	J			3.2	J		
Thallium	ug/L	6.4 J							7.3	B				
Zinc	ug/L	124					3.3	J	21.6		59.2	J	3.2	J
Water Quality Parameters														
Alkalinity	ug/L	979000	240000		260000		255000	J	280000		229000		293000	
Chloride	ug/L	22400000	19000000		21000000		22400000		18000000		17300000	J	19000000	
Hardness	ug/L	20000000	20000000		10000000		9360000		8200000		8850000		8140000	
Sulfate	ug/L	416000							3200					
Total dissolved solids	ug/L	35500000	32000000		24000000		27400000	J	26000000		27800000		35500000	
Total organic carbon	ug/L	6600					500	J	1100	J	740	J		
Total suspended solids	ug/L	280000	74000		90000		125000		13000		13000		33000	
Turbidity	NTU	742					48.4	J	8.8		10.5		7.4	

		LOCATION CODE:	PB-BED-MW26							
		SAMPLE NO:	Not Sampled		CA3004		Not Sampled		Not Sampled	
		SAMPLE DATE:	SEP-01		17-JAN-02		APR-02		02-JUL-02	
		LOW-FLOW SAMPLED:	NA		NO		NA		NA	
PARAMETER	UNIT	MDC	RESULT	VQ	RESULT	VQ	RESULT	VQ	RESULT	VQ
Metals - Unfiltered										
Aluminum	ug/L	93200			93200					
Arsenic	ug/L	56.8			56.8					
Barium	ug/L	24000			1970					
Chromium	ug/L	454			454					
Iron	ug/L	232000			232000					
Lead	ug/L	79.2			79.2					
Manganese	ug/L	7470			7470					

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 07/21/02 | INITIATOR D. KESSLER | CHKD | DRAWN VANDERGRIFF | CHKD C. TUMLIN | PROJECT MNGR S. DOWNEY

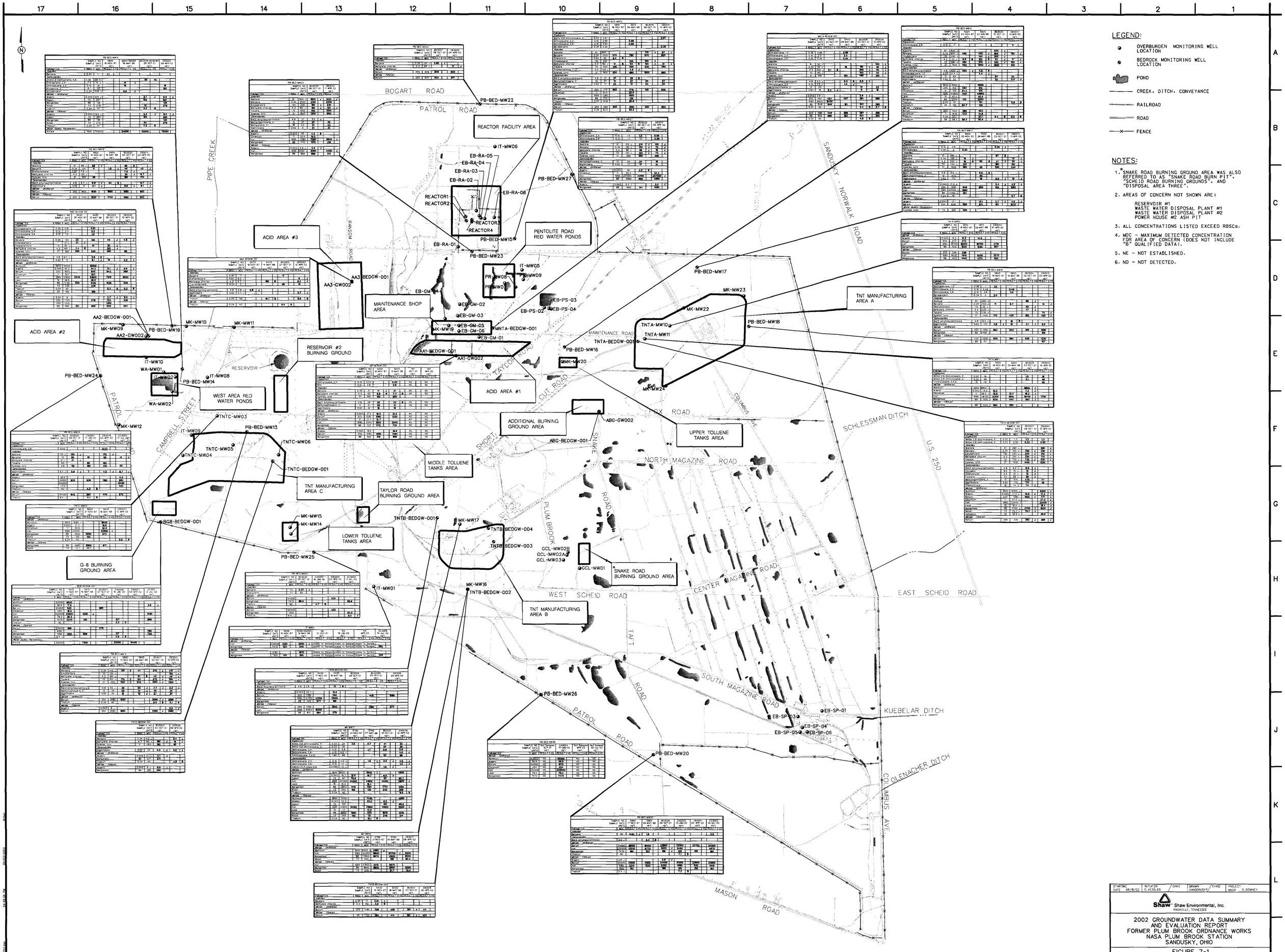
Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 6-25
DETECTED CONSTITUENTS IN OVERBURDEN/BEDROCK BACKGROUND MONITORING WELLS
(NOVEMBER 1997, MAY 1998, SEPTEMBER-OCTOBER 2001, JANUARY, APRIL AND JULY 2002)

AREA	JOB NO.	DRAWING NO.	REV
	833886	833886ES014.DGN	

C:\CADD\Design\833886es014.dgn 02:31:30 PM 06/23/03 lstout



LEGEND:

- OVERBURDEN MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- POND
- CREEK, DITCH, CONVEYANCE
- RAILROAD
- ROAD
- FENCE

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. AREAS OF CONCERN NOT SHOWN ARE:
   RESERVOIR #1
   WASTE WATER DISPOSAL PLANT #1
   WASTE WATER DISPOSAL PLANT #2
   POWER HOUSE #2 ASH PIT
3. ALL CONCENTRATIONS LISTED EXCEED RBSCs.
4. MDC - MAXIMUM DETECTED CONCENTRATION FOR AREA OF CONCERN (DOES NOT INCLUDE "B" QUALIFIED DATA).
5. NE - NOT ESTABLISHED.
6. ND - NOT DETECTED.

SCALE
0 800 1600 FEET

STARTING DATE 05/16/02	INITIATOR D. KESSLER	CHKD	DRAWN VANDERGRIFF	CHKD	PROJECT MGR S. DOWNEY

Shaw Environmental, Inc.
KNOXVILLE, TENNESSEE

2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

FIGURE 7-1
DETECTED CONSTITUENTS ABOVE RBSCs IN OVERBURDEN/BEDROCK MONITORING WELLS

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	833886	833886ES003.DGN	

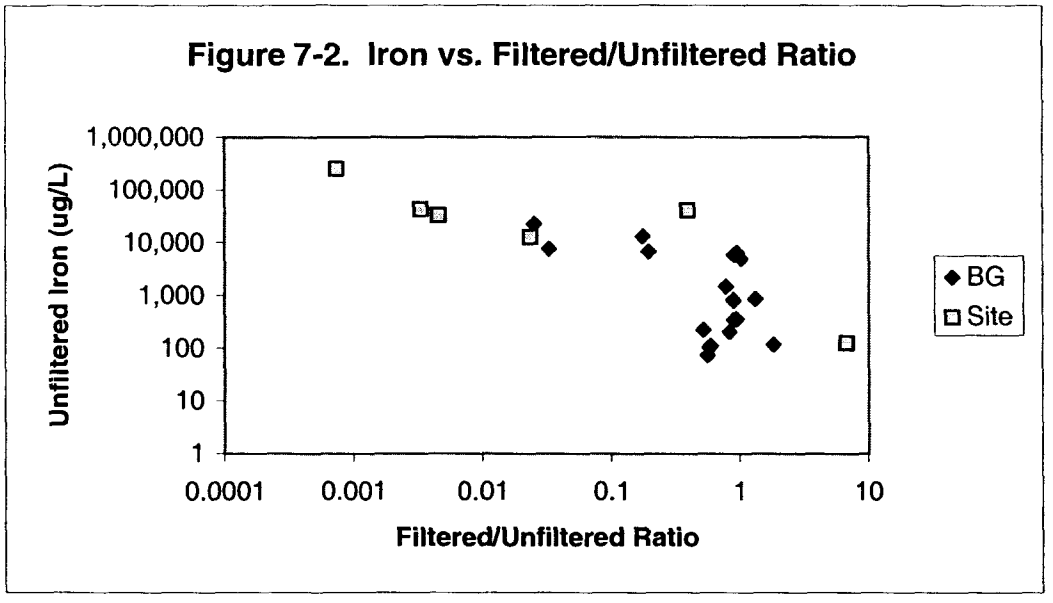


Figure 7-2. Iron vs. Filtered/Unfiltered Ratio
Unfiltered Iron (ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
0.0001
0.001
0.01
0.1
1
10
Filtered/Unfiltered Ratio
BG
Site

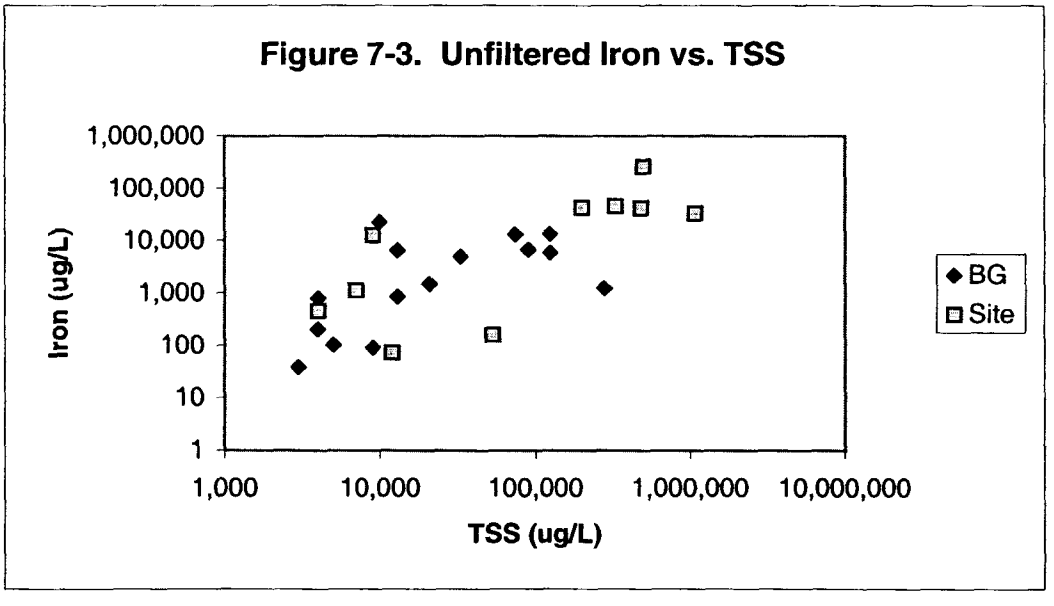


Figure 7-3. Unfiltered Iron vs. TSS
Iron (ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
1,000
10,000
100,000
1,000,000
10,000,000
TSS (ug/L)
BG
Site

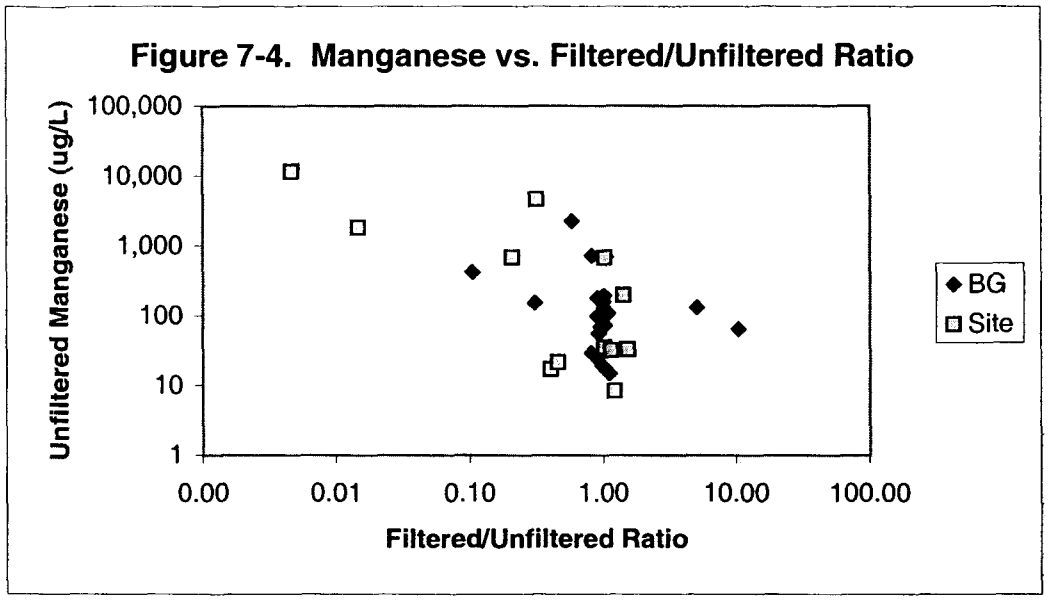


Figure 7-4. Manganese vs. Filtered/Unfiltered Ratio
Unfiltered Manganese (ug/L)
100,000
10,000
1,000
100
10
1
0.00
0.01
0.10
1.00
10.00
100.00
Filtered/Unfiltered Ratio
BG
Site

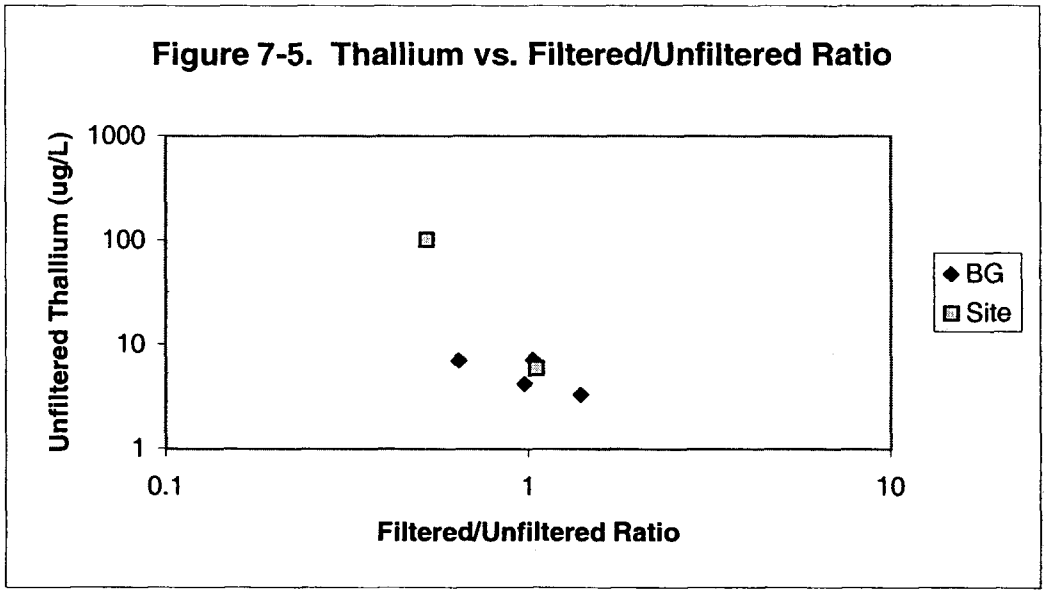


Figure 7-5. Thallium vs. Filtered/Unfiltered Ratio
Unfiltered Thallium (ug/L)
1000
100
10
1
0.1
1
10
Filtered/Unfiltered Ratio
BG
Site

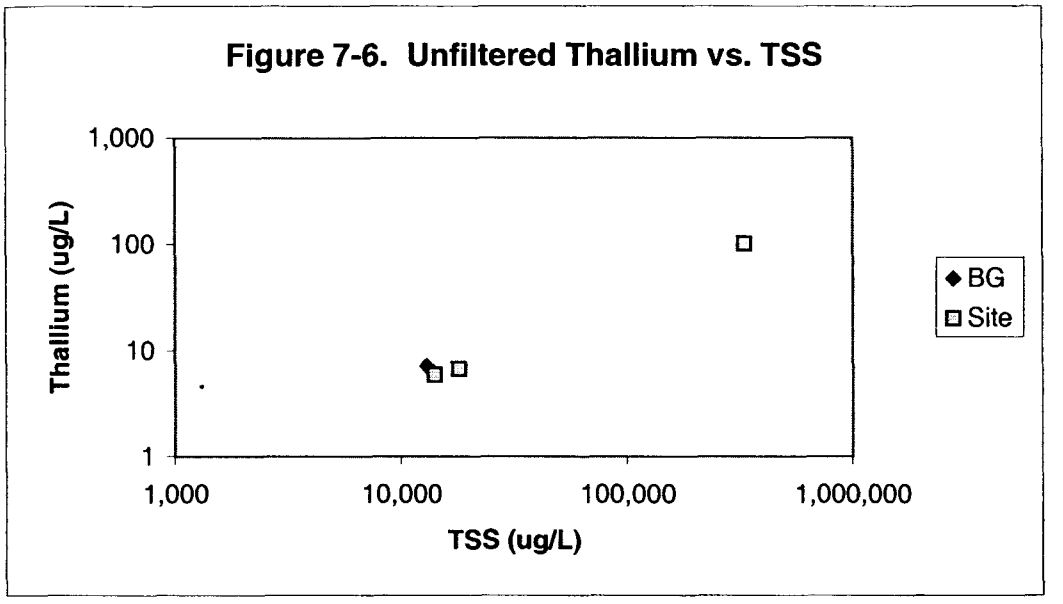


Figure 7-6. Unfiltered Thallium vs. TSS
1,000
100
10
1
Thallium (ug/L)
1,000
10,000
100,000
1,000,000
TSS (ug/L)
BG
Site

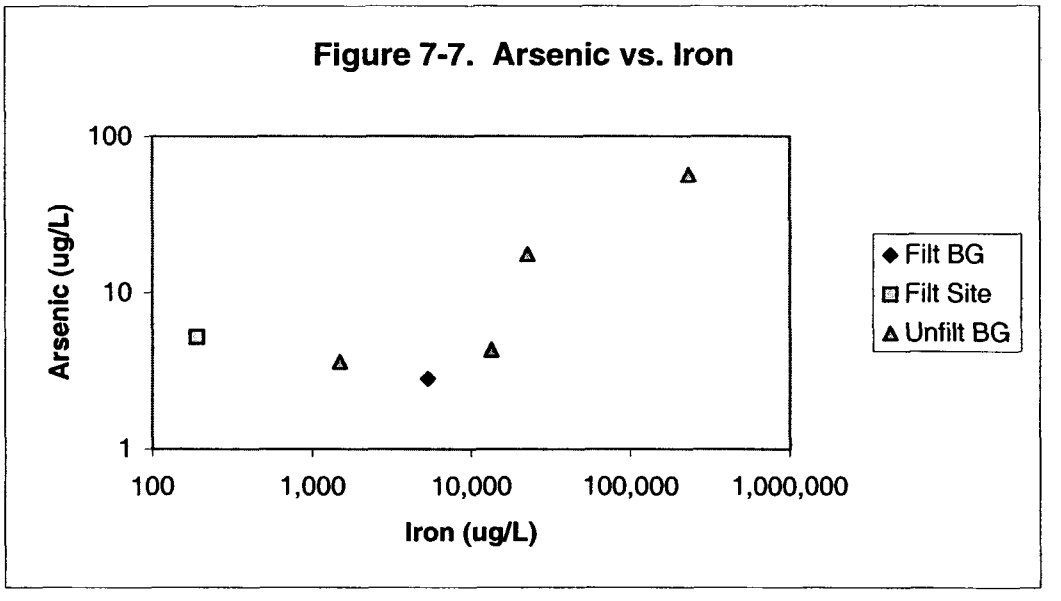


Figure 7-7. Arsenic vs. Iron
100
10
1
Arsenic (ug/L)
100
1,000
10,000
100,000
1,000,000
Iron (ug/L)
Filt BG
Filt Site
Unfilt BG