U.S. Army Corps of Engineers
Louisville District

Defense Environmental Restoration Program
For
Formerly Used Defense Sites

Limited Site Investigation

Final Report

for
the former

Plum Brook Ordnance Works

Pentolite Area Waste Lagoons

Sandusky, Ohio
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List of Acronyms

ASTM	American Standards for Testing Materials
BTEX	benzene, toluene, ethylbenzene, xylene
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CLP	Contract Laboratory Program
COC	Chain of Custody
CRL	Central Regional Laboratory
D&D	Decontamination & Decommissioning
DERP	Defense Environmental Restoration Program
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
ERIIS	Environmental Risk Information & Imaging Services
ERNS	Emergency Response Notification System
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Sites
gpm	gallons per minute
GSA	General Services Administration
HNO_3	Nitric Acid
IDW	Investigation-Derived Waste
INPR	Inventory Project Request
IT	IT Corporation
LeRC	Lewis Research Center
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
msl	mean sea level
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautical and Space Administration
NIST	National Institute of Standard Technology
NPL	National Priorities Lists
OEPA	Ohio Environmental Protection Agency
PA	Preliminary Assessment
PAWL	Pentolite Area Waste Lagoons
PBOW	Plum Brook Ordnance Works
PBRF	Plum Brook Reactor Facility

PBS	Plum Brook Station
PE	Pentaerythritol
PETN	Pentaerythritol tetranitrate
PID	Photoionization Detector
ppb	parts per billion
PRGs	Preliminary Remediation Goals
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SAS	Spectial Analytical Services
SI	Sight Investigation
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
SW846	Test Methods for Evaluating Solid Waste 1986
TAL	Target Analyte List
TCL	Target Compound List
TOC	Total Organic Carbon
TNT	trinitrotoluene
USACE	U.S. Army Corp of Engineers
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

1.0 Introduction

Located south of Sandusky, Ohio, the former Plum Brook Ordnance Works (PBOW) installation was operated from 1941 to 1945 by the Department of Defense (DOD) for the manufacturing of trinitrotoluene (TNT), dinitrotoluene (DNT) and pentolite. Contamination that is potentially related to DOD activities has been detected at several sites within the facility. These sites are being addressed by the DOD under the Defense Environmental Restoration Program (DERP), Formerly Used Defense Sites (FUDS).

A limited Site Investigation (SI) of the former Pentolite Area Waste Lagoons (PAWL), one of the PBOW sites, is documented herein. The potential for contamination of the former PAWL site was identified in an Inventory Project Request (INPR) (Huntington District U.S. Army Corps of Engineers (USACE), 1998). The purpose of this limited (SI) was to evaluate the potential contamination of the PAWL site due to past Department of Defense (DOD) activities. The References section of this report identifies the guidance documents and information used to complete this investigation. Historical information was reviewed to identify the environmental media and locations most likely to be affected. Field sampling and chemical laboratory analyses were performed to evaluate the environmental media at the site. Results of the laboratory analyses were then compared to risk-based, media specific screening criteria. USEPA Region 9 Preliminary Remediation Goals (PRGs) have been used as the screening criteria.

This project is one of several limited SI projects simultaneously undertaken by the US Army Corps of Engineers to be executed by the Louisville District (CELRL) in cooperation with the Huntington District (CELRH).

The sampling and chemical laboratory analyses were performed in accordance with the Quality Assurance Project Plan (QAPP) prepared by the Corps of Engineers, Louisville District, dated June 1999.

2.0 Site Description

2.1 Location

The PAWL site is located within the northern portion of the National Aeronautical and Space Administration (NASA) operated Plum Brook Station (PBS) facility in Erie County, Ohio. The PBS facility, formerly Plum Brook Ordnance wr0oks (PBOW), occupies 6,400 acres of land belonging to Perkins, Huron, Milan, and Oxford Townships, and is located approximately four miles south of Sandusky, Ohio. Figure 1 (attached) illustrates the PBOW vicinity location plan. Figure 2 (attached) depicts a more detailed illustration of PBOW and Figure 3 (attached) shows the PAWL site location plan.

The former PAWL includes approximately 1.3 acres within the vicinity of the currently existing Plum Brook Reactor Facility (PBRF). See the Sample Location Plan on Figure 4

(attached) for the location of the former PAWL illustrated on the current site layout). The PAWL are not currently detectable and the area is grass covered and relatively flat. This area is located just south of the PBRF Hot Laboratory and surrounded by an 8-foot tall chain-link fence. Current photographs of the area are provided in Appendix A.

Erie County is characterized by a continental climate. Winters are cold and cloudy and summers are warm and humid. The county's first freezing temperature typically occurs in October, and its last freezing temperature is normally in April. Average annual precipitation for Sandusky from 1961 to 1990 was 34.05 inches. Wind is from the southwest 55 percent of the time (Dames & Moore 1997).

2.2 Topography

According to historic plans obtained from the PBS Preliminary Assessment (PA) (Science Applications International Corporation Report (SAIC), 1991), the surface elevation of the waste lagoons was 626.15 feet msl. The perimeter bottom of the waste lagoon angled at a slope of about 2:1 to a bottom elevation of 620.5 msl. The surface of the area that presently occupies the former PAWL is relatively flat and at about 630 feet above mean sea level (msl). Based on review of historic topographic quadrangles (USGS, 1959, 1969 and 1979), the surface elevation in the former PAWL has not changed significantly since the PAWL were filled in conjunction with the construction of the Plum Brook Reactor Facility (PBRF). Copies of the 1959 and 1969 topographic quadrangles are included in Appendix B.

2.3 Hydrology

Based on discussions with NASA personnel, the entire Plum Brook Reactor Facility was specifically graded so that all surface water would flow into a series of catch basins, all of which fed into the Water Effluent Monitoring System. This single outfall from the entire 27-acre site is located in the southeast corner of the fenced in area. Form here the water is discharged into Pentolite Ditch, which runs east to Plum Brook. The point at which Pentolite Ditch enters Plum Brook is just upstream of our NPDES monitoring station for Plum Brook, prior to it leaving the PBS boundary. Plum Brook flows north from here to end up in Sandusky Bay.

Based on published hydrologic information (U.S. Department of the interior, 1987), the closest wetland to the former PAWL is a reservoir about 500 feet to the east. A wetlands map of the area is included in Appendix C.

2.4 Geology

2.4.1 Plum Brook Ordnance Works (Installation- Wide)

Based on the Site Wide Ground Water Study (IT Corporation, 1997-1998), three

formations, all of the Devonian Age, underlie the PBOW installation. The Delaware Limestone is the lowermost formation. It is characterized as a hard, dense, finely crystalline limestone and dolomite. Dissolution of this unit has been described which has produced solution channels along bedding planes and joints, and has even formed caverns in some areas. The unit is typically buff-colored and usually described as fossiliferous. In the vicinity of PBOW, benzene, toluene, ethyl benzene, and xylene (BTEX) and hydrogen sulfide are common in area quarries. Overlying the Delaware Limestone is the Olentangy Formation. Two members of the Olentangy Formation have been characterized at the PBOW facility, 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 interpreted to be a unit approximately 15 feet thick which outcrops occasionally in a 1,000 to 2,000-foot wide, northeast striking band across the middle portion of the PBOW. It has been described as a dark-gray to blue, very hard, siliceous, fossiliferous limestone or dolomitic mudstone. The uppermost formation at the PBOW facility is the Ohio Shale. Only one member of the Ohio Shale formation is present in the PBOW area- the Huron Shale. This unit has been described as black, thinly bedded, with pyrite and abundant carbonaceous matter with some large pyrite/carbonate concretions up to 6 feet in diameter.

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 approximately 5 feet or less for most of PBOW to greater than 25 feet. The overburden is thickest on the northern portion of the installation.

2.4.2 Pentolite Area Waste Lagoons (Site Specific)

A subsurface boring record (Dames and Moore, 1997), located about ¼ mile east of the former PAWL site, indicated a subsurface profile consisting of an upper layer of brown fine sand extending from the ground surface to a depth of approximately 6 feet below ground surface (bgs). Based on the review of historical grading plans, this upper layer may be fill material associated with the construction of the PBRF. This upper layer is generally underlain by a layer of consisting of silty clay and clayey silt soils extending to limestone bedrock. Shale fragments were encountered in the overburden soils from 14 feet to 24 feet bgs. Limestone bedrock was encountered at a depth of about 24 feet bgs.

The subsurface conditions encountered during this investigation are described in Section 3.1 of this report. Generally, the lithology encountered was consistent with the anticipated conditions from the information reviewed.

2.5 Hydrogeology

2.5.1 PBOW (Installation Wide)

Based on the Site Wide Groundwater Study (IT Corporation 1997-1998), potable groundwater has been encountered in the bedrock units underlying the PBOW facility. Generally this groundwater flows north toward Lake Erie. Based on the hydrogeologic information given in Appendix D (Groundwater Resources of Erie County, 1986), the PBOW facility includes 3 distinct hydrogeologic regions. Groundwater yields from these regions range from limited, to the northeast and south, to more than 500 gallons per minute (gpm), to the northwest.

2.5.2 PAWL (Site Specific)

No groundwater was encountered in the soil borings at the time of our fieldwork for this SI investigation. Groundwater encountered in the overburden soils beneath the PAWL site would likely be perched or trapped water. Perched water occurs in irregular, discontinuous granular zones within the soil overburden. Perched water sources contain widely varying quantities of water depending on recent precipitation and other site-specific factors. Based on the soil types encountered, overburden groundwater quantities should be minimal.

Based on the hydogeologic information presented in Appendix D, the PAWL site is located in a hydrogeologic region that reports groundwater yields of 15 gpm, or less from wells drilled into the limestone. Hydrogen sulfide may be present in varying amounts.

2.6 Operational History and Waste Characteristics

2.6.1 Plum Brook Station (Installation Wide)

Based on the Archives Search Report (USACE, 1993), the original PBS site was established in 1941 and referred to as Plum Brook Ordnance Works (PBOW). The installation was established for the purpose of manufacturing trinitrotoluene (TNT), dinitrotoluene (DNT), pentolite, and nitric and sulfuric acids. Built by E.B. Badger and Sons Company, the facility was operated under contract by the Trojan Powder Company. Production of explosives ceased two weeks after Victory over Japan (VJ) Day, with excess of one billion pounds of explosives manufactured during the four-year operating period.

By September 1945, the entire Ordnance Inspection Department was abolished. Decontamination of TNT, acid, pentolite and DNT manufacturing lines was completed during the last quarter of 1945. On December 17, 1945, the physical custody of the plant was transferred from Trojan to the Ordnance Department.

The USACE assumed responsibility for maintenance and custodial duties until September 1946 when the property was transferred to the War Assets Administration (predecessor to the Government Services Administration (GSA)), after it was certified by the U.S. Army to be decontaminated.

NASA acquired the PBOW in 1963 and presently uses the site, now referred to as PBS.

The PBS site currently lies in an area that is primarily rural and agricultural with a low population density. The NASA Glenn Research Center occupies a majority of the former ordnance works. The Department of the Army maintains a reserve center on the southernmost portion of the facility. The remainder of the former installation is in private ownership with the vast majority being cultivated. Based on the referenced USDA Soil Survey, the majority of the crops cultivated in Erie county are primarily fruits and vegetables of various types. Specific crops are unknown at this time. A tract along the northern boundary is owned by the Perkins Board of Education and is used as a bus maintenance facility. A land use map (dated 1980/1983) and an historic land ownership map (dated 1865) of the PBOW and its vicinity is included in Appendix E.

2.6.2 Pentolite Area Waste Lagoons (Site Specific)

2.6.2.1 Historic Conditions

Based on the referenced SAIC report, the first stage of the pentolite manufacturing process involved the nitration of pentaerythritol (PE) by adding nitric acid and water. Pentaerythritol tetranitrate (PETN) was an end product of this process, along with wastewater containing 5% nitric acid. Then, the PETN was treated with water, acetone, and ammonium bicarbonate to dissolve and neutralize the free acid present. Mixing equal parts of PETN and TNT produced pentolite. This step also involved the addition of acetone and water. The stoichiometric relationship of the pentolite manufacturing process is as follows:

- PE + HNO_3 + H_2O → PETN + wastewater (nitric acid as 5%)
- PETN + acetone + ammonia bicarbonate + H_2O → preliminary filtered neutralized PETN + wastewater
- (TNT + acetone) + (PETN + H_2O) → pentolite + wastewater

The wastewater from the pentolite manufacturing process potentially contained some PE, PETN, TNT, and acetone. Wastewater from each of the three stages of the manufacturing process was conveyed to two settling basins or the PAWL via

vitreous sewer pipes. A wastewater ditch (15-inch channel pipe) encircled the entire perimeter of the lagoons. Wastewater from the first two-pentolite lines, along with wastewater from the acetone recovery house, entered the lagoons at the west inlet from the wastewater ditch. Wastewater from the third pentolite line entered the lagoons at the east inlet from the wastewater ditch. Once inside the ditch, the flow of the wastewater was north to south. Three inverts, located at the north and south ends of the lagoons, fed the wastewater into two timber rising wells filled with limestone. These limestone beds were apparently served as filters and extended 35 feet into the lagoons. The remainder of the basins further settled the wastewater until it eventually passed over the outlet weir and was pumped to a secondary treatment facility. Specific wastewater details, treatment processes, and sludge disposal methods are not known.

The PAWL were constructed of pre-cast concrete blocks (15 feet by 9 feet by 4 inches thick) with asphalt expansion joints, and each lagoon measured approximately 112 feet by 137 feet. Four to six inches of No. 4 gravel had underlain the PAWL. Details of the Plans and Sections of the PAWL are shown on Figure 5A and 5B (attached).

Based on the Site Inspection Report (Morrison Knudsen, 1994), the Pentolite Area was decommissioned in 1945 when ordnance manufacturing ended. All of the buildings in the area were to be removed or burned in place according to the decontamination procedures. Decontamination of pentolite manufacturing lines was halted during the last quarter of 1945, and it was estimated that 65% of the necessary decontamination of PBOW had been completed by December 1945. The "Shut Down and Decontamination Procedures for PBOW, Sandusky, OH," (Dykema and Lee 1944) states that the stand by and storage procedure for the pentolite settling basin consisted of the following:

1. Draining and flushing limestone bed and basin proper with a high-pressure hose.
2. Removing limestone while it is completely wet and flush basin thoroughly after removal.
3. Inspecting basin thoroughly for evidence of accumulated explosives.

Based on the Records Reviews Report (Dames & Moore, 1997), there is no information regarding decontamination of surrounding soils in the Pentolite Area. Furthermore, the decontamination procedures do not mention the removal of the concrete slabs of the PAWL and an aerial photograph from 1956 shows that the lagoons were still intact. However, this aerial photo indicates that the vitreous sewer pipes leading to the lagoons have been removed. Based on the decontamination procedures, it is assumed that these lines were flushed with water and then thoroughly cleaned with acetone.

According to SAIC the PAWL remained essentially intact until 5 July 1956 when approximately 500 acres (including the Pentolite Area and PAWL) was leased by the NASA from the Department of the Army. The Plum Brook Reactor Facility

(PBRF) was constructed on this site, and consequently, the PAWL were most likely removed. The entire Pentolite Area was filled and graded to facilitate construction of the PBRF. According to Dames and Moore, a memo by Everett and Campbell in 1958 states that the "Pentolite Area of approximately 117.3 acres was decontaminated, demolished, and cleared for use as the Lewis Laboratory Reactor Facility. " Three photographs loaned to the Corps of Engineers Louisville District Engineering Division from a scrapbook held by the on site NASA facilities staff show extensive disturbance of the contours of an area that included the PAWL. These construction photographs of the PBRF, circa 1958, show that the PAWL concrete liners were missing, leaving two irregularly shaped shallow excavations. Examination of the subject photographs indicates that construction of the reactor facility removed the PAWL features. A 1959 historic topographic quadrangle reveals the PBRF with no evidence of the PAWL.

A copy of historical aerial photographs dated 1956, 1969, 1977 and 1995 are included in Appendix F.

2.6.2.2 Current Conditions

No previous investigations have been performed at the waste lagoons. However, an Underground Storage Tank Corrective Actions Remedial Investigation, Feasibility Study, Phase I Report (Ebasco Environmental, 1991) was performed in the vicinity of the lagoons. Six monitoring wells were installed and groundwater and soil samples were collected. Four VOCs were detected in the soil samples including, 1,2-Dichloroethene at 120 ug/kg, 1,1,1- Tricloroethane at 22 ug/kg, Trichloroethene at 760 ug/kg and Tetrachloroethene at 19 ug/kg.

Based on a June 1999 site visit, the PAWL are no longer visible. The area of the PAWL is grass covered and relatively flat. The corners of the former PAWL were surveyed, based on aerial photographs, to accommodate soil borings. This area is located just south of the PBRF Hot Laboratory and surrounded by an 8-foot tall chain-link fence. Current photographs of the area are given in Appendix A.

Environmental Information and Imaging Services (ERIIS) performed a database search of the PBOW vicinity. The data base search included those sites within close proximity to the PBOW that are currently listed under the following database records:

- National Priorities List (NPL)
- Resource Conservation and Recovery Information System- TSDs: Subject to Corrective Action (RCRIS_CA)
- Resource Conservation and Recovery Information System- Non-Corrective Action TSD Facilities (RCRIS_TS)
- Comprehensive Environmental Response, Compensation and liability Information System (CERCLIS)

- No Further Remedial Action Planned Sites (NFRAP)
- Resource conservation and Recovery Information System-Large Quantity Generators (RCRIS_LG)
- Resource conservation and Recovery Information System-Small Quantity Generators (RCRIS_SG)
- Emergency Response Notification System (ERNS)
- Ohio Master Sites List (HWS)
- Ohio Leaking Underground Storage Tank Report (LRST)
- Ohio Solid Waste Facility List (SWF)
- Ohio Underground Storage Tank Report (RST)

A description of each of these records is presented in Appendix G. Within the radii on the ERRIS figure in Appendix G, the search revealed 25 LRST sites, 18 RST sites, 3 SWF sites, 1 RCRIS_TS site, 1 NFRAP site, 5 RCRIS_SG sites, 1 ERNS site and 3 HWS sites. Of these sites, 6 LRST sites, 9 RST sites, 1 RCRIS_SG site, 1 RCRIS_TS site, 1 NFRAP site and 1 HWS site are located on the PBOW installation and the remainder are located outside the installation boundary. Information concerning each of these listed facilities and their location is included in Appendix G. Based on the proximity of these sites and/or their status, the potential for any of these listed facilities to negatively impact the PAWL site is minimal.

3.0 Soil/Waste Source Sampling

3.1 Sampling Activities

Based on historical data, the most likely location to encounter contaminated media associated with the operation of the PAWL is within and below the former lagoon features. Using historical aerial photographs and geo-referencing the former lagoon locations were identified for soil borings and sample collection. Five soil borings were advanced within the footprint of the former lagoons using direct push sampling methods. Boring DP02 was advanced in the vicinity of the former east inlet location. Boring DP03 was advanced at the parameter of the former lagoons, that is the wastewater ditch. The remainder of the borings were located to incorporate the entire footprint of the lagoons attempting to capture a significant release. The boring locations are illustrated on the Sample Location Plan (Figure 4). In addition, the boring locations are shown on a 1950 aerial photograph and 1997 aerial photograph (Figures 6 and 7, respectively)."

Each boring location was surveyed using the state plane coordinate system. Survey data is included on the boring location plan. Continuous soil samples were obtained in two to four foot intervals until the borings were terminated. Boring termination depths ranged from 8 feet bgs to 22 feet bgs.

A representative portion of each sample was field screened for VOCs and TNT and field classified in accordance with the Unified Soil Classification System (USCS). Field

screening for VOCs was performed using a photoionization detector (PID). Field screening for TNT was performed using and EnSys Test Kit. As a safety measure, radiation screening was performed throughout the field activities. Details on field screening procedures are outlined in the associated, above referenced QAPP. The general subsurface conditions encountered in the borings and results of the field screening are illustrated on the boring logs given in Appendix H. Detailed soil sample collection data along with field screening results are also documented on the "Soil Sample Collection Field Sheets" also given in Appendix H.

Beneath a surface veneer of grass, each boring generally encountered an upper layer of fill material consisting of silty fine sand. This material was field classified as SP, poorly graded sands or SM, silty sands/ sand silt mixtures in accordance with the USCS. Laboratory plasticity and sieve analysis indicated a selected sample of this material to be ML, silty or clayey fine sand, in accordance with the USCS. The results of the plasticity test and sieve analyses are presented in Appendix I. This upper fill layer extended to depths ranging from about 2.5 to 6.0 feet bgs. A thin layer of crushed limestone was encountered at the bottom of the fill material in several of the borings. This crushed limestone layer is most likely a remnant of the sub-base material beneath the concrete bottom of the former waste lagoons.

Beneath the upper layer each boring generally encountered a second strata consisting of silty clay soils with an occasional sand seam. This material was field classified as CL, silty clay of low plasticity, in accordance with the USCS. Laboratory Plasticity testing confirmed this field classification. The results of these plasticity tests are presented in Appendix I. This silty clay material extended to the boring termination depth in each of the borings. Boring DP-04 was advanced to bedrock, which was encountered at a depth of approximately 22 feet bgs. Groundwater was not encountered in any of the borings at the time of the field activities.

Selected subsurface soil samples were sent, under chain of custody protocol, to an off site laboratory for chemical analyses. Chemical analyses of each laboratory sample included Volatile Organic Compounds (VOCs), Target Analyte List (TAL) Metals, and Explosives. Samples selected for chemical analyses were based on the interval most likely to be contaminated from visual indications and/or field screening results. The results of the chemical analyses are presented in Appendix J. A summary of the chemical analysis results is presented in Tables 1 and 2.

Field quality control (QC) samples were collected to monitor sampling precision, cross contamination, and decontamination procedures. These QC samples included duplicate, rinsate and temperature blanks collected in accordance with the procedures outlined within the QAPP, dated May 1999, revised July 2000.

3.2 Targets

The PAWL site is currently located within a restricted area associated with the PBRF. The area is surrounded by an 8-foot high, security fence and is accessible to plant and maintenance workers.

3.3 Field Screening

Field screening with the PID meter revealed insignificant levels of organic vapors. Field screening for TNT revealed negligible explosive concentrations in the soils. Field screening results are shown on the boring logs in Appendix H. Field screening for radiation revealed only background levels.

3.4 Analytical Results

- **General:** The results of the chemical laboratory analysis and chain of custody documentation are given in Appendix J. An independent chemical data validation assessment is provided in Appendix K. Based on evaluation of the geology encountered in the borings, the following chemical samples likely represent the native materials below the former PAWL: samples from Boring DP02, the 2.0–3.9 feet sample from Boring DP03 and the 4-6 feet sample from Boring DP05. The remainder of the chemical samples likely represents the fill material associated with the decommissioning of the former PAWL. A summary of the samples taken for chemical laboratory analyses is given in the following table.

SOIL SAMPLES COLLECTED FOR CHEMICAL LABORATORY ANALYSES				
Boring Number	**Sample Number**	**Sample Depth (ft)**	**Soil Type (USCS)**	**Chemical Laboratory Analyses (SW-846 Methods)**
DP02	PBOW99-DP002-0004	2.0-4.0	CL	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP02	PBOW99-DP002-0006	4.0-5.8	SP&CL	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP02	PBOW99-DP008-0004 (duplicate)	4.0-5.8	SP&CL	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP02	PBOW99-RN002-0001 (Rinsate)	After Sampling PBOW99-DP002-006	Rinsate Water	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP03	PBOW99-DP003-0002	1.0-2.0	CL	Explosives: 8330 TAL Metals: 6000/7000 series
DP03	PBOW99-DP003-0004	2.0-3.9	SP&CL	Explosives: 8330 TAL Metals: 6000/7000 series
DP04	PBOW99-DP004-0002	0.0-1.6	SP	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP04	PBOW99-DP004-004	2.0-3.7	SP	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP05	PBOW99-DP05-0002	0.0-2.0	SP	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP05	PBOW99-DP0005-0006	4.0-6.0	CL, SP & (ML-SM)	Explosives: 8330 VOCs: 8260B TAL Metals: 6000/7000 series
DP06	PBOW99-DP006-0002	0.0-2.0	SM	Explosives: 8330 TAL Metals: 6000/7000 series
DP06	PBOW99-DP006-0004	2.0-4.0	SM	Explosives: 8330
DP06	PBOW99-DP006-0006	4.0-5.9	SM&CL	VOCs: 8260B TAL Metals: 6000/7000 series Explosives: 8330

- **Inorganic Analyses**: Table 1 lists the metals detected in the samples and the associated screening criteria (Region 9 PRGs). All reporting limits were below the PRGs. None of the metals detected were above the PRG with the exception of

arsenic. However, based on the referenced report entitled "Site Investigation of the Reservoir No. 2, ... Ash Pit" (IT Corporation, 1997), the arsenic detected is consistent with background levels. There were no PRG available for calcium, manganese, sodium and thallium.

- **Volatile Organic Analyses**: Table 2 lists the VOCs detected in each sample analyzed and the associated PRGs. All reporting limits were below the PRGs. None of the VOCs detected were above the PRG. There was no PRG available for 2-Butanone.

- **Explosive Analysis:** All of the samples analyzed revealed undetectable levels of explosives. All reporting limits were below the PRGs.

- **Radiation Testing**: As a safety measure, selected samples were tested for radiation by Method HASL 300. The results of the testing are also included in Appendix J. None of the samples detected revealed radiation levels above background levels.

- **Independent Data Validation:** Independent data validation revealed the laboratory analytical data is acceptable. Details on chemical data validation are presented in Appendix K.

3.5 Conclusions

The primary purpose of the this investigation was to evaluate the potential for contamination of the PAWL site due to past Department of Defense (DOD) activities. Sampling was directed to locations most likely to be contaminated. That is, soil samples were taken and analyzed within and below the former PAWL features and compared to Region 9 PRGs. Contamination was not revealed by the soil sampling, field screening and chemical laboratory analyses performed within the potential source area of the PAWL site. Independent data validation revealed the laboratory analytical data is acceptable.

4.0 Ground Water Pathways

4.1 Hydrogeology

Hydrogeologic conditions at the PBOW are detailed in a Section 2.5. No groundwater was detected in the overburden soils during our field activities. Any overburden groundwater beneath the PAWL site is generally expected to be perched or trapped water of minimal quantities. Based on the regional hydrogeologic information in Appendix D, groundwater sources in the bedrock formations beneath the site are expected to be yield 15 gpm or less. The soil types beneath the former PAWL would significantly impede migration of contaminates to the deeper bedrock aquifer.

4.2 Targets

The PBS is a large NASA testing facility surrounded by residential and commercial development. Both PBS and the surrounding development obtain drinking water from the Erie County Water Company, which takes its water from Lake Erie.

4.3 Conclusions

Groundwater was not encountered in any of the borings at the time of the field activities; therefore, no overburden groundwater samples were obtained. Based on the hydrogeologic information reviewed and obtained, both overburden and bedrock quantities and potability appear limited. Because soil sampling and analyses did not reveal a source of contamination, it is unlikely that groundwater has been impacted by the operation or decommissioning of the PAWL site.

5.0 Surface Water Pathways

5.1 Hydrology

The entire Plum Brook Reactor Facility was specifically graded so that all surface water would flow into a series of catch basins, all of which fed into the Water Effluent Monitoring System. This single outfall from the entire 27-acre site is located in the southeast corner of the fenced in area. Form here the water is discharged into Pentolite Ditch, which runs east to Plum Brook. The point at which Pentolite Ditch enters Plum Brook is just upstream of the NPDES monitoring station for Plum Brook, prior to it leaving the PBS boundary. Plum Brook flows north from here to end up in Sandusky Bay.

No surface water was available at the time of our field activities; therefore, no surface water samples were taken.

5.2 Targets

The PAWL site is currently located within a restricted area associated with the PBRF. The area is surrounded by an 8-foot high, security fence and is accessible only to plant and maintenance workers.

5.3 Conclusions

Surface water samples were not available at the time of the field activities. Surface soil samples within the potential source area did not reveal contaminated media. Therefore, it is unlikely that surface water has been impacted by the operation or decommissioning of the PAWL site.

6.0 Air Pathways

PID air monitoring was performed throughout drilling activities. No measurements above background were detected. A formal air-monitoring program was not conducted. None of the soil samples within the potential source area revealed the presence of contaminated media. Therefore, it is unlikely that the air quality has been, or is being impacted by the operation or decommissioning of the PAWL site.

7.0 Summary, Conclusions and Recommendations

The goal of the PAWL SI was to gather the data necessary to evaluate the site for contamination due to past DOD activities. Historical and database information was reviewed and soil samples were collected and analyzed to evaluate the environmental media and the potential migration pathways. In addition, information gathered was used to assess potential targets that could be affected by the site.

- Wastewater from the pentolite manufacturing process was conveyed to two settling basins known as the PAWL in the early 1940s. This wastewater potentially contained metals, VOCs and explosives.

- Based on historical aerial photographs and topographic quadrangles, the PAWL were present in 1956, but were no longer present in 1959.

- Historical construction drawings, present topographic information and data from soil borings indicate the former PAWL area was filled with sand in conjunction with the construction of the PBRF between 1956 and 1959.

- The location of the PAWL was identified by using historical aerial photographs and geo-referencing

- Field observations, soil sampling, field screening and chemical laboratory analyses indicated no evidence of contaminated media.

- Review of construction photographs loaned by NASA personnel of the PBRF, circa 1958, shows that the PAWL concrete liners were missing, leaving two irregularly shaped shallow excavations.

- Soil borings did not encounter the concrete slabs that reportedly lined the former lagoons, indicating that the slabs have likely been removed.

- NASA has initiated a detailed program to undertake the decommissioning of the PBRF so that continued Nuclear Regulatory Commission (NRC) licensing is not required. Additional data stemming from the decommissioning effort indicates that the operation and decommissioning of the PAWL have not negatively impacted the environment. (Montgomery Watson, 2000)

Based on the results of this SI, it appears that the operation and decommissioning of the PAWL have not negatively impacted the environment. Both the construction photographs and analytical data from USACE and NASA indicate that the PAWL area has been removed. Hence there is no need to pursue additional work at the PAWL under the FUDS program. Based on the results of this SI and coordination with federal and/or state regulatory authorities, a No Further Action (NFA) decision document for the former PAWL site is recommended.

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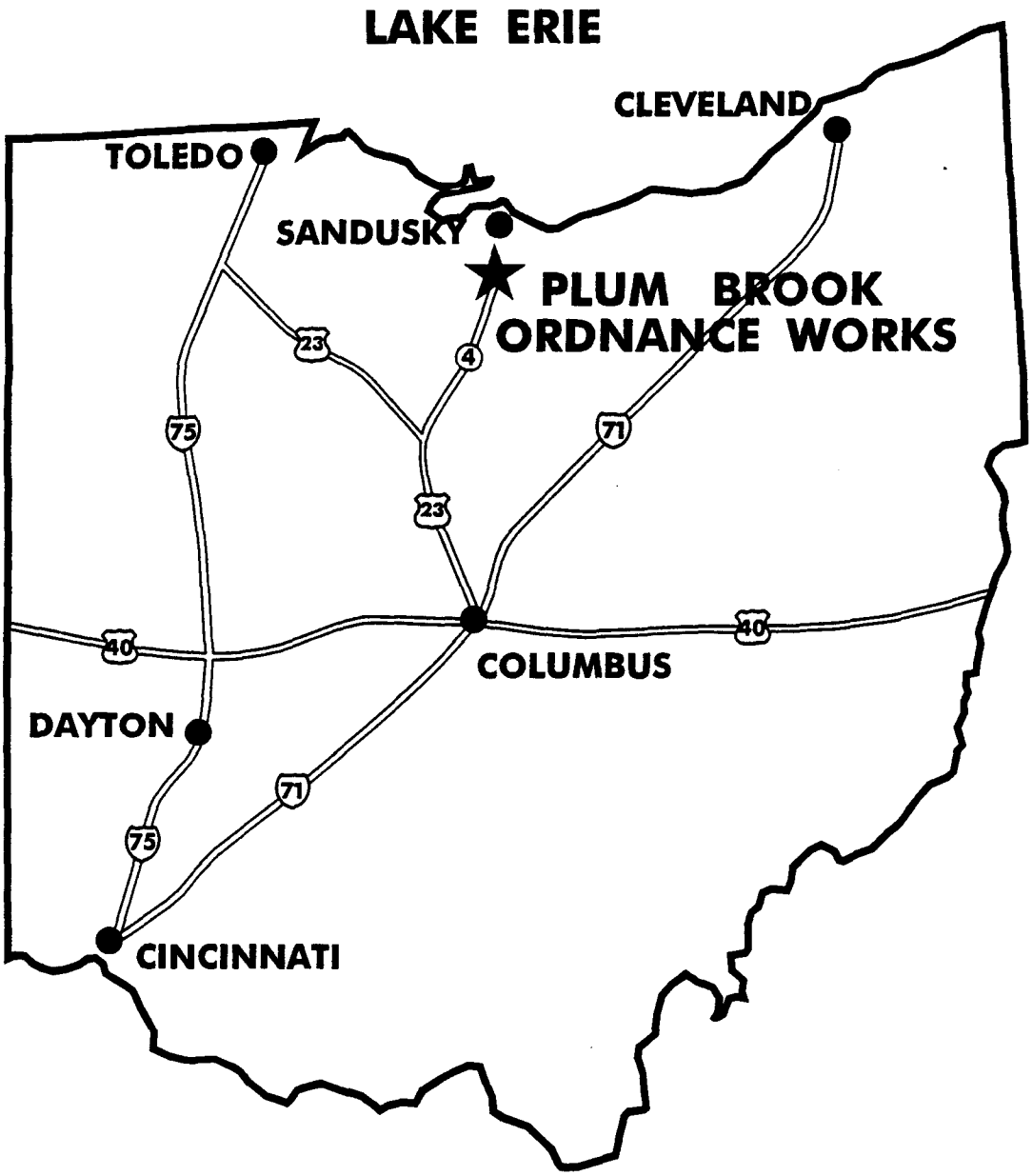

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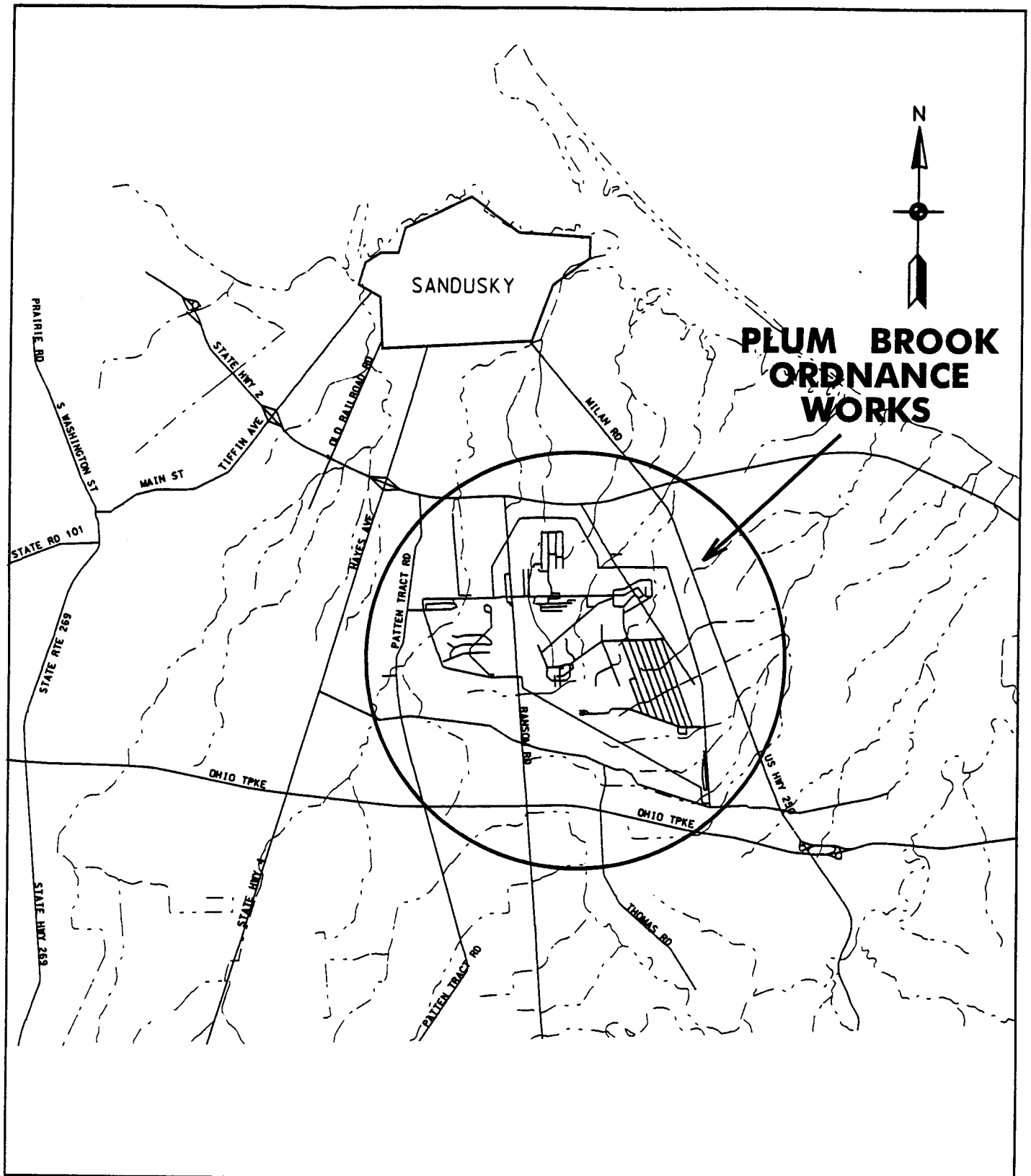
Date: AUG 1999	Scale: NONE	Drawing Code:	Sheet Ref. No.		FIGURE 1



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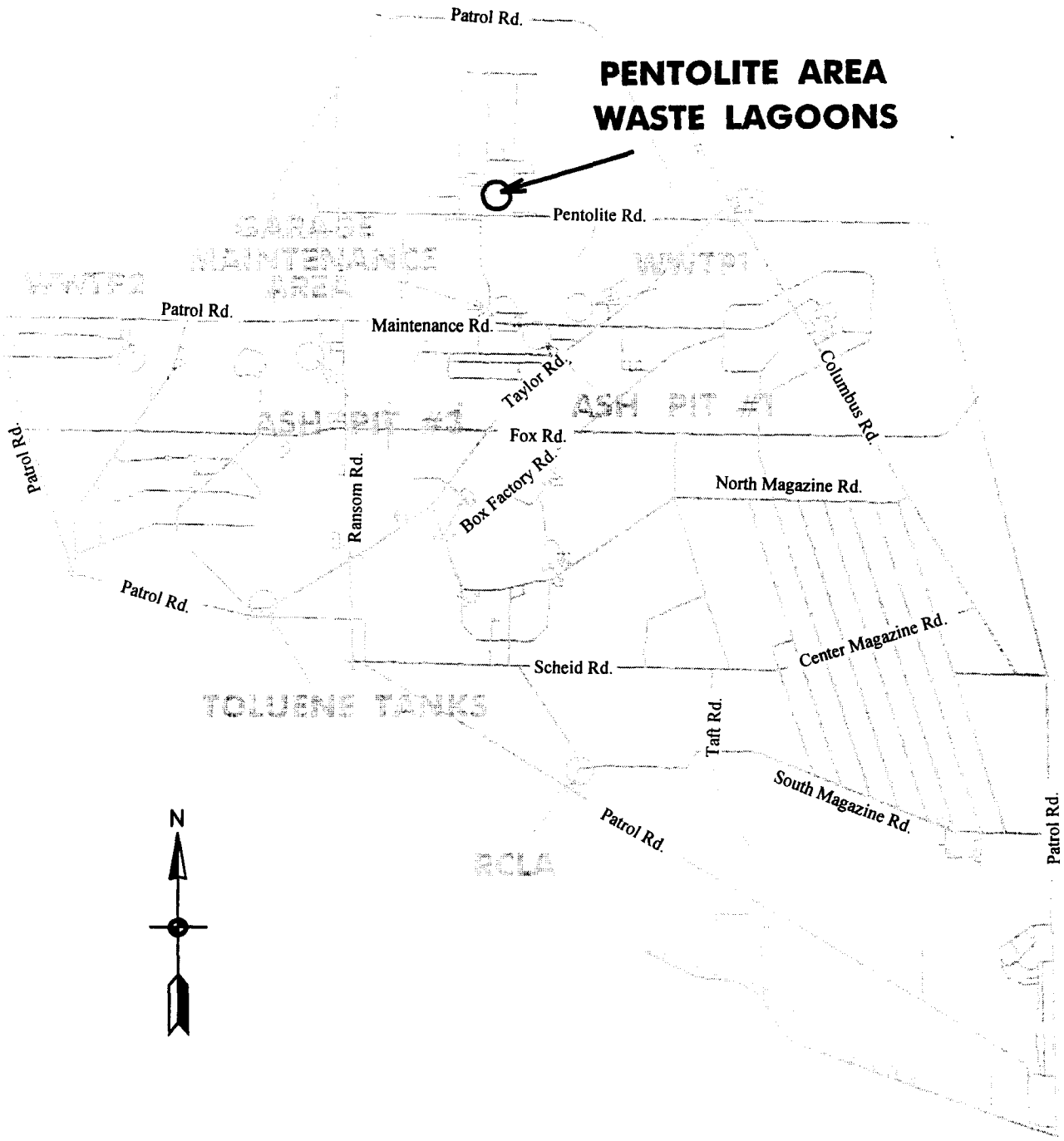
Reviewed By:	Approved By: CRK				
Date: AUG 1999	Scale: NONE	Drawing Code:	Sheet Ref. No.		FIGURE 2



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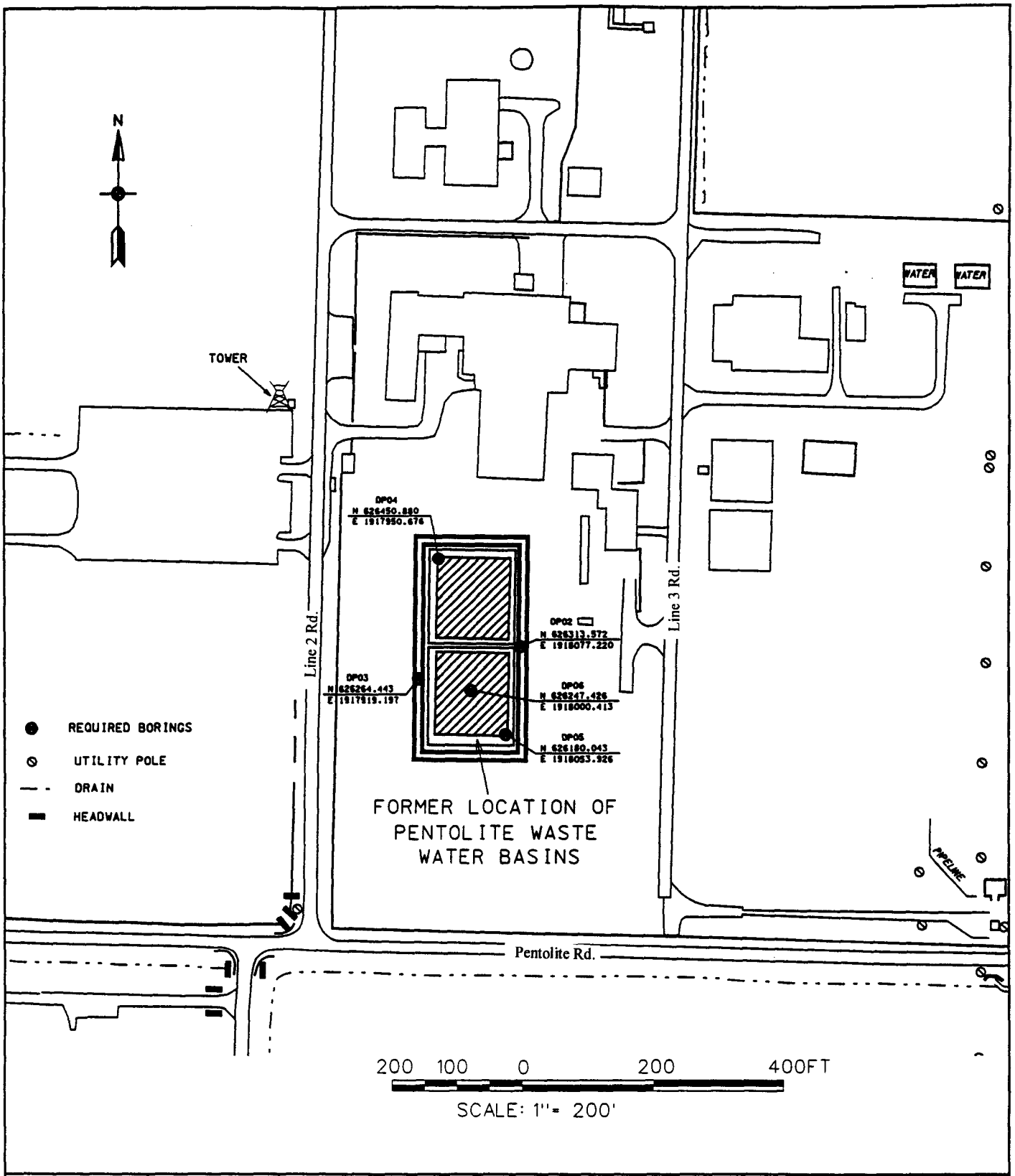
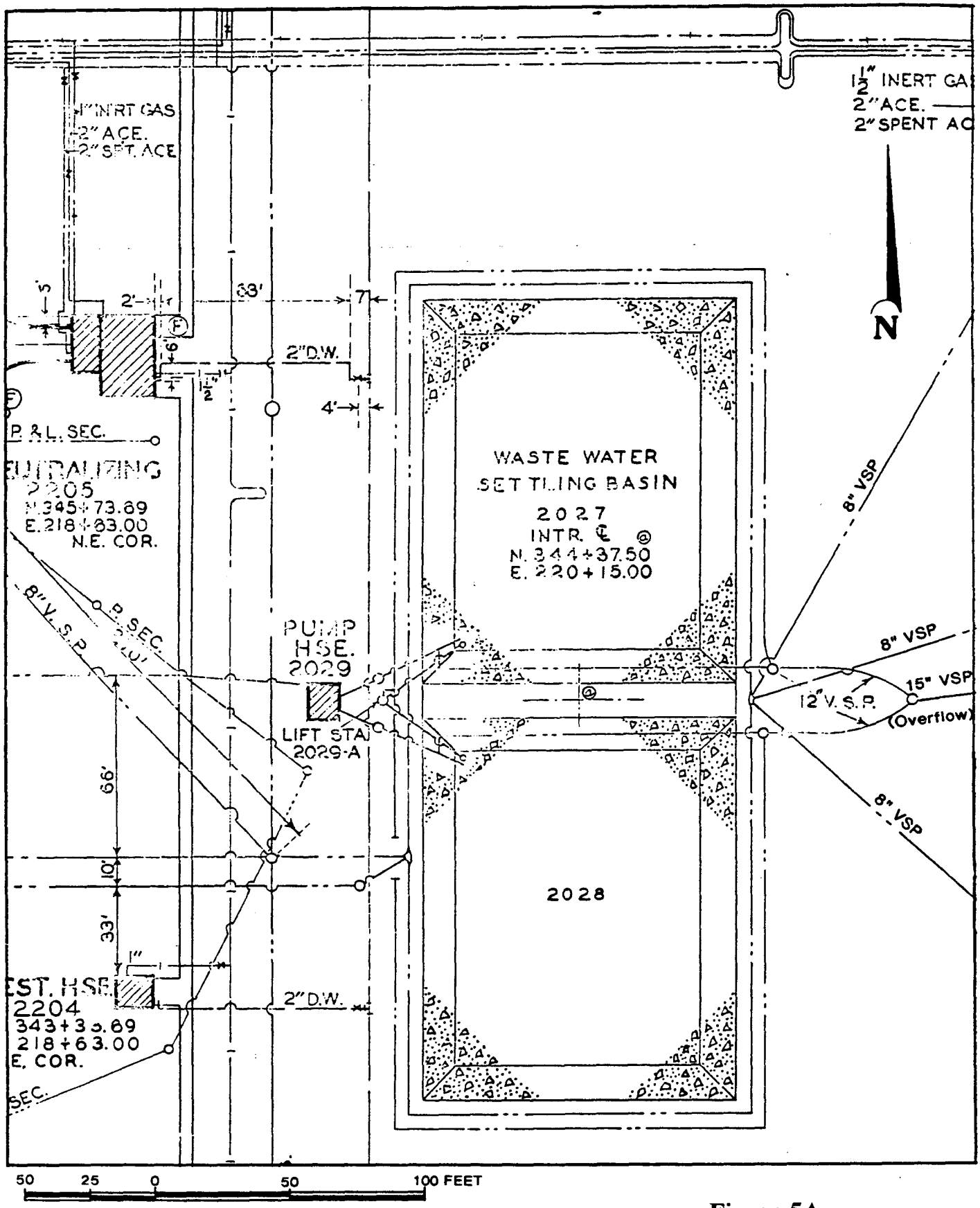


Design By: CRK	Drawn By: WDB	Checked By:	US Army Corps of Engineers	SAMPLE LOCATION PLAN PENTOLITE AREA WASTE LAGOONS PLUM BROOK ORDNANCE WORKS SANDUSKY, OHIO
Reviewed By:	Approved By: CRK			
Date: AUG 1999	Scale: 1" = 200'	Drawing Code:	Sheet Ref. No.	FIGURE 4



KEY:

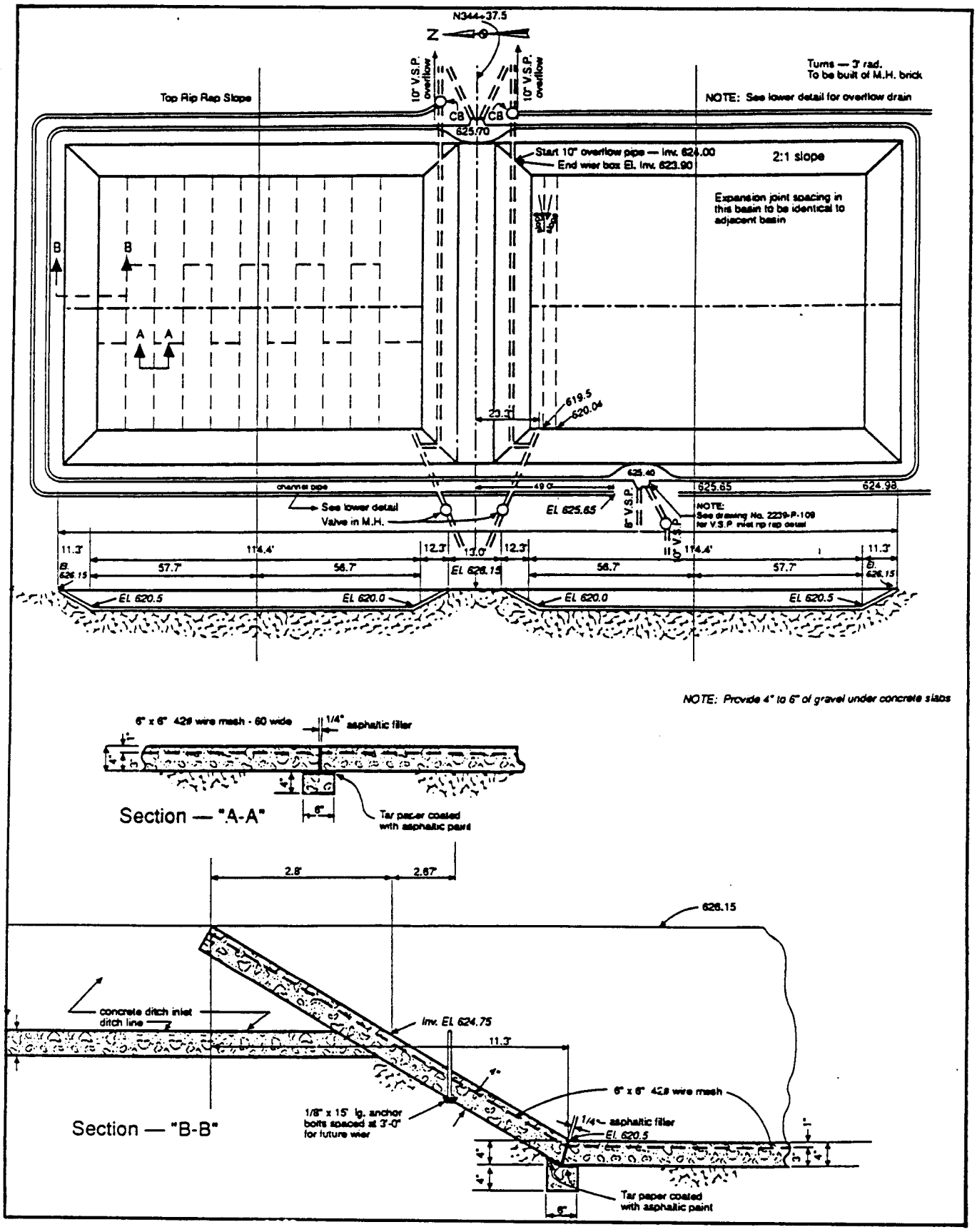
VSP Vitreous Sewer Pipe

BASE: Plan No. R-42, "Unit Layout Map, Pentolite Area", E.B. Badger & Sons (no date)

Figure 5A

LAYOUT OF
PENTOLITE WASTE WATER BASINS

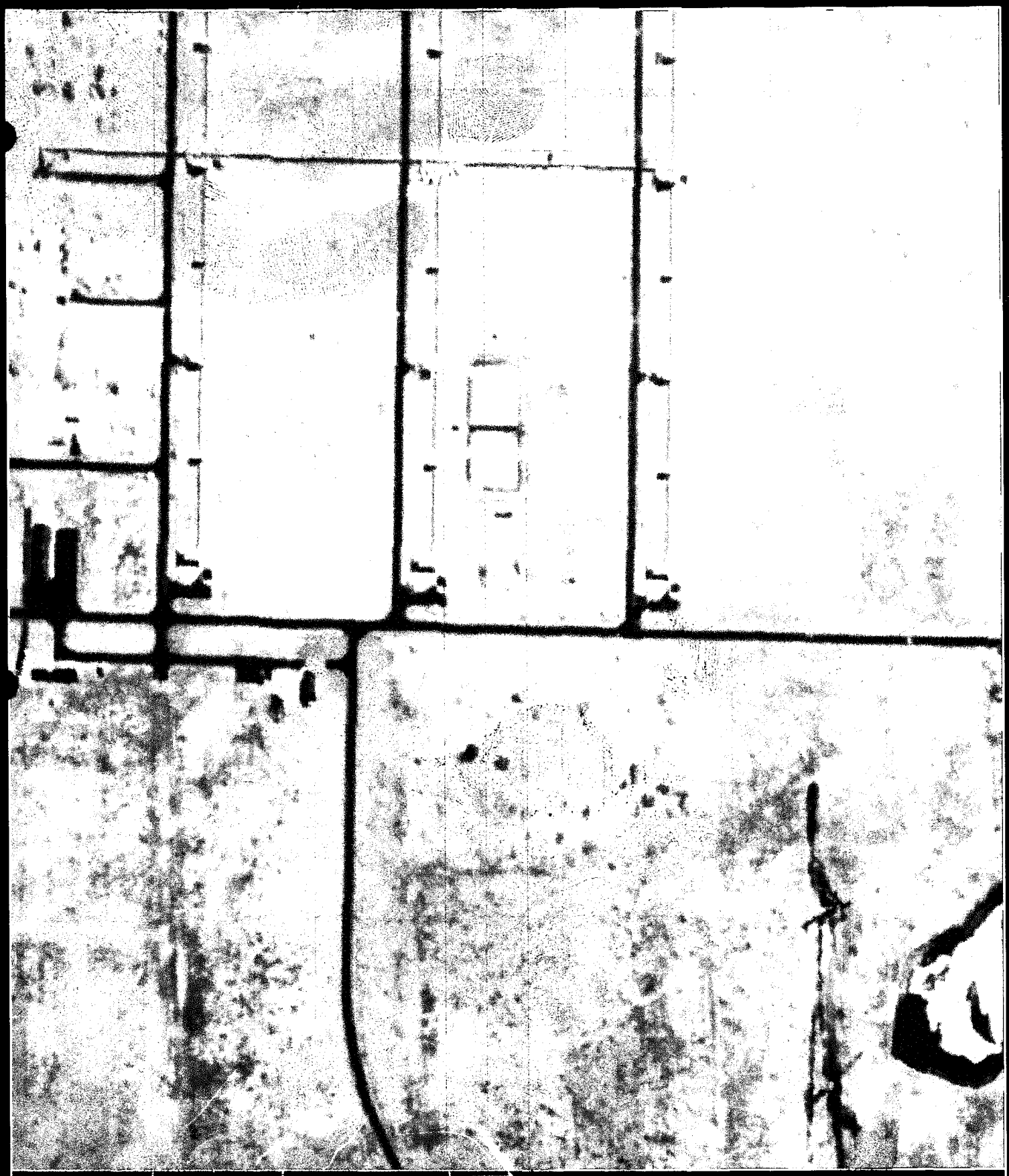
Plum Brook Ordnance Works
Sandusky, Ohio



REFERENCE: SAIC 1991 PBS Preliminary Assessment

Figure 5B

CONSTRUCTION DETAILS OF
PENTOLITE WASTE WATER BASINS
Plum Brook Ordnance Works
Sandusky, Ohio



Design By:	Drawn By: WDB	Checked By:	US Army Corps of Engineers	PENTOLITE AREA WASTE LAGOONS FROM C. 1950 AERIAL PHOTOGRAPH PLUM BROOK ORDNANCE WORKS SANDSUSKY, OHIO		
Reviewed By:	Approved By:					
Date: AUG 1999	Scale: 1" = 300'		Drawing Code:		Sheet Ref. No.	FIGURE 6

Design By: CRK	Drawn By: WDB	Checked By:	US Army Corps of Engineers	PENTOLITE AREA WASTE LAGOONS ILLUSTRATED ON 1997 AERIAL PHOTOGRAPH PLUM BROOK ORDNANCE WORKS SANDSUSKY, OHIO	
Reviewed By:	Approved By:				
Date: AUG 1999	Scale: 1" = 200'		Drawing Code:	Sheet Ref. No.	FIGURE 7

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TABLE 1: Soil Sample Analytical Result Detection Summary Inorganic Analysis SW846 (6000/7000) Series Methods				
Analyte	**Sample Numbers Results (Reporting Limits) mg/kg**			**Region 9 PRG (mg/kg)**
	DP002-0004	**DP002-0006**	**DP008-0004**	
Aluminum	10,100 (23.8)	7260 (24.3)	6960 (23.4)	75,000
Antimony	ND (1.2)	ND (1.2)	ND (1.2)	30
Arsenic	**7.0** (1.2)	**6.4** (1.2)	**6.7** (1.2)	0.38
Barium	77.1 (23.8)	64.8 (24.3)	56.6 (23.4)	5200
Beryllium	ND (0.59)	ND (0.61)	ND (0.58)	150
Cadmium	ND (0.24)	ND (0.24)	ND (0.23)	37
Calcium	15,900 (594)	27,800 (606)	19,000 (584)	*
Chromium	15 (0.59)	12.1 (0.61)	11.2 (0.58)	210
Cobalt	6.5 (5.9)	6.2 (6.1)	6.8 (5.8)	3,300
Copper	18.0 (3.0)	16.0 (3.0)	17.4 (2.9)	2,800
Iron	17,100 (1.9)	13,400(12.1)	15,300 (11.7)	22,000
Lead	13.8 (0.36)	14.9 (0.36)	20.8 (0.35)	130
Magnesium	5,710 (594)	9,100 (606)	6,030 (584)	*
Manganese	226 (1.8)	348 (1.8)	391 (1.8)	3,100
Mercury	ND (0.12)	ND (0.12)	ND (0.12)	22
Nickel	21.0 (4.8)	17.9 (4.9)	17.7 (4.7)	150
Potassium	857 (594)	751 (606)	651 (584)	*
Selenium	ND (0.59)	ND (0.61)	ND (0.58)	370
Silver	ND (0.59)	ND (0.61)	ND (0.58)	370
Sodium	ND (594)	ND (606)	ND (584)	*
Thallium	ND (1.2)	ND (1.2)	ND (1.2)	*
Vanadium	26.2 (5.9)	18.9 (6.1)	18.7 (5.8)	520
Zinc	50.0 (2.4)	46.2 (2.4)	52.8 (2.3)	22,000

* PRG not available
PRG = Preliminary Remediation Goal
mg/kg = milligrams per kilogram
Bold = over PRG

TABLE 1 (continued): Soil Sample Analytical Result Detection Summary Inorganic Analysis SW846 (6000/7000) Series Methods				
Analyte	**Sample Numbers Results (Reporting Limits) mg/kg**			**Region 9 PRG (mg/kg)**
	DP003-0002	**DP003-0004**	**DP004-0002**	
Aluminum	8560 (23.5)	4,790 (24.4)	6,530 (22.5)	75,000
Antimony	ND (1.2)	ND (1.2)	ND (1.1)	30
Arsenic	**9.4** (1.2)	**5.7** (1.2)	**4.9** (1.1)	0.38
Barium	49.6 (23.5)	35.6 (24.4)	82.8 (22.5)	5200
Beryllium	ND (0.59)	ND (0.61)	ND (0.56)	150
Cadmium	ND (0.24)	ND (0.24)	ND (0.22)	37
Calcium	88,200 (588)	35,600 (610)	17,500 (562)	*
Chromium	13.5 (0.59)	8.8 (0.61)	11.1 (0.56)	210
Cobalt	9.1 (5.9)	6.1 (6.1)	ND (5.6)	3,300
Copper	41.7 (2.9)	13.4 (3.1)	9.7 (2.8)	2,800
Iron	20,000(11.8)	12900 (12.2)	11,300 (11.2)	22,000
Lead	13.2 (0.35)	7.8 (0.37)	14.4 (0.34)	130
Magnesium	14,700 (588)	11,000 (610)	5,130 (562)	*
Manganese	632 (1.8)	389 (1.8)	191 (1.7)	3,100
Mercury	ND (0.12)	ND (0.12)	ND (0.11)	22
Nickel	26.7 (4.7)	17.6 (4.9)	11.1 (4..5)	150
Potassium	2,310 (588)	738 (610)	658 (562)	*
Selenium	ND (0.59)	ND (0.61)	ND (0.56)	370
Silver	ND (0.59)	ND (0.61)	ND (0.56)	370
Sodium	ND (588)	ND (610)	ND (562)	*
Thallium	ND (1.2)	ND (1.2)	ND (1.1)	*
Vanadium	18.5 (5.9)	14.0 (6.1)	19.9 (5.6)	520
Zinc	67.9 (2.4)	38.6 (2.4)	40.9 (2.2)	22,000

* PRG not available
PRG = Preliminary Remediation Goal
mg/kg = milligrams per kilogram
Bold = over PRG

TABLE 1 (continued): Soil Sample Analytical Result Detection Summary Inorganic Analysis SW846 (6000/7000) Series Methods				
Analyte	**Sample Numbers Results (Reporting Limits) mg/kg**			**Region 9 PRG (mg/kg)**
	DP004-0004	**DP005-0002**	**DP005-0006**	
Aluminum	5310 (22.4)	9,410 (22.7)	6,170 (24.7)	75,000
Antimony	ND (1.1)	ND (1.1)	ND (1.2)	30
Arsenic	**4.8** (1.1)	**7.4** (1.1)	**5.9** (1.2)	0.38
Barium	27.6 (22.4)	49.7 (22.7)	53.7 (24.7)	5200
Beryllium	ND (0.56)	ND (0.57)	ND (0.62)	150
Cadmium	ND (0.22)	ND (0.23)	ND (0.25)	37
Calcium	12,400 (560)	23,900 (566)	44,900 (618)	*
Chromium	8.7 (0.56)	13.8 (0.57)	10,9 (0.62)	210
Cobalt	ND (5.6)	7.1 (5.7)	6.6 (6.2)	3,300
Copper	8.6 (2.8)	13.1 (2.8)	15.4 (3.1)	2,800
Iron	11,400(11.2)	15100 (11.3)	15,100 (12.4)	22,000
Lead	11.5 (0.34)	9.6 (0.34)	9.3 (0.37)	130
Magnesium	3,840 (560)	8,160 (566)	13,800 (618)	*
Manganese	186 (1.7)	382 (1.7)	520 (1.9)	3,100
Mercury	ND (0.11)	ND (0.11)	ND (0.12)	22
Nickel	10.7 (4.5)	18.3 (4.5)	18.9 (4.9)	150
Potassium	ND (560)	1,290 (566)	1,180 (618)	*
Selenium	ND (0.56)	ND (0.57)	ND (0.62)	370
Silver	ND (0.56)	ND (0.57)	ND (0.62)	370
Sodium	ND (560)	ND (566)	ND (618)	*
Thallium	ND (1.1)	ND (1.1)	ND (1.2)	*
Vanadium	17.3 (5.6)	22.0 (5.7)	17.6 (6.2)	520
Zinc	35.5 (2.2)	45.6 (2.3)	44.5 (2.5)	22,000

* PRG not available
PRG = Preliminary Remediation Goal
mg/kg = milligrams per kilogram
Bold = over PRG

TABLE 1 (continued): Soil Sample Analytical Result Detection Summary Inorganic Analysis SW846 (6000/7000) Series Methods				
Analyte	**Sample Numbers Results (Reporting Limits) mg/kg**			**Region 9 PRG (mg/kg)**
	DP006-0002	**DP006-0006**	**DP006-0006**	
Aluminum	8710 (23.2)	8010 (25.4)	8010 (25.4)	75,000
Antimony	ND (1.2)	ND (1.3)	ND (1.3)	30
Arsenic	**7.1** (1.2)	**8.3** (1.3)	**8.3** (1.3)	0.38
Barium	54.3 (23.2)	56.0 (25.4)	56.0 (25.4)	5200
Beryllium	ND (0.58)	ND (0.64)	ND (0.64)	150
Cadmium	ND (0.23)	ND (0.25)	ND (0.25)	37
Calcium	28,100 (581)	25,900 (636)	25,900 (636)	*
Chromium	13.4 (0.58)	13.0 (0.64)	13.0 (0.64)	210
Cobalt	7.0 (5.8)	8.3 (6.4)	8.3 (6.4)	3,300
Copper	15.3 (2.9)	18.9 (3.2)	18.9 (3.2)	2,800
Iron	16,400 (11.6)	17,600 (12.7)	17,600 (12.7)	22,000
Lead	9.9 (0.35)	13.4 (0.38)	13.4 (0.38)	130
Magnesium	9770 (581)	7,480 (636)	7,480 (636)	*
Manganese	395 (1.7)	357 (1.9)	357 (1.9)	3,100
Mercury	ND (0.12)	ND (0.13)	ND (0.13)	22
Nickel	20.2 (4.6)	23.5 (5.1)	23.5 (5.1)	150
Potassium	1,200 (581)	1,210 (636)	1,210 (636)	*
Selenium	ND (0.58)	ND (0.64)	ND (0.64)	370
Silver	ND (0.58)	ND (0.64)	ND (0.64)	370
Sodium	ND (581)	ND (636)	ND (636)	*
Thallium	ND (1.2)	ND (1.3)	ND (1.3)	*
Vanadium	22.4 (5.8)	18.5 (6.4)	18.5 (6.4)	520
Zinc	48.0 (2.3)	52.0 (2.5)	52.0 (2.5)	22,000

* PRG not available
PRG = Preliminary Remediation Goal
mg/kg = milligrams per killogram
Bold = over PRG

TABLE 2: Soil Sample Analytical Result Detection Summary Volatile Organic Analysis SW846 Method 8260B				
Analyte	**Sample Numbers Results (Reporting Limits) ug/kg**			**Region 9 PRG (ug/kg)**
	DP002-0006	**DP008-0004**	**DP004-0002**	
Acetone	13 (12)			16,000
Methylene Chloride		5.9 (5.8)	7.1 (5.6)	20
Analyte	**Sample Numbers Results (Reporting Limits) ug/kg**			**Region 9 PRG (ug/kg)**
	DP005-0006			
Acetone	38 (12)			16,000
2-Butanone	13 (12)			*

* PRG not available
PRG = Preliminary Remediation Goal
ug/kg = micrograms per kilogram

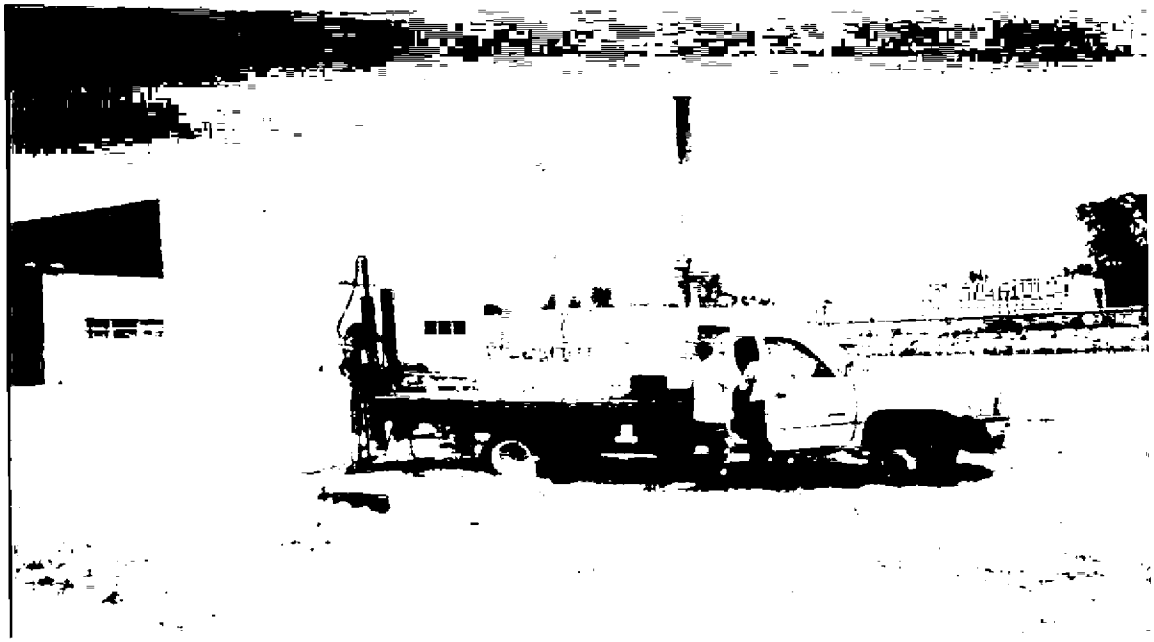
Appendix A

Current Photographs of the Pentolite Area Waste Lagoons (PAWL)

Photograph #1: Pentolite Area Waste Lagoons Site Location

Photograph #2: Pentolite Area Waste Lagoons Drilling Operations

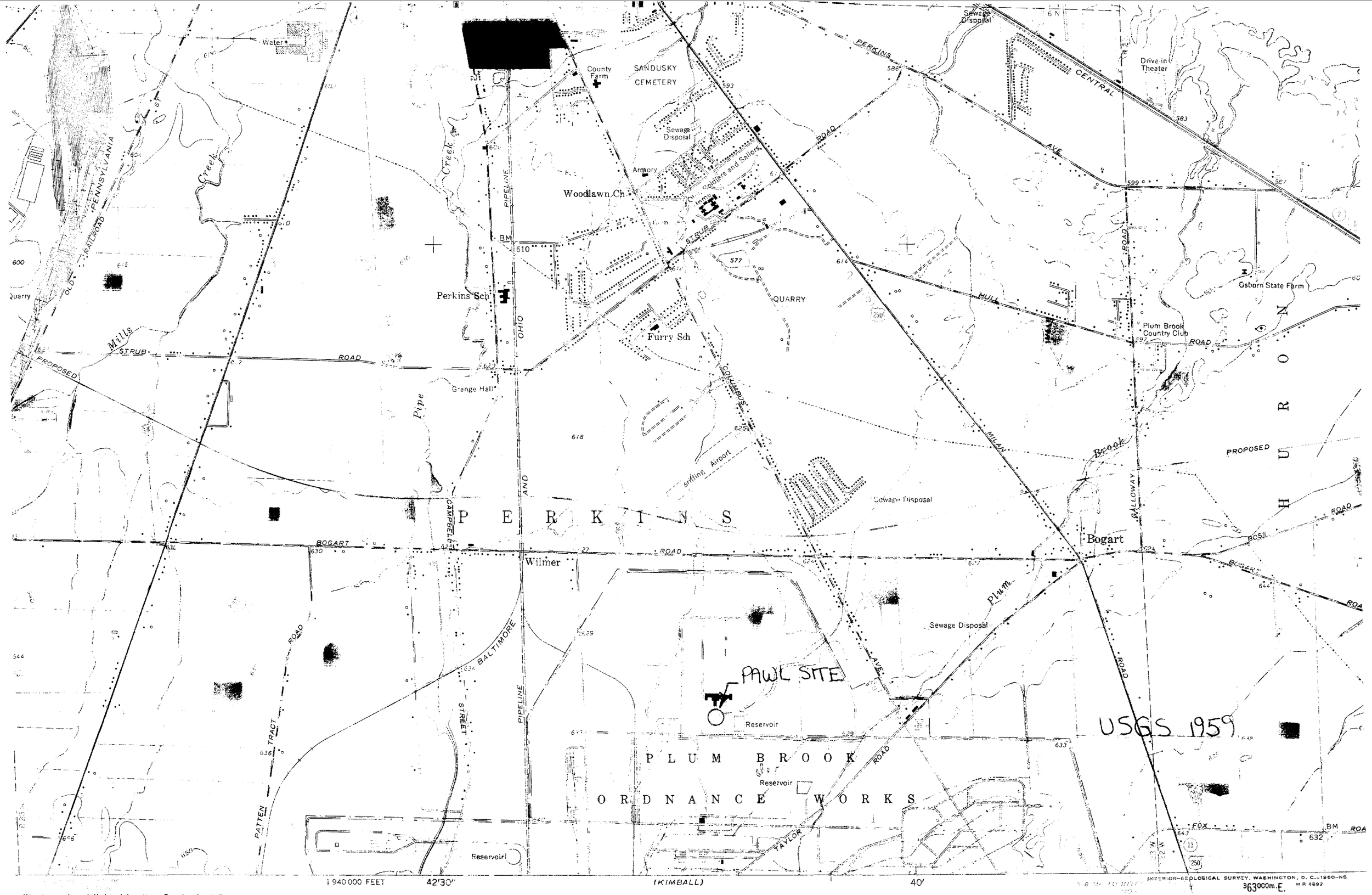
Photograph #3: Pentolite Area Waste Lagoons Site Location



Photograph #4: Pentolite Area Waste Lagoons Drilling Operations

Appendix B

Historic Topographic Quadrangles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County Farm
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Sewage Disposal
Drive-in Theater
PERKINS
CENTRAL
AVE
Sewage Disposal
Armory
Soldiers and Sailors
Woodlawn Ch
PIPELINE
OHIO
AND
Creek
Pipe
Mills
PENNSYLVANIA
RAILROAD
Quarry
Perkins Sch
STRUB
ROAD
PROPOSED
Grange Hall
Furry Sch
QUARRY
COLUMBUS
Sifting Airport
MULL
MILAN
Osborn State Farm
Plum Brook Country Club
GALLOWAY
Brook
PROPOSED
P E R K I N S
Sewage Disposal
BOGART
Wilmer
Bogart
BOSS
CAMPBELL
BALTIMORE
STREET
PATTEN
TRACT
Plum
Sewage Disposal
PAWL SITE
Reservoir
USGS 1959
P L U M B R O O K
O R D N A N C E W O R K S
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FOX
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40'
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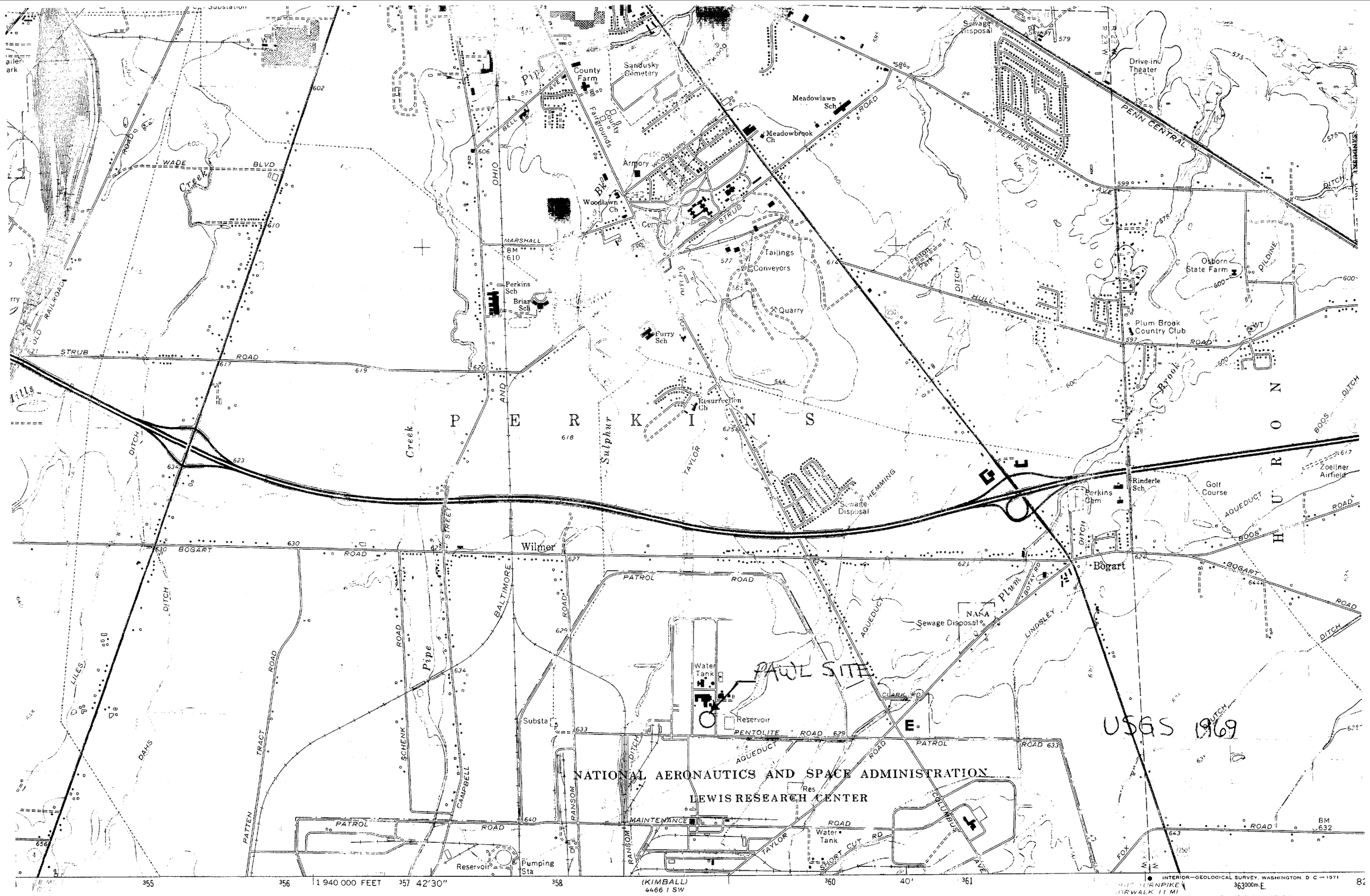
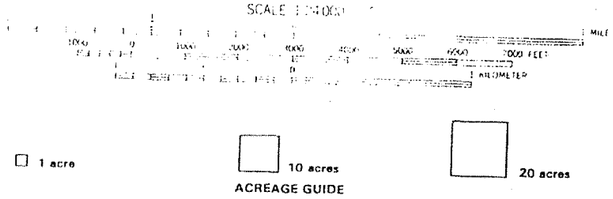
MR 4892
363000m.E.


PAUL SITE
USGS 1969
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
P E R K I N S
H U R O N
Wilmer
Bogart
Sandusky Cemetery
County Fairgrounds
County Farm
Meadowlawn Sch
Meadowbrook Ch
Armory
Woodlawn Ch
Tailings
Conveyors
Quarry
Perkins Sch
Briar Sch
Furry Sch
Resurrection Ch
Sewage Disposal
Drive-in Theater
Osborn State Farm
Plum Brook Country Club
Perkins Cem
Rinderle Sch
Golf Course
Zoellner Airfield
NASA
Water Tank
Reservoir
Pumping Sta
Substa
MAINTENANCE
Res
PENN CENTRAL
WADE BLVD
STRUB ROAD
BOGART ROAD
PATROL ROAD
PENTOLITE ROAD
AQUEDUCT ROAD
CLARK RD
SHORT CUT RD
COLUMBUS AVE
LINDSLEY
PERKINS AVE
MARSHALL AVE
BELL AVE
WOODLAWN AVE
STRUB ROAD
OHIO AND BALTIMORE
TAYLOR
HEMMING
PATTEN
TRACT ROAD
SCHENK
CAMPBELL
RANSOM
STREET
Pipe Creek
Sulphur Creek
Plum Brook
DITCH
BM 610
BM 632
355
356
1 940 000 FEET
357
42'30"
358
(KIMBALL)
4466 I SW
360
40'
361
363000m.E.
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971
SCALE 1:24 000

Appendix C

Plum Brook Ordnance Vicinity Wetlands Map



Other information including a narrative report concerning the wetland resources depicted on this document may be available. For information, contact:

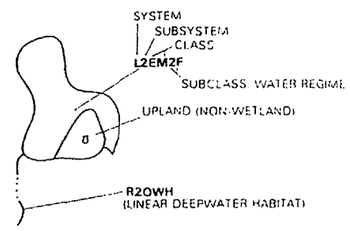
Regional Director (ARDE) Region I
U.S. Fish and Wildlife Service
Lloyd 500 Bldg., Suite 1692
500 N.E. Multnomah Street
Portland, Oregon 97232

SPECIAL NOTE

This document was prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with **Classification of Wetlands and Deepwater Habitats of the United States** (FWS/OBS - 79/31 December 1979). The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of the aerial photographs. Thus, a detailed on the ground and historical analysis of a single site may result in a revision of the wetland boundaries established through photographic interpretation. In addition, some small wetlands and those obscured by dense forest cover may not be included on this document.

Federal, State and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, State or local government or to establish the geographical scope of the regulatory programs of government agencies. **Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.**

SYMBOLOGY EXAMPLE



U – Primarily represents upland areas, but may include unclassified wetlands such as man-modified areas, non photo-identifiable areas and/or unintentional omissions.

NOTES TO THE USER

- Wetlands which have been field examined are indicated on the map by an asterisk (*).
- Additions or corrections to the wetlands information displayed on this map are solicited. Please forward such information to the address indicated.
- Subsystems, Classes, Subclasses, and Water Regimes in *italics* were developed specifically for NATIONAL WETLANDS INVENTORY mapping.
- Some areas designated as R4SB, R4SBW, OR R4SBJ (INTERMITTENT STREAMS) may not meet the definition of wetland.
- This map uses the class Unconsolidated Shore (US). On earlier NWI maps that class was designated Beach/Bar (BB), or Flat (FL). Subclasses remain the same in both versions.

AERIAL PHOTOGRAPHY

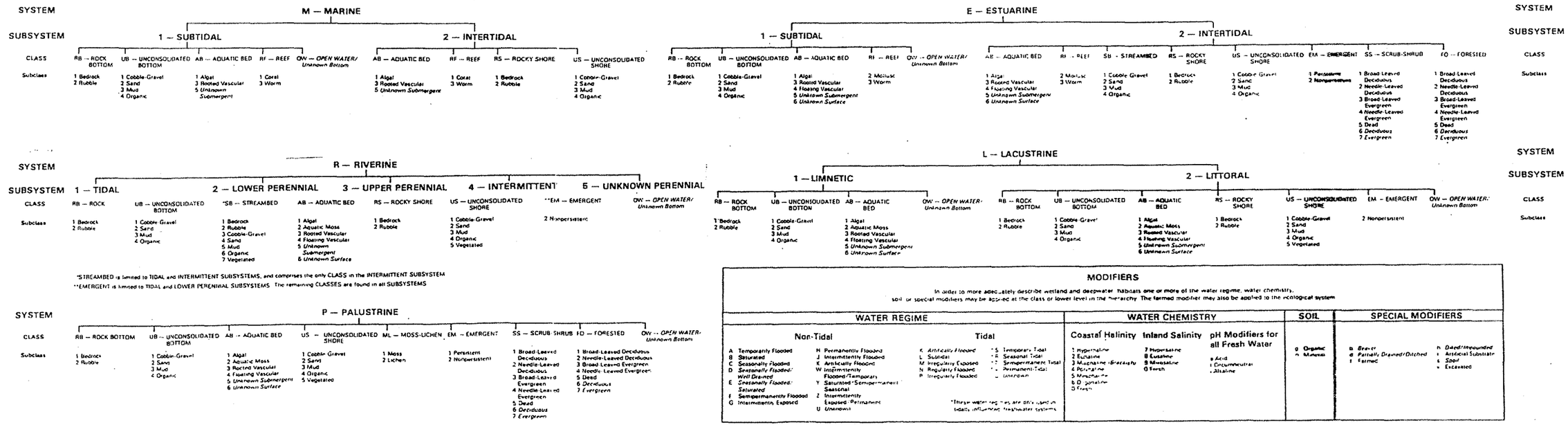
DATE	4 / 85	DATE	/ /
SCALE	1:65 000	SCALE	
TYPE	CIR	TYPE	

U.S. DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

Prepared by National Wetlands Inventory

1987



MODIFIERS

In order to more adequately describe wetland and deepwater habitats one or more of the water regime, water chemistry, soil or special modifiers may be added at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME

Non-Tidal

- A Temporarily Flooded
- B Saturated
- C Seasonally Flooded
- D *Seasonally Flooded/ Well Drained*
- E *Seasonally Flooded/ Saturated*
- F Semipermanently Flooded
- G Intermittently Exposed
- H Permanently Flooded
- J Intermittently Flooded
- K Artificially Flooded
- W Intermittently Flooded/Temporary
- Y Saturated/Semipermanent/ Seasonal
- Z Intermittently Exposed/Permanent
- U Unknown

Tidal

- *K Artificially Flooded
- L Subtidal
- M Irregularly Exposed
- N Regularly Flooded
- P Irregularly Flooded
- *S Temporary-Tidal
- *R Seasonal Tidal
- *T Semipermanent Tidal
- *V Permanent Tidal
- _ Unknown

*These water regimes are only used in tidally influenced freshwater systems.

WATER CHEMISTRY

Coastal Halinity

- 1 Hyperhaline
- 2 Euhaline
- 3 Mixohaline (Brackish)
- 4 Polyhaline
- 5 Mesohaline
- 6 Oligohaline
- 0 Fresh

Inland Salinity

- 7 Hypersaline
- 8 Eusaline
- 9 Mixosaline
- 0 Fresh

pH Modifiers for all Fresh Water

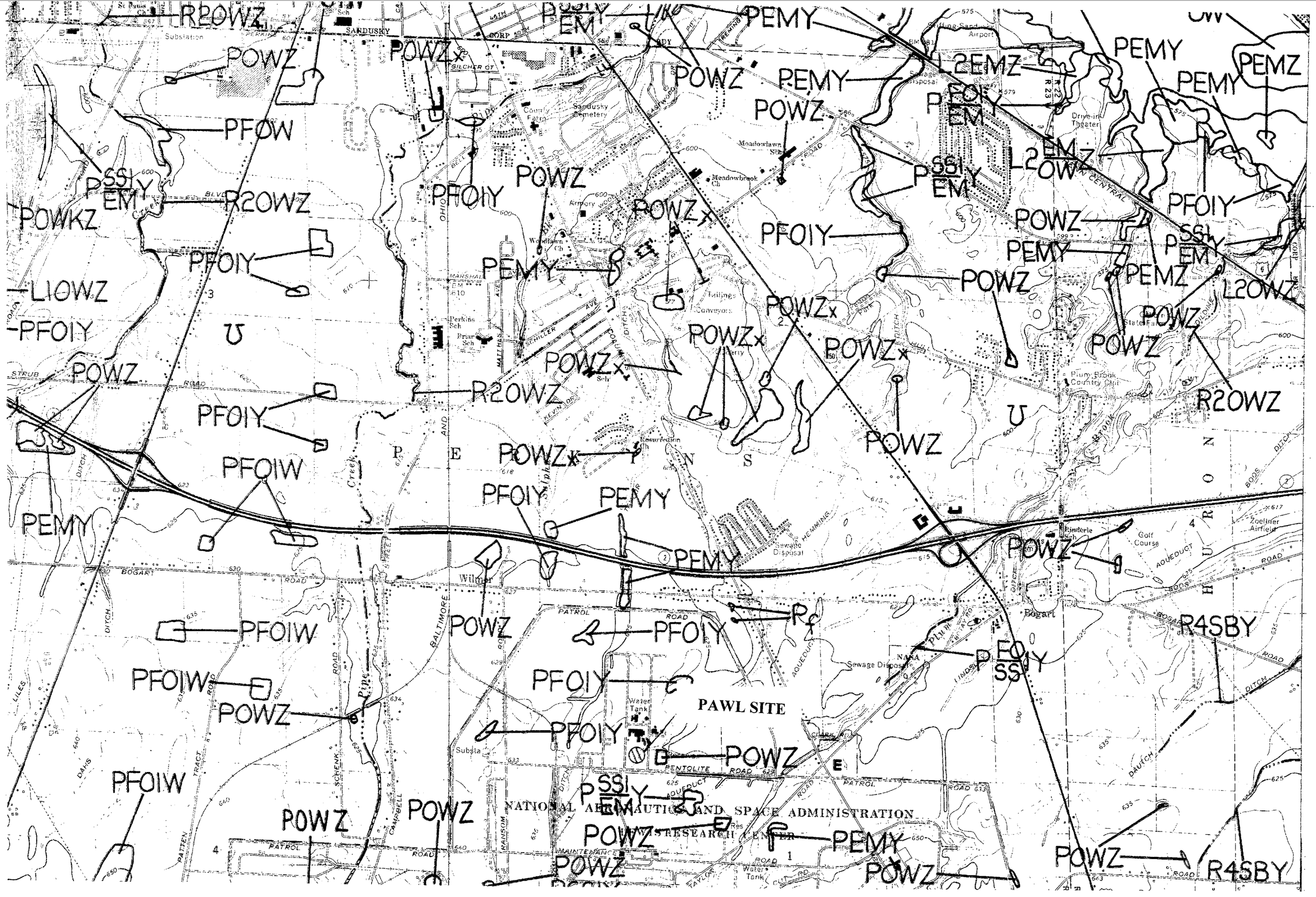
- a Acid
- i Circumneutral
- k Alkaline

SOIL

- g Organic
- n Mineral

SPECIAL MODIFIERS

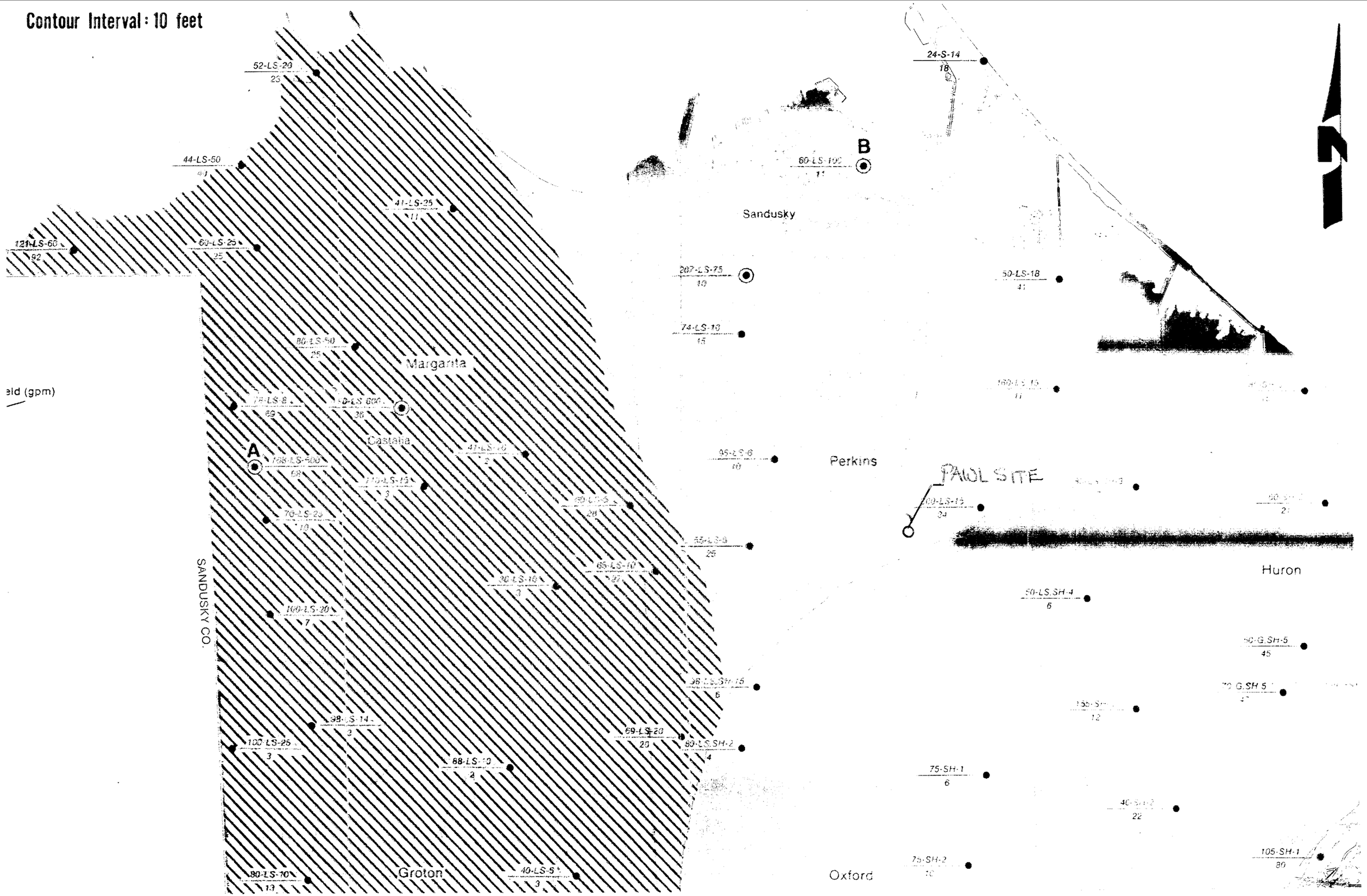
- b *Beaver*
- d *Partially Drained/Ditched*
- f Farmed
- h *Diked/Impounded*
- r Artificial Substrate
- s *Spoil*
- x Excavated


R2OWZ
POWZ
POWZx
PEMY
PEMZ
L2EMZ
PFOW
PSSI
EM
R2OWZ
POWKZ
PFOIY
L1OWZ
U
POWZ
PFOIW
R4SBY
PAWL SITE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
SANDUSKY
Sandusky Cemetery
Meadowlawn Sch
Meadowbrook Ch
Armory
Woodlawn Ch
Perkins Sch
Pruer Sch
Tailings Conveyors
Sewage Disposal
Drive-in Theater
Plum Brook Country Club
Zoellner Airfield
Golf Course
Bogart
Wilmer
Water Tank
Substa
Subsetation
BOGART ROAD
PATROL ROAD
PENTOLITE ROAD
MAINTENANCE ROAD
AQUEDUCT ROAD
BALTIMORE
CAMPBELL
SCHENK
RANSOM
PATTEN
TRACT
DAVIS
LILES
DAUTCH
BODS
DITCH
Pine Creek
Plum Brook
Sandusky Creek
Sandusky Bay
Lake Erie
P E N N S
H U R O N

Appendix D

Hydrogeologic Information
(Groundwater Resources of Erie County)

Contour Interval: 10 feet



LEGEND

AREAS IN WHICH YIELDS OF 100 TO 500 GALLONS PER MINUTE MAY BE DEVELOPED.

Yields of more than 500 gallons per minute have been developed at depths of less than 200 feet in cavernous limestone and dolomite. Domestic supplies are generally obtained at depths of around 100 feet.

Hydrogen sulfide, in varying amounts, may be encountered in the bedrock.

Areas in which there is a potential concentration of contamination due to the underground disposal of storm wastes from Bellevue.

Municipal and industrial water supplies are available from wells drilled into permeable sand and gravel deposits in ancient buried valley.

AREAS IN WHICH YIELDS OF 25 TO 100 GALLONS PER MINUTE MAY BE DEVELOPED.

Buried valley containing more than 150 feet of unconsolidated deposits. Much of the valley fill consists of clay and fine sand. Extensive test drilling may be needed to locate coarse materials capable of supplying larger yields to drilled wells.

AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE MAY BE DEVELOPED.

Yields of 15, or less, gallons per minute are developed from wells drilled into the limestone. Hydrogen sulfide may be present in varying amounts.

AREAS IN WHICH YIELDS OF 3 TO 10 GALLONS PER MINUTE MAY BE DEVELOPED.

Ground water obtained from the Berea sandstone. Although this formation covers a larger area than shown, its thickness and recharge potential limit productivity to isolated zones.

AREAS IN WHICH YIELDS SELDOM EXCEED 3 GALLONS PER MINUTE

Limited quantities of ground water are obtained from thin, discontinuous sand and gravel deposits interbedded in fine, sandy clay or from the underlying shale. Drilling deeper than 30 feet into the shale is not recommended. Occasional gas or salt noted in the eastern half of the county.

Larger yields may be obtained in western Huron and Oxford townships and southeastern Perkins Township. Wells may encounter water-bearing limestone beneath as much as 60 feet of impervious shale.

Thick deposits (as much as 90 feet) of clay, sand and gravel cover the shale bedrock. Where permeable sands and gravels are present, adequate domestic supplies are obtained.

The ground-water characteristics of Erie County have been mapped regionally, based upon interpretations of 2100 water well records and the area's geology and hydrology. Well log data on the map were selected as typical for the areas shown.

Information regarding specific sites may be obtained from the Division of Water.

Chemical Analysis Table

Well site	A	B	C	D	E	F
Depth (ft.)	168	60	146	100	69	30
Aquifer	LS	LS	SG	SS	Sh	Sh
Iron (Fe)	0.33	0.02	1.3	0.92	1.1	0.39
Calcium (Ca)	536.	130.	82.	86.	8.2	4.0
Sodium (Na)	6.5	29.	30.	21.	479.	100.
Chloride (Cl)	12.0	49.	0.6	10.	134.	10.
Fluoride (F)	1.0	0.3	0.43	0.2	0.8	0.2
Sulfate (SO_4)	1224.	232.	68.	72.	188.	16.0
Hydrogen Sulfide (H_2S)	0.5	—	—	—	Trace	Trace
Hardness as $CaCO_3$	1537.	472.	282.	301.	32.0	14.0
Dissolved Solids	2150.	630.	—	328.	1230.	267.
pH	7.3	6.9	7.5	6.8	8.0	6.7

Chemical Constituents as Mg/1

Depth (ft.) - Water-bearing Formation - Yield (gpm)

154-LS-15
110

Depth to Bedrock (ft.)

● Domestic Well

◉ Municipal—Industrial Well

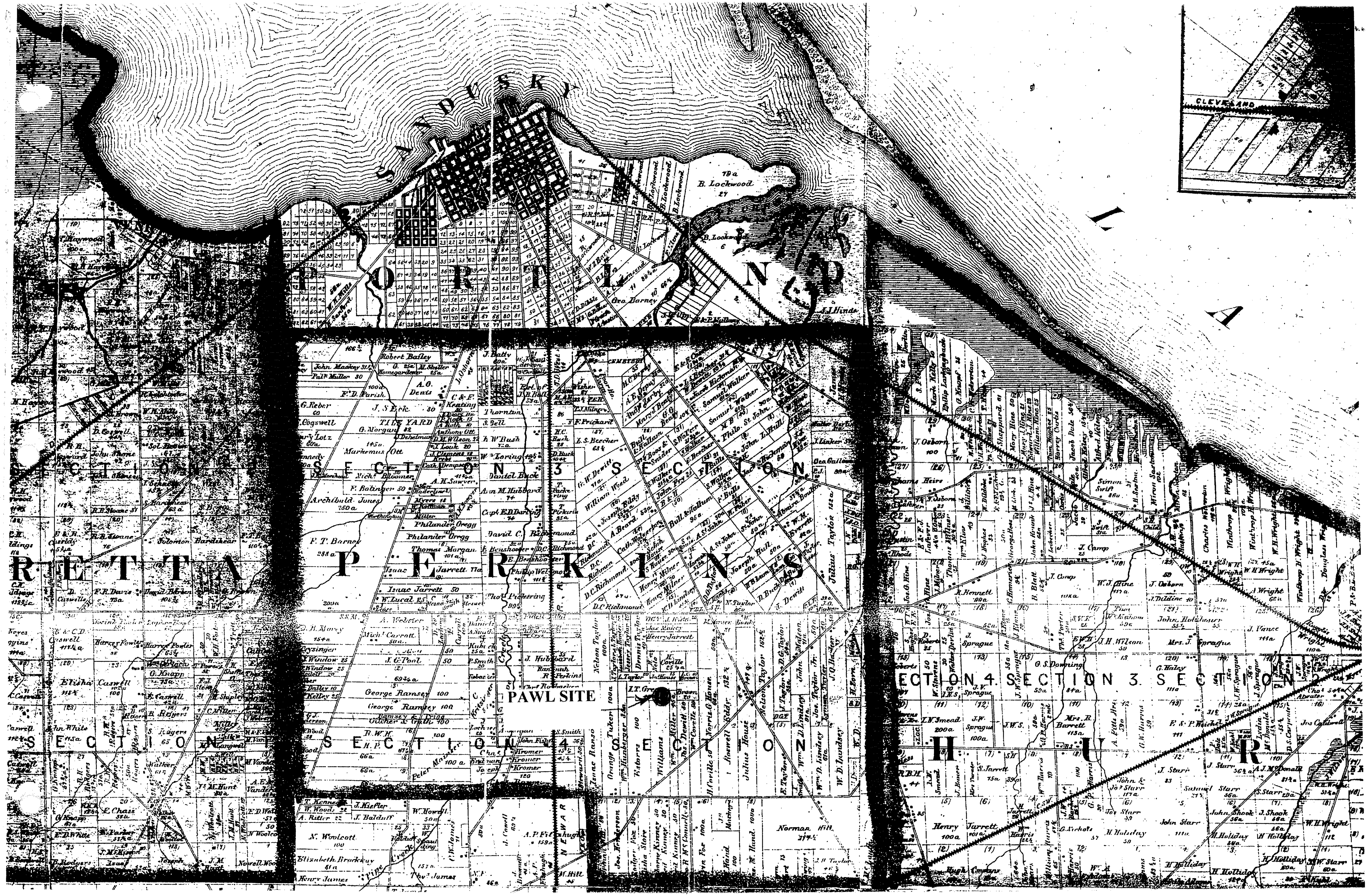
A Chemical Analyses

Formations

SS - Sandstone
SH - Shale
LS - Limestone
SG - Sand and Gravel

Appendix E

Plum Brook Ordnance Works Vicinity Land Use Map (Dated 1980/1983) and Historic Land Ownership Map (Dated 1865)


SANDUSKY
CLEVELAND
B. Lockwood
J.J. Hinde
Robert Bailey
Archibald Jones
F. T. Barnes
Thomas Morgan
Isaac Jarrett
Isaac Jarrett
Philander Gregg
David C. Richmond
William Wood
Julius Taylor
SECTION 3 SECTION
PERKINS
PAWL SITE
George Ramsey
N. Woolcott
Elizabeth Brockway
Henry James
Norman Hill
Julius House
SECTION 4 SECTION 3 SECTION 2
J. Osborn
J.H. Wilson
W.H. Wright
J. Starr
John Starr
Henry Jarrett
J.W. Smead
H. Holliday
John Shook

PAWL SITE

LAND USE AND LAND COVER

1 URBAN OR BUILT-UP LAND

11 Residential
12 Commercial and Services
13 Industrial
14 Transportation, Communications and Utilities
15 Industrial and Commercial Complexes
16 Mixed Urban or Built-up Land
17 Other Urban or Built-up Land

2 AGRICULTURAL LAND

21 Cropland and Pasture
22 Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas
23 Confined Feeding Operations
24 Other Agricultural Land

3 RANGELAND

31 Herbaceous Rangeland
32 Shrub and Brush Rangeland
33 Mixed Rangeland

4 FOREST LAND

41 Deciduous Forest Land
42 Evergreen Forest Land
43 Mixed Forest Land

5 WATER

51 Streams and Canals
52 Lakes
53 Reservoirs
54 Bays and Estuaries

6 WETLAND

61 Forested Wetland
62 Nonforested Wetland

7 BARREN LAND

71 Dry Salt Flats
72 Beaches
73 Sandy Areas Other than Beaches
74 Bare Exposed Rock
75 Strip Mines, Quarries, and Gravel Pits
76 Transitional Areas
77 Mixed Barren Land

8 TUNDRA

81 Shrub and Brush Tundra
82 Herbaceous Tundra
83 Bare Ground Tundra
84 Wet Tundra
85 Mixed Tundra

For definitions of Level I and Level II categories see U.S. Geological Survey Professional Paper 964, *A Land Use and Land Cover Classification System for Use With Remote Sensor Data, 1976*, by Anerson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. Minimum mapping units are: 4 hectares (10 acres) for Level II categories 11–17, 23–24, 51–54, 75, and urban occurrences of 76; and 16 hectares (40 acres) for all other Level II categories.

SCALE 1:250 000

5 0 5
KILOMETERS

5 0 5
MILES

Land use and land cover information compiled from source materials dated 1980 and 1983

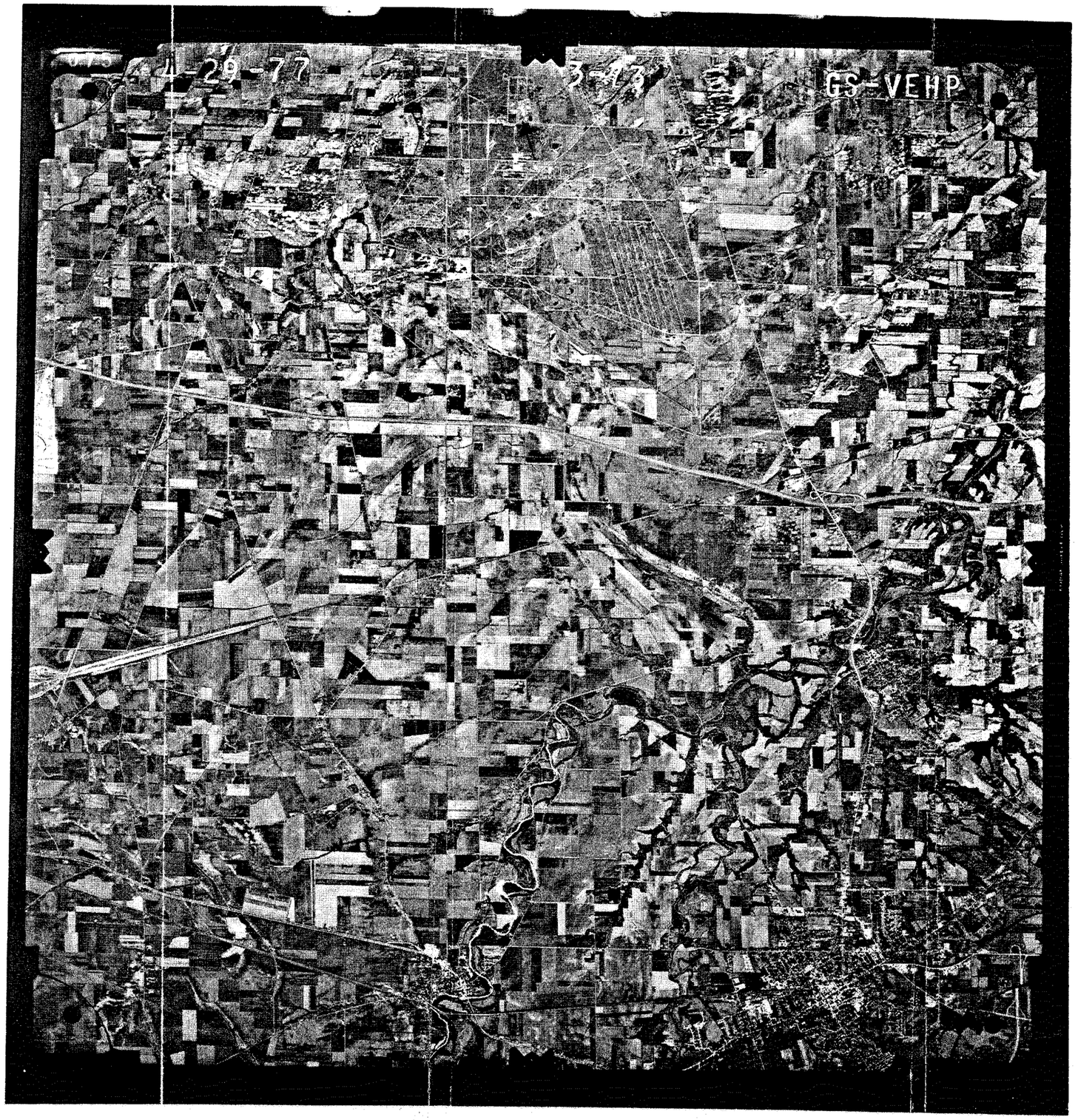
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Appendix F

Historic Aerial Photographs
(Dated 1956, 1969, 1977 & 1995)

5-7-56
2B-12 GS-CBR

69



77

1 8 3
NAPP
0 4 0
3 6 3

Appendix G

Listed Facilities and Descriptions within Proximity of Plum Brook Ordnance Works

ERIIS REPORT OVERVIEW

The following features are available for an ERIIS report:

- Database Report
  - Statistical Profile
  - Database Records
- Related Maps
  - Digital Custom Plotted Map
  - Sanborn Fire Insurance Map(s)
  - Topographical Map(s)

Statistical Profile

The statistical profile is an at-a-glance numeric summary of the databases searched for your ERIIS Report.

Database Records

The detailed federal and state database information indicates potential and actual environmental threats within the study radius. These records are sorted by their distance from the study site.

Digital Custom Map

The digital custom map is cross referenced with the database records. The cross-in-circle in the center of the map represents the study site. The red circles represent distances from the study site. The plottable sites in the report are distinguished on the map by symbols of different shape and color.

Historic Fire Insurance Maps

The ERIIS collection of historical Sanborn Fire Insurance Maps covers 14,000 cities and towns. These maps may indicate prior use of the study site. If no maps are available for the study site, a notice to that effect is included. This notice should serve as evidence of due diligence.

Topographical Map

USGS topographical maps show natural and man-made features as well as the shape and elevation of the terrain. The 7.5 minute quad maps are produced at a scale of 1:24,000, or one inch represents 2,000 feet.

If you have any questions about this report,
please contact ERIIS Customer Service at 1-800-989-0403

ERIIS CORRIDOR STATISTICAL PROFILE
State: OH

ERIIS Report #317596A

Mar 4, 1999

Site:
SOUTH OF SANDUSKY
SANDUSKY, OH

Database	Plotted Sites
NPL	0
RCRIS_CA	0
RCRIS_TS	1
CERCLIS	0
NFRAP	1
RCRIS_LG	0
RCRIS_SG	1
ERNS	0
HWS	1
LRST	6
SWF	0
RST	9
	19

NR in a radius count indicates that the database cannot be reported by this search criteria due to insufficient and/or inaccurate addresses reported by a federal/state agency.

NPL
Date of Data: 10/14/1998
Release Date: 10/20/1998
ate on System: 11/20/1998
S Environmental Protection Agency
Office of Solid Waste and Emergency Response
703/603-8881
Date of Last Contact: 11/02/1998

National Priorities List

The NPL Report is an EPA listing of the nation's worst uncontrolled or abandoned hazardous waste sites. NPL sites are targeted for possible long-term remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. In addition, the NPL Report includes information concerning cleanup agreements between EPA and Potentially Responsible Parties (commonly called Records of Decision, or RODS), any liens filed against contaminated properties, as well as the past and current EPA budget expenditures tracked within the Superfund Consolidated Accomplishments Plan (SCAP).

RCRIS_CA
Date of Data: 07/01/1998
Release Date: 09/18/1998
Date on System: 12/04/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
800/424-9346
Date of Last Contact: 11/04/1998

Resource Conservation and Recovery Information System - TSD's Subject to Corrective Action

The RCRIS_CA Report contains information pertaining to hazardous waste treatment, storage , and disposal Facilities (RCRA TSD's) which have conducted, or are currently conducting, a corrective action(s) as regulated under the Resource Conservation and Recovery Act. The following information is included within the RCRIS_CA Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the facility or EPA

RCRIS_TS
Date of Data: 07/01/1998
Release Date: 09/18/1998
Date on System: 12/04/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
800/424-9346
Date of Last Contact: 11/04/1998

Resource Conservation and Recovery Information System - Non-Corrective Action TSD Facilities

The RCRIS_TS Report contains information pertaining to facilities which either treat, store, or dispose of EPA regulated hazardous waste. The following information is also included in the RCRIS_TS Report:

- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties

RCLIS
e of Data: 10/14/1998
ease Date: 10/20/1998
Date on System: 11/13/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
703/603-8881
Date of Last Contact: 11/02/1998

Comprehensive Environmental Response, Compensation, and Liability Information System

The CERCLIS Database is a comprehensive listing of known or suspected uncontrolled or abandoned hazardous waste sites. These sites have either been investigated, or are currently under investigation by the U.S. EPA for the release, or threatened release of hazardous substances. Once a site is placed in CERCLIS, it may be subjected to several levels of review and evaluation, and ultimately placed on the National Priorities List (NPL). In addition to site events and milestone dates, the CERCLIS Report also contains financial information from the Superfund Consolidated Accomplishments Plan (SCAP).

NFRAP
Date of Data: 10/14/1998
Release Date: 10/20/1998
Date on System: 11/13/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
703/603-8881
Date of Last Contact: 11/02/1998

No Further Remedial Action Planned Sites

The No Further Remedial Action Planned Report (NFRAP), also known as the CERCLIS Archive, contains information pertaining to sites which have been removed from the U.S. EPA's CERCLIS Database. NFRAP sites may be sites where, following an initial investigation, either no contamination was found, contamination was removed quickly without need for the site to be placed on the NPL, or the contamination was not serious enough to require federal Superfund action or NPL consideration.

RCRIS_LG
Date of Data: 07/01/1998
Release Date: 09/18/1998
Date on System: 12/04/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
800/424-9346
Date of Last Contact: 11/04/1998

Resource Conservation and Recovery Information System - Large Quantity Generators

The RCRIS_LG Report contains information pertaining to facilities which either generate more than 1000kg of EPA regulated hazardous waste per month, or meet other applicable requirements of the Resource Conservation And Recovery Act. The following information is also included in the RCRIS_LG Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the facility or EPA

RCRIS_SG
Date of Data: 07/01/1998
Release Date: 09/18/1998
Date on System: 12/04/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
800/424-9346
Date of Last Contact: 11/04/1998

Resource Conservation and Recovery Information System - Small Quantity Generators

The RCRIS_SG Report contains information pertaining to facilities which either generate between 100kg and 1000kg of EPA regulated hazardous waste per month, or meet other applicable requirements of the Resource Conservation And Recovery Act. On advice of the U.S. EPA, ERIIS does not report so-called "RCRA Protective Filers." Protective Filers, commonly called Conditionally Exempt Small Quantity Generators (CESQG's), are facilities that have completed RCRA notification paperwork, but are not, in fact, subject to RCRA regulation. The determination of CESQG status is made by the U.S. EPA. The following information is also included in the RCRIS_SG Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the facility or EPA

ERNS
Date of Data: 10/08/1998
Release Date: 10/09/1998
Date on System: 11/13/1998
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
202/260-2342
Date of Last Contact: 10/19/1998

Emergency Response Notification System

ERNS is a national computer database system that is used to store information concerning the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The ERNS Reporting System contains preliminary information on specific releases, including the spill location, the substance released, and the responsible party. Please note that the information in the ERNS Report pertains only to those releases that occured between January 1, 1997 and October 8, 1998.

HWS
Date of Data: 01/02/1998
Release Date: 01/02/1998
Date on System: 02/27/1998
OH Environmental Protection Agency
Emergency and Remedial Response Division
614/644-2924
Date of Last Contact: 08/19/1998

Ohio Master Sites List

The Ohio Master Sites List tracks sites in Ohio where hazardous waste has been found or where there are any known, suspected, or likely release of such wastes from a facility.

LRST
Date of Data: 10/01/1998
Release Date: 11/20/1998
Date on System: 12/04/1998
OH Office of the State Fire Marshal
Bureau of Licensing and Certification
614/752-7924
Date of Last Contact: 12/01/1998

Ohio Leaking Underground Storage Tank Report

The Ohio Leaking Underground Storage Tank Report (formerly The Petroleum Underground Storage Tank Release Incident Report, or PUSTR) is a comprehensive listing of all reported active and inactive leaking underground storage tanks located within the State of Ohio.

SWF
Date of Data: 12/31/1997
Release Date: 02/01/1998
Date on System: 03/11/1998
OH Environmental Protection Agency
Division of Solid Waste Management
614/644-3135
Date of Last Contact: 10/16/1998

Ohio Solid Waste Facility List

The Ohio Solid Waste Facility List contains information pertaining to all active and closed permitted solid waste landfills and processing facilities within the State of Ohio.

RST
Date of Data: 10/01/1998
Release Date: 10/01/1998
Date on System: 10/01/1998
OH Office of the State Fire Marshal
Bureau of Licensing and Certification
614/752-7924
Date of Last Contact: 10/26/1998

Ohio Underground Storage Tank Report

The Ohio Underground Storage Tank Report is a comprehensive listing of all registered active and inactive underground storage tanks located within the State of Ohio.

ERIIS SUMMARY OF PLOTTABLE SITES

ERIIS Report #317596A — Mar 4, 1999

ERIIS ID.	FACILITY/ADDRESS	DATABASE	DISTANCE FROM SITE	MAP ID
005009583	HEMMINGER FARMS 1118 FOX RD SANDUSKY, OH 44870-8367 COUNTY: ERIE	LRST	Corridor	9583
39005013250	NASA 6100 CLEVELAND AVE SANDUSKY, OH 44870 COUNTY: ERIE	LRST	Corridor	3250
39005013251	NASA 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	LRST	Corridor	3251
39013000073	NASA LERC PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RCRIS_TS	Corridor	73
39039000797	NASA PLUM BROOK 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NFRAP	Corridor	797
39005013257	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	LRST	Corridor	3257
39010005044	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5044
39010005045	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5045
39010005046	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5046
10005047	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5047
39010005048	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5048
39010005049	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5049
39010005050	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5050
39010005051	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5051
39010005052	NASA PLUM BROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RST	Corridor	5052
39005013258	NASA PLUMBROOK STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	LRST	Corridor	3258
39005014705	PERKINS TRANSP. BUS GARAGE TAYLOR RD AT COLUMBUS AVE SANDUSKY, OH 44870 COUNTY: ERIE	LRST	Corridor	4705
39050000278	US NASA PLUM BROOK TAYLOR & COLUMBUS RD SANDUSKY, OH 44870 COUNTY: ERIE	HWS	Corridor	278
08010305	USDOI SANDUSKY BIOLOGICAL STATION 6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	RCRIS_SG	Corridor	305

ERIIS ID EPA ID	FACILITY	ADDRESS	RAATS ISSUE DATE RAATS ACTION/STATUS RAATS PENALTIES	DISTANCE FROM SITE	DIRECTION FROM SITE	MAP ID
39013000073 OH3800015379	NASA LERC PLUM BROOK STATION COUNTY: ERIE	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	FACILITY NOT REPORTED IN RAATS	Corridor Site		73

FACILITY VIOLATIONS

	DATE DETERMINED:	DATE RESOLVED:	AREA OF VIOLATION:
1.	08/24/1989	12/05/1991	GENERATOR-ALL REQUIREMENTS
2.	08/24/1989	12/05/1991	GENERATOR-LAND BAN REQUIREMENTS
3.	02/18/1992	05/20/1992	GENERATOR-ALL REQUIREMENTS

FACILITY EVALUATIONS

	EVALUATION DATE:	EVALUATING AGENCY:	TYPE OF EVALUATION:	AREA(S) OF EVALUATION:
1.	08/24/1989	STATE	COMPLIANCE EVALUATION INSPECTION	GENERATOR-ALL REQUIREMENTS GENERATOR-LAND BAN REQUIREMENTS
2.	02/18/1992	STATE	COMPLIANCE EVALUATION INSPECTION	GENERATOR-ALL REQUIREMENTS GENERATOR-LAND BAN REQUIREMENTS

FACILITY ENFORCEMENTS

	ENFORCEMENT DATE:	ENFORCING AGENCY:	TYPE OF ACTION:	PENALTY(S):
1.	09/21/1990	EPA	WRITTEN, INFORMAL ADMINISTRATIVE ACTION	
2.	02/28/1992	STATE	WRITTEN, INFORMAL ADMINISTRATIVE ACTION	

ERIIS ID EPA ID	FACILITY	ADDRESS	DISTANCE FROM SITE	DIRECTION FROM SITE	MAP ID
39039000797 OH3800015379	NASA PLUM BROOK COUNTY: ERIE	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	Corridor		797

SITE EVENT(S)	COMPLETE DATE
DISCOVERY	08-01-1983
PRELIMINARY ASSESSMENT	08-01-1984
STATE, FUND FINANCED	09-30-1994

ERIIS ID EPA ID	FACILITY	ADDRESS	RAATS ISSUE DATE RAATS ACTION/STATUS RAATS PENALTIES	DISTANCE FROM SITE	DIRECTION FROM SITE	MAP ID
39008010305 OH3143690250	USDOI SANDUSKY BIOLOGICAL STATION COUNTY: ERIE	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	FACILITY NOT REPORTED IN RAATS	Corridor Site		305

ERIIS ID US EPA ID. OH EPA ID.	FACILITY	ADDRESS	PRIORITY	DELISTED(Y/N)	MAP ID
39050000278 OH3800015379 322-0552	US NASA PLUM BROOK DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	TAYLOR & COLUMBUS RD SANDUSKY, OH 44870 COUNTY: ERIE	NO PRIORITY	NOT REPORTED	278

ERIIS ID	FACILITY	ADDRESS	COUNTY	DISTANCE FROM SITE	DIRECTION FROM SITE	MAP ID
39005009583	HEMMINGER FARMS	1118 FOX RD SANDUSKY, OH 44870-8367	ERIE	Corridor Site		9583
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
220219400	NO FURTHER ACTION	ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.				
39005014705	PERKINS TRANSP. BUS GARAGE	TAYLOR RD AT COLUMBUS AVE SANDUSKY, OH 44870	ERIE	Corridor Site		4705
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
228167200	REPORTED	CLOSURE OF AN UNDERGROUND STORAGE TANK.				
39005013250	NASA	6100 CLEVELAND AVE SANDUSKY, OH 44870	ERIE	Corridor Site		3250
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
22936903	INITIAL CORRECTIVE ACTION	SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM AN UST NOT REGULATED BY RCRA SUBTITLE I.				
22936902	NO FURTHER ACTION	ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.				
39005013251	NASA	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	ERIE	Corridor Site		3251
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
22936901	NO FURTHER ACTION	ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.				
22936907	NO FURTHER ACTION	ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.				
22936905	INITIAL CORRECTIVE ACTIONS	SUSPECTED OR CONFIRMED FOR RELEASE OF A HAZARDOUS SUBSTANCE FROM A REGULATED UST.				
22936906	INITIAL CORRECTIVE ACTIONS	SUSPECTED OR CONFIRMED FOR RELEASE OF A HAZARDOUS SUBSTANCE FROM A REGULATED UST.				
22936908	INITIAL CORRECTIVE ACTIONS	SUSPECTED OR CONFIRMED FOR RELEASE OF A HAZARDOUS SUBSTANCE FROM A REGULATED UST.				
22936904	INITIAL CORRECTIVE ACTIONS	SUSPECTED OR CONFIRMED FOR RELEASE OF A HAZARDOUS SUBSTANCE FROM A REGULATED UST.				
39005013257	NASA PLUM BROOK STATION	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	ERIE	Corridor Site		3257
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
22936910	NO FURTHER ACTION	CLOSURE OF AN UNDERGROUND STORAGE TANK.				
39005013258	NASA PLUMBROOK STATION	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329	ERIE	Corridor Site		3258
INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY				
22936911	NO FURTHER ACTION	CLOSURE OF AN UNDERGROUND STORAGE TANK.				

ERIIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER	MAP ID
39010005044 / 0-227802	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135	PETER W. MCCALLUM (216) 433-8852	5044

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
28	REMOVED	NOT REPORTED	3,000	55	BARE STEEL
29	REMOVED	NOT REPORTED	770	33	BARE STEEL
30	REMOVED	NOT REPORTED	770	33	BARE STEEL
31	REMOVED	NOT REPORTED	770	33	BARE STEEL

39010005045 / 0-227803	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5045

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
32	REMOVED	USED OIL	1,500	55	BARE STEEL

39010005046 / 0-227804	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5046

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
201	CURRENTLY IN USE	GASOLINE	8,000	8	FIBERGLASS
202	CURRENTLY IN USE	DIESEL	8,000	8	FIBERGLASS

39010005047 / 0-227805	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5047

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
37	REMOVED	NOT REPORTED	12,000	18	BARE STEEL
38	REMOVED	NOT REPORTED	12,000	18	BARE STEEL

39010005048 / 0-227806	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5048

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
39	REMOVED	UNK	250	UNK	UNKNOWN

39010005049 / 0-227807	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5049

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
23	REMOVED	USED OIL	500	36	BARE STEEL

39010005050 / 0-227808	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5050

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
24	REMOVED	USED OIL	1,000	29	BARE STEEL

ERIIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER	MAP ID
39010005051 / 0-227809	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5051

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
26	REMOVED	NOT REPORTED	11,000	29	BARE STEEL
27	REMOVED	NOT REPORTED	11,000	29	BARE STEEL

39010005052 / 0-227810	NASA PLUM BROOK STATION DISTANCE FROM SITE: Corridor Site DIRECTION FROM SITE:	6100 COLUMBUS AVE SANDUSKY, OH 44870-8329 COUNTY: ERIE	NASA LEWIS RESEARCH CENTER 21000 BROOKPARK RD CLEVELAND, OH 44135		5052

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
35	REMOVED	GASOLINE	9,000	55	BARE STEEL

Unplottable Sites

The remaining report pages list additional environmental sites that have been selected based on geographic criteria unique to your study site. They are classified as "unplottable sites" and require further investigation to assess their potential impact on your site.

How to Evaluate Unplottable Sites

Step 1
Streets Within the Radius: the following page is an alphabetical index of all streets that intersect or are contained within the largest study radius (usually one mile).

Step 2
Cross-Reference: use the "Streets Within the Radius" index to cross-reference the unplottable sites. For example, if Maple Avenue and Oak Avenue are listed in the street index, then any unplottable sites with a Maple Avenue or Oak Avenue address should be checked for possible impact on study site.

Questions on ERIIS' Proprietary Geocoding?

We're happy to answer any questions you might have about our data processing and **point-geocoding** (assigning a latitude and longitude to each address). Just give us a call on our toll-free number at (800) 989-0402 and let us know what state you're calling from. Our customer service staff is available from 8 a.m. to 8 p.m. (EST).

The ASTM Standard Practice For Environmental Site Assessments

As stated in the recently published **Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process** (E1527) by the American Society for Testing and Materials (ASTM):

> "For large databases with numerous facility records (such as RCRA hazardous waste generators and registered underground storage tanks), the records are not practically reviewable unless they can be obtained from the source agency in the smaller geographic area of ZIP code (3.3.24)."

Therefore, this Report contains information available by latitude/longitude or by ZIP code. If your research requires environmental records for which only city or county information is available (i.e., no valid street or ZIP code) ERIIS will include this data at no extra charge.

ERIIS LIST OF STREETS IN THE RADIUS

ERIIS Report #317596A

Mar 4, 1999

STREET NAME
BIRCHWOOD DR
E BOGART ROAD
W BOGART ROAD
BOSTON ROAD
BOTAY ROAD
BOUY ROAD
BOX FACTORY ROAD
CAMBRIDGE CIR
CAMPBELL ST
CLARK ROAD
COLUMBUS AVE
COUNTRY PLACE DR
DALLAS AVE
DEERFIELD LANE
DENVER AVE
FOX ROAD
HARTFORD AVE
INDIANA AVE
INDUSTRIAL PKY
KIRKWOOD TER
LAKE CT
S LAKE WILMER DR
LINDEN WAY
LINDEN WAY DR
LISBON CIR
LONDON ROAD
N MAGAZINE ROAD
MAINTENANCE ROAD
MASON ROAD
MEMPHIS AVE
MICHIGAN AVE
MILAN ROAD
NORMANDY CT
OHIO TER
PARKWAY S
PATROL ROAD
PATTEN TRACT ROAD
PENNSYLVANIA AVE
PENTOLITE ROAD
RANSOM ROAD
RICHMOND CIR
SCHEID ROAD
SCHENK ROAD
SHORT CUT ROAD
STATE HWY 2
SWANO DR
TAYLOR ROAD
US HWY 250
VIRGINIA AVE
WALT LAKE TRL

ERIIS SUMMARY OF UNPLOTTABLE SITES
(Facilities sorted alphabetically within ZIP Code)

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ERIIS ID.	FACILITY/STREET	CITY/STATE/ZIP/COUNTY	DATABASE
.005021849	BOB GARBA-FRANKLIN FLATS 90601 RIVER VIEW DR	HURON, OH 44839 COUNTY: ERIE	LRST
39005022207	CONSOLIDATED ELECTRIC 1901 SAWMILL INDUSTRIAL PKWY	HURON, OH 44839 COUNTY: ERIE	LRST
39010004952	DANIEL & CAROL LAPP 2112 CLEVELAND RD	HURON, OH 44839 COUNTY: ERIE	RST
39005022311	DANIEL LAPP 2112 CLEVELAND AVE	HURON, OH 44839 COUNTY: ERIE	LRST
39010019398	DENNIS MICHELSON 2416 CLEVELAND SANDUSY RD	HURON, OH 44839 COUNTY: ERIE	RST
39010005028	ERIE COUNTY LANDFILL HOOVER RD	HURON, OH 44839 COUNTY: ERIE	RST
39005022468	ERIE CTY LANDFILL HOOVER RD	HURON, OH 44839 COUNTY: ERIE	LRST
39005022729	GASTOWN 3674 2103 CLEVELAND	HURON, OH 44839 COUNTY: ERIE	LRST
39005022843	GTE NORTH, INC. MAIN ST	HURON, OH 44839 COUNTY: ERIE	LRST
39010005038	GTE NORTH, INC. MAIN & SHIRLEY	HURON, OH 44839 COUNTY: ERIE	RST
39018000056	HURON LIME COMPANY LANDFILL #1 RIVER RD	HURON, OH 44839 COUNTY: ERIE	SWF
18000052	HURON LIME COMPANY LANDFILL #2 PO BOX 451	HURON, OH 44839-0451 COUNTY: ERIE	SWF
39005023854	PRESTON TRUCKING CO 1711 SAWMILL INDUSTRIAL PKWY	HURON, OH 44839 COUNTY: ERIE	LRST
39010004878	RYE BEACH HY-MILER 2026 CLEVELAND RD	HURON, OH 44839 COUNTY: ERIE	RST
39005025012	YELLOW FREIGHT RYE BEACH RD	HURON, OH 44839 COUNTY: ERIE	LRST
39005021816	BFI SR 101	SANDUSKY, OH 44870 COUNTY: ERIE	LRST
39010004932	C.S.C. OIL CO. #484 607 PERKINS AVE	SANDUSKY, OH 44870 COUNTY: ERIE	RST
39005022026	CAUSEWAY DR LIFT STA 1300 CAUSEWAY DR	SANDUSKY, OH 44870 COUNTY: ERIE	LRST
39010004967	CEDAR POINT #1 CAUSEWAY DR	SANDUSKY, OH 44870 COUNTY: ERIE	RST
39005022195	COMMODORE PERRY SVC PLAZA MILE POST 100.0 SOUTH SIDE	SANDUSKY, OH 44870 COUNTY: ERIE	LRST
39008008756	ERIE COUNTY SCHOOLS 7142 TAYLOR-COLUMBUS AVE	SANDUSKY, OH 44870 COUNTY: ERIE	RCRIS_SG
39005022515	FARWELL ST LIFT STATION FARWELL ST	SANDUSKY, OH 44870 COUNTY: ERIE	LRST
39005022720	GAS AMERICA 7065 US RT 30	SANDUSKY, OH 44870 COUNTY: ERIE	LRST
39008009438	GORDON FOOD SERVICE INC 1415 HOLLAND RD	PERRYSBURG, OH 44870 COUNTY: ERIE	RCRIS_SG

ERIIS Report #317596A

ERIIS ENVIRONMENTAL DATA REPORT
RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM
RCRIS_SG - UNPLOTTABLE SITES

Mar 4, 1999

ERIIS ID EPA ID	FACILITY	ADDRESS	RAATS ISSUE DATE RAATS ACTION/STATUS RAATS PENALTIES
39008004325 OHD981786650	NORTHCOAST AUTO BODY COUNTY: ERIE	1944 ONE HALF MILAN RD SANDUSKY, OH 44870	FACILITY NOT REPORTED IN RAATS
39008004832 OHD982211450	SOHIO OIL CO NO 06672 COUNTY: ERIE	RTE 2 AND RTE 250 SANDUSKY, OH 44870	FACILITY NOT REPORTED IN RAATS
39008008756 OHR000003673	ERIE COUNTY SCHOOLS COUNTY: ERIE	7142 TAYLOR-COLUMBUS AVE SANDUSKY, OH 44870	FACILITY NOT REPORTED IN RAATS
39008008438 OHR000025809	GORDON FOOD SERVICE INC COUNTY: ERIE	1415 HOLLAND RD PERRYSBURG, OH 44870	FACILITY NOT REPORTED IN RAATS

ERIIS ENVIRONMENTAL DATA REPORT
EMERGENCY RESPONSE NOTIFICATION SYSTEM
ERNS - UNPLOTTABLE SITES

ERIIS Report #317596A

Mar 4, 1999

ERIIS ID REPORT NUMBER SOURCE AGENCY	SPILL CITY, STATE, ZIP CODE SPILL COUNTY	DISCHARGER NAME ORGANIZATION ADDRESS	MEDIA AFFECTED LAND	WATER	AIR	GRND WATER	FACILITY	SPILL DATE WATER WAY AFFECTED
39002000030 420277 NATL. RESPONSE CTR	SANDUSKY, OH 44870 ERIE	JIMS AUTO SALVAGE 1707 GEORGE STREET SANDUSKY, OH 44870	N	N	N	N	N	01/17/1998 STORM DRAIN/SOIL

LOCATION: Superior Street / Dead End, North Side Of Venice Road
DESCRIPTION: Caller States: Company Towed Many Vehicles Over 2 Days, Some Of The Vehicles Being Towed Spilled Gasoline And Motor Oil Onto The Roadway
MATERIAL SPILLED: Oil, Misc: Motor QTY: 0 Unk LBS: 0 QTY IN WATER: 0 Unk
Oil: Diesel QTY: 0 Unk LBS: 0 QTY IN WATER: 0 Unk
Gasoline: Automotive (4.23g Pb/g QTY: 0 Unk LBS: 0 QTY IN WATER: 0 Unk
ACTIONS TAKEN: None / Police Were Onscene, Were Going To Make Company Clean Up / Nothing Has Been Done To Date
MISCELLANEOUS: Sandusky Bay Is .5 Miles Away / Some Product Has Reached A Storm Drain And It Has Been Raining

ERIIS Report #317596A

ERIIS ENVIRONMENTAL DATA REPORT
OHIO MASTER SITES LIST
HWS - UNPLOTTABLE SITES

Mar 4, 1999

ERIIS ID US EPA ID. OH EPA ID.	FACILITY	ADDRESS	PRIORITY	DELISTED(Y/N)
39050000992 OHD980611487 362-0117		PORT CLINTON, OH 44870 COUNTY: ERIE	LOW	YES REASON: DSIWM SITE
39050000993 OHD980611487 362-0117		PORT CLINTON, OH 44870 COUNTY: ERIE	LOW	YES REASON: DSIWM REGULATION

ERIIS ID	FACILITY	ADDRESS	COUNTY
39005021849	BOB GARBA-FRANKLIN FLATS	90601 RIVER VIEW DR HURON, OH 44839	ERIE
INCIDENT NO. 228205100	STATUS REPORTED	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005022207	CONSOLIDATED ELECTRIC	1901 SAWMILL INDUSTRIAL PKWY HURON, OH 44839	ERIE
INCIDENT NO. 224197300	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005022311	DANIEL LAPP	2112 CLEVELAND AVE HURON, OH 44839	ERIE
INCIDENT NO. 222179300	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005022468	ERIE CTY LANDFILL	HOOVER RD HURON, OH 44839	ERIE
INCIDENT NO. 397128300	STATUS REPORTED	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005022729	GASTOWN 3674	2103 CLEVELAND HURON, OH 44839	ERIE
INCIDENT NO. 229105800	STATUS CORRECTIVE ACTIONS IN PROGRESS	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005022843	GTE NORTH, INC.	MAIN ST HURON, OH 44839	ERIE
INCIDENT NO. 226093300	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005023854	PRESTON TRUCKING CO	1711 SAWMILL INDUSTRIAL PKWY HURON, OH 44839	ERIE
INCIDENT NO. 224197400	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005025012	YELLOW FREIGHT	RYE BEACH RD HURON, OH 44839	ERIE
INCIDENT NO. 220106100	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005021816	BFI	SR 101 SANDUSKY, OH 44870	ERIE
INCIDENT NO. 221113001	STATUS DISPROVED	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	

ERIIS ID	FACILITY	ADDRESS	COUNTY
39005022026	CAUSEWAY DR LIFT STA	1300 CAUSEWAY DR SANDUSKY, OH 44870	ERIE
INCIDENT NO. 220128300	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005022195	COMMODORE PERRY SVC PLAZA	MILE POST 100.0 SOUTH SIDE SANDUSKY, OH 44870	ERIE
INCIDENT NO. 72948000	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005022515	FARWELL ST LIFT STATION	FARWELL ST SANDUSKY, OH 44870	ERIE
INCIDENT NO. 220078600	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005022720	GAS AMERICA	7065 US RT 30 SANDUSKY, OH 44870	ERIE
INCIDENT NO. 880063800	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005023788	PETERSON LIFT STATION	PETERSON LN SANDUSKY, OH 44870	ERIE
INCIDENT NO. 222274400	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005024063	SANDUSKY BD OF EDUCATION	8118 CAMP ST SANDUSKY, OH 44870	ERIE
INCIDENT NO. 222173700	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005024532	UNITED PARCEL SERV	PERKINS AVE SANDUSKY, OH 44870	ERIE
INCIDENT NO. 220165100	STATUS NO FURTHER ACTION	LUST TRUST FUND (LTF) ELIGIBILITY CLOSURE OF AN UNDERGROUND STORAGE TANK.	
39005024617	UNKNOWN	PERKINS TOWNSHIP SANDUSKY, OH 44870	ERIE
INCIDENT NO. 22704500	STATUS DISPROVED	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	
39005024619	UNKNOWN	RAMADA & US RT 250 SANDUSKY, OH 44870	ERIE
INCIDENT NO. 221060900	STATUS REPORTED	LUST TRUST FUND (LTF) ELIGIBILITY ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.	

ERIIS ID	FACILITY	ADDRESS	COUNTY
39005024648	UNKNOWN (CITY WATER/SEWER LINE)	SR 101 SANDUSKY, OH 44870	ERIE

INCIDENT NO.	STATUS	LUST TRUST FUND (LTF) ELIGIBILITY
221113000	REPORTED	ELIGIBLE FOR LTF OVERSIGHT AND/OR SPENDING - SUSPECTED OR CONFIRMED FOR RELEASE OF PETROLEUM FROM A REGULATED UST.

ERIIS ENVIRONMENTAL DATA REPORT
OHIO SOLID WASTE FACILITIES
SWF - UNPLOTTABLE SITES

ERIIS Report #317596A

Mar 4, 1999

ERIIS ID FACILITY ID	FACILITY ADDRESS	OPERATOR ADDRESS
39018000056 22-00-04	HURON LIME COMPANY LANDFILL #1 RIVER RD HURON, OH 44839 COUNTY: ERIE FACILITY TYPE: INDUSTRIAL SW LF CAPACITY: NOT REPORTED	H J MICHAELS HURON LIME COMPANY NOT REPORTED NOT REPORTED (419) 433-2141 FACILITY STATUS: CLOSED
39018000052 22-00-05	HURON LIME COMPANY LANDFILL #2 PO BOX 451 HURON, OH 44839-0451 COUNTY: ERIE FACILITY TYPE: INDUSTRIAL SW LF CAPACITY: NOT REPORTED	A.J. PARIS, HURON LIME COMPANY PO BOX 451 HURON, OH 44839 (419) 433-2141 FACILITY STATUS: ACTIVE
39018000388	HENSEN DUMP AKA HURON LIME CO. #2 WEST SIDE OF RIVER ROAD, 1/2 MILE HURON TOWNSHIP, OH COUNTY: ERIE FACILITY TYPE: PRIVATE, LIME SLUDGE CAPACITY: 12 ACRES	NOT REPORTED NOT REPORTED NOT REPORTED NOT REPORTED FACILITY STATUS: CLOSED 1982

ERIIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER
39010004878 / 0-220041	RYE BEACH HY-MILER	2028 CLEVELAND RD HURON, OH 44839 COUNTY: ERIE	DISTRICT PETROLEUM PRODUCTS, INC 1832 MILAN RD SANDUSKY, O 44870	MIKE STIPP

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	CURRENTLY IN USE	GASOHOL	10,000	23	FIBERGLASS
2	CURRENTLY IN USE	GASOHOL	4,000	23	BARE STEEL
3	CURRENTLY IN USE	GASOHOL	6,000	23	BARE STEEL
4	CURRENTLY IN USE	GASOHOL	6,000	23	BARE STEEL
5	CURRENTLY IN USE	KEROSENE	2,000	23	BARE STEEL
6	TEMPORARILY OUT OF USE	USED OIL	550	23	BARE STEEL

39010004952 / 0-220235	DANIEL & CAROL LAPP	2112 CLEVELAND RD HURON, OH 44839 COUNTY: ERIE	DANIEL & CAROL LAPP 404 S HAMPTON CT HURON, OH 44839	

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	REMOVED	GASOLINE	6,000	24	FIBERGLASS
2	REMOVED	GASOLINE	6,000	24	FIBERGLASS
3	REMOVED	GASOLINE	6,000	24	FIBERGLASS

39010005028 / 0-225986	ERIE COUNTY LANDFILL	HOOVER RD HURON, OH 44839 COUNTY: ERIE	ERIE COUNTY COMMISSIONERS PO BOX 370 HURON, OH 44839	JACK R. MYERS

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	CURRENTLY IN USE	DIESEL	1,000	27	UNKNOWN

39010005038 / 0-227135	GTE NORTH, INC.	MAIN & SHIRLEY HURON, OH 44839 COUNTY: ERIE	GTE NORTH, INC. 1300 COLUMBUS SANDUSKY RD N MARION, OH 43302	KEITH E. ZUSPAN

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
2	CURRENTLY IN USE	DIESEL	8,000	1	FIBERGLASS

39010019398 / 0-220307	DENNIS MICHELSON	2416 CLEVELAND SANDUSY RD HURON, OH 44839 COUNTY: ERIE	DENNIS MICHELSON 6322 146TH ST SW EDMONDS, WA 98026	

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	CURRENTLY IN USE	UNK	UNKNOWN	UNK	UNKNOWN
2	CURRENTLY IN USE	UNK	UNKNOWN	UNK	UNKNOWN
3	CURRENTLY IN USE	UNK	UNKNOWN	UNK	UNKNOWN
4	CURRENTLY IN USE	UNK	UNKNOWN	UNK	UNKNOWN

39010004932 / 0-220191	C.S.C. OIL CO. #484	607 PERKINS AVE SANDUSKY, OH 44870 COUNTY: ERIE	C.S.C. OIL CO. 2210 GOLDSMITH LN - STE 108 LOUISVILLE, KY 40218	WILLIAM SHEPARD

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	CURRENTLY IN USE	GASOLINE	10,000	25	BARE STEEL
2	CURRENTLY IN USE	GASOLINE	10,000	25	BARE STEEL
3	CURRENTLY IN USE	GASOLINE	10,000	25	BARE STEEL

ERIS ENVIRONMENTAL DATA REPORT
OHIO UNDERGROUND STORAGE TANKS
RST - UNPLOTTABLE SITES

ERIS Report #317596A

Mar 4, 1999

ERIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER
39010004967 / 0-220277	CEDAR POINT	#1 CAUSEWAY DR SANDUSKY, OH 44870 COUNTY: ERIE	CEDAR FAIR LIMITED PARTNERSHIP PO BOX 5006 SANDUSKY, OH 44870	RONALD K. FUSSNER

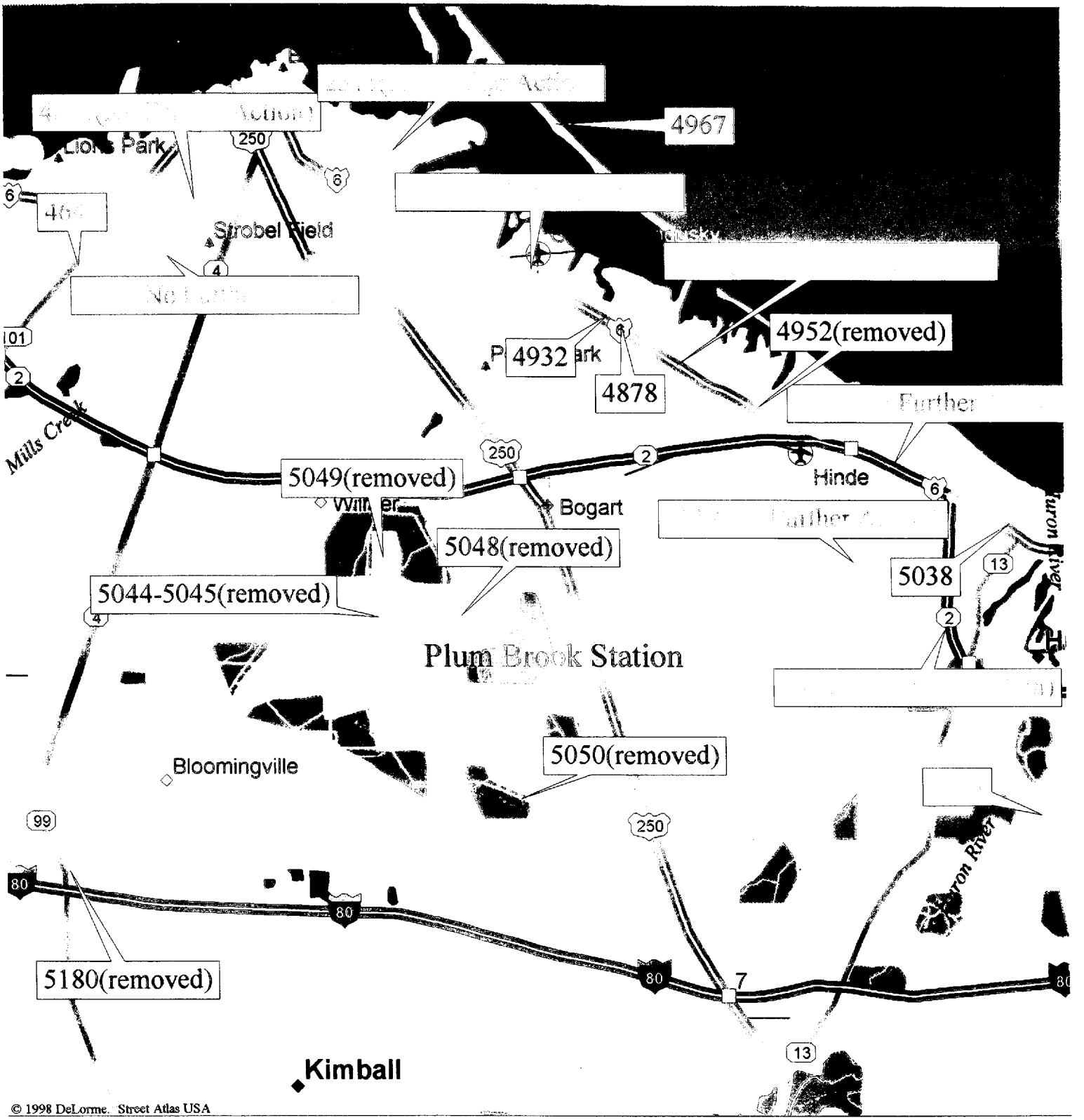
TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
10	CURRENTLY IN USE	GASOLINE	10,000	13	FIBERGLASS
11	CURRENTLY IN USE	DIESEL	6,000	13	FIBERGLASS
4	CURRENTLY IN USE	GASOLINE	2,500	8	FIBERGLASS
6	CURRENTLY IN USE	USED OIL	2,500	7	FIBERGLASS
7	CURRENTLY IN USE	DIESEL	6,000	7	FIBERGLASS
8	CURRENTLY IN USE	GASOLINE	10,000	7	FIBERGLASS
9	CURRENTLY IN USE	GASOLINE	10,000	13	FIBERGLASS

ERIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER
39010009258 / 0-390093	SANDUSKY STEEL & SUPPLY CO.	4957 RT 250 N NORWALK, OH 44870 COUNTY: ERIE	SANDUSKY STEEL & SUPPLY CO. 4957 RT 250 N MILAN, OH 44846	STEVE LICHTESSIEN

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	REMOVED	GASOLINE	550	24	BARE STEEL

ERIS ID / FACILITY ID	FACILITY	ADDRESS	OWNER ADDRESS	MANAGER
39010015180 / 0-720201	O.E. MEYER CO.	1520 E STATE ST SANDUSKY, OH 44870 COUNTY: ERIE	O.E. MEYER CO. PO BOX 479 SANDUSKY, OH 44870	

TANK ID	STATUS	SUBSTANCE	CAPACITY	AGE	CONSTRUCTION
1	REMOVED	UNK	2,000	34	COMPOSITE
2	REMOVED	UNK	2,000	34	UNKNOWN



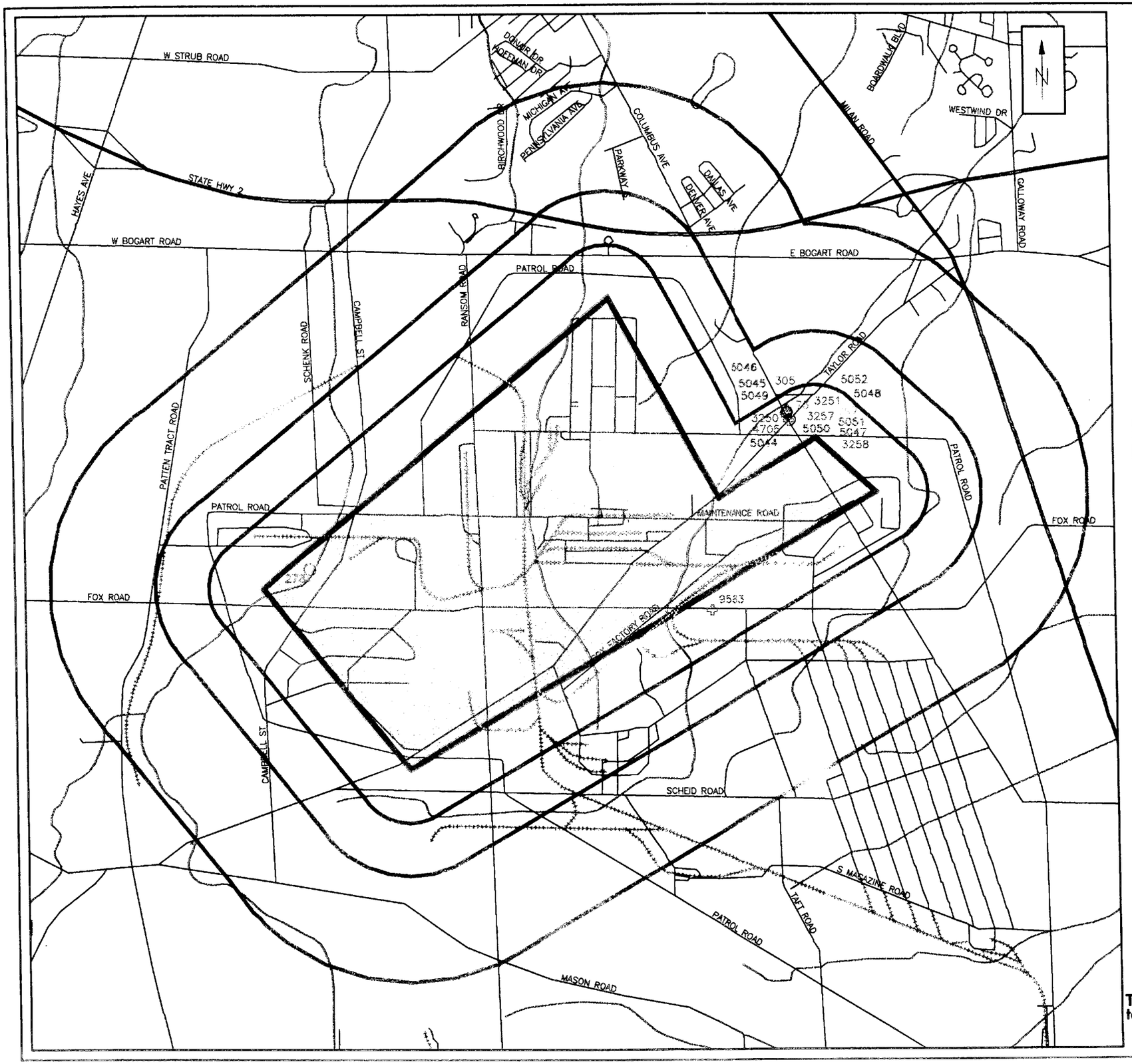
Mag 12.00
Tue Aug 10 14:12 1999
Scale 1:87,500 (at center)

2 Miles

2 KM

Local Road
Major Connector
State Route
Primary State Route
Ferry
Interstate/Limited Access
Toll Highway
US Highway

Exit
Utility/Pipe
Railroad
Small Town
Airfield
Park/Reservation
Locale
Public Airport



ERIS

505 Huntmar Park Dr, Suite 200
Herndon, VA 20170
(703)834-0600 (800)989-0402
FAX: (703)834-0606

SITE INFORMATION

South Of Sandusky
Sandusky, OH
Sandusky County
Job Number: 317596A
Map Plotted: Mar 4, 1999

MAP LEGEND

- Study Site
- ASTM Buffer
- Hydrography
- Railroads
- Roads
- Highways
- NPL 0 Sites
- RCRIS_TS 1 Site
- RCRIS_CA 0 Sites
- CERCLIS 0 Sites
- NFRAP 1 Site
- RCRIS_LG 0 Sites
- RCRIS_SG 1 Site
- ERNS 0 Sites
- HWS 1 Site
- LRST 6 Sites
- SWF 0 Sites
- RST 9 Sites

Miles

0 0.5

The Information on this map is subject to the ERIIS Disclaimer

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Appendix H

Field Investigation Soil Boring Logs & Soil Sample Collection Field Sheets

BORING LOGS
PLUM BROOK ORDNANCE WORKS
Pentolite Waste Lagoon Area

HTRW DRILLING LOG

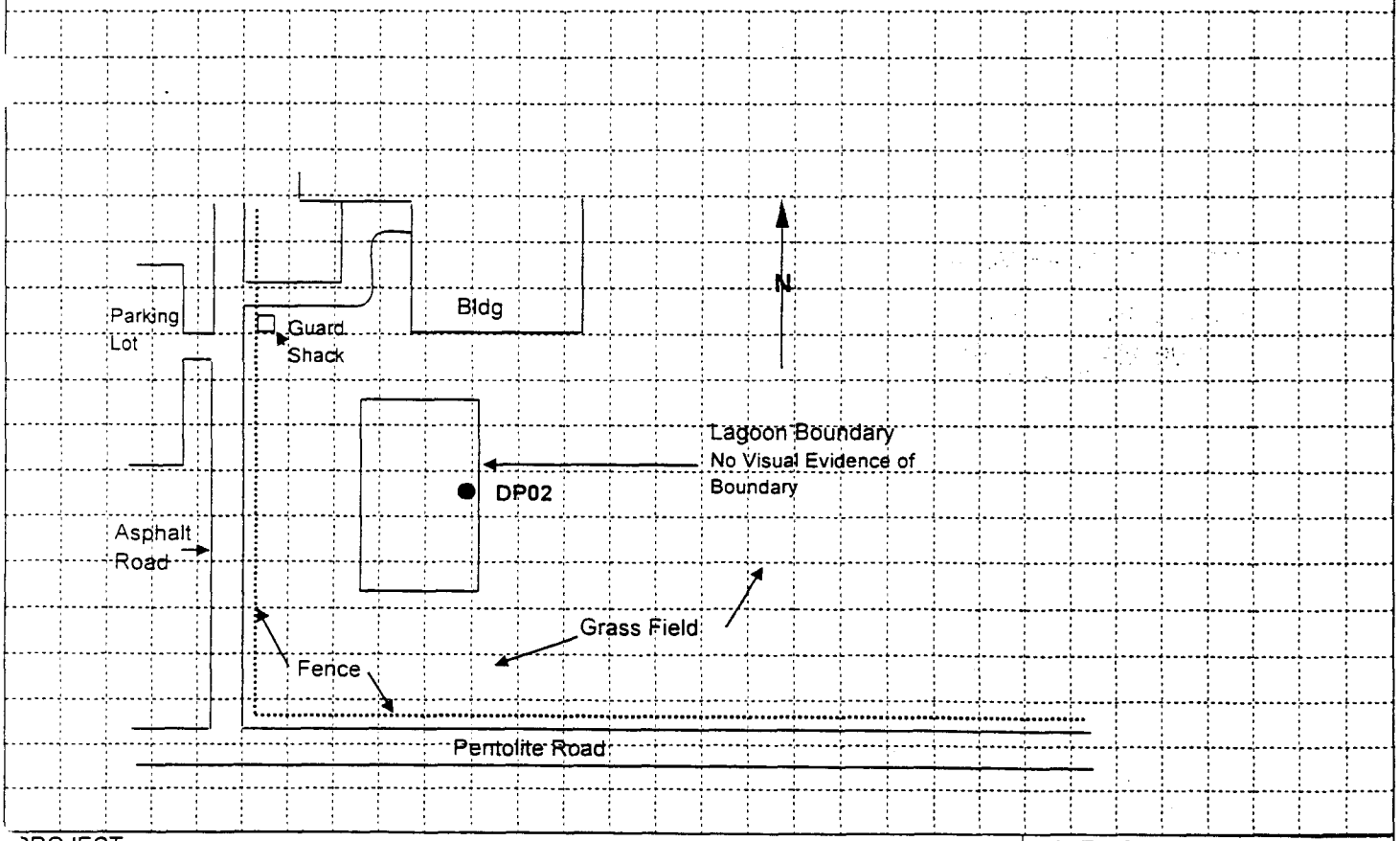
DISTRICT: Louisville		HOLE NUMBER: DP02
1. COMPANY NAME: *URS Greiner Woodward Clyde*	2. DRILLING CONTRACTOR: Terra Trace	SHEET 1 OF 2 SHEETS
3. PROJECT: PLUM BROOK ORDINANCE WORKS	4. LOCATION: Sandusky, Ohio	
5. NAME OF DRILLER: Kevin Conlon, Mike Marthaler	6. MANUFACTURER'S DESIGNATION OF DRILL: Hurricane Dual Sampler	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1-3/4" ID 4 Foot long Stainless Steel Sampler with acetate liner	8. HOLE LOCATION: Pentolite Lagoon Area	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 6-11-99	11. DATE COMPLETED: 6-11-99
12. OVERBURDEN THICKNESS: --	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 8.0 bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	---	---	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	X	X	3 Explosive	3 TOC	3 Radiation	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Chips		---	

LOCATION SKETCH/COMMENTS SCALE: 1" = '



PROJECT: PLUM BROOK ORDINANCE WORKS Sandusky, Ohio

HOLE NO: DP02

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP02

PROJECT: PLUM BROOK ORDINANCE WORKS, Sandusky, Ohio

INSPECTOR: Michael Sonderman

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	Loose, moist, brown to reddish brown, fine grained Silty SAND (SP)	No HS EXP=ND				Grass cover Drove 4.0' Rec=4.0'
	1						Collected sample from 2-4' T=1515 1-4oz for Explosives 1-4oz for Radiation 1-4oz for TOC 1-2oz for VOC's 1-2oz for TAL Metals
	2	Medium stiff, moist, olive, low plastic, Silty CLAY (CL) With crushed Limestone	No HS EXP=ND		PBOW99-DP002-0004		
	3	Medium stiff, moist, olive, low plastic, CLAY (CL), few pieces organic material Becoming Sandy CLAY					Duplicate PBOW99-DP008-0004 T=1600
	4	Loose, moist, brown, fine grained, Silty SAND (SP)	No HS EXP=ND		PBOW99-DP002-0006		Drove from 4-8' Sampled 4-6' Rec=3.8' T=1530 1-2oz for VOC's 1-2oz for TAL Metals 1-4oz for Explosives 1-4oz for TOC 1-4oz for Radiation
	5	Medium stiff, moist, olive yellowish red mottled, low plastic, Silty CLAY (CL) with fine Sand					
	6						
	7						
	8						Bottom of boring @ 8' bgs
	9						HS=Headspace Rec=Recovery T=Time EXP= Explosives oz=Ounce N/A=Not applicable bgs=Below ground surface ND=Not Detected
	10						

PROJECT: PLUM BROOK ORDINANCE WORKS Sandusky, Ohio

HOLE NO: DP02

HTRW DRILLING LOG

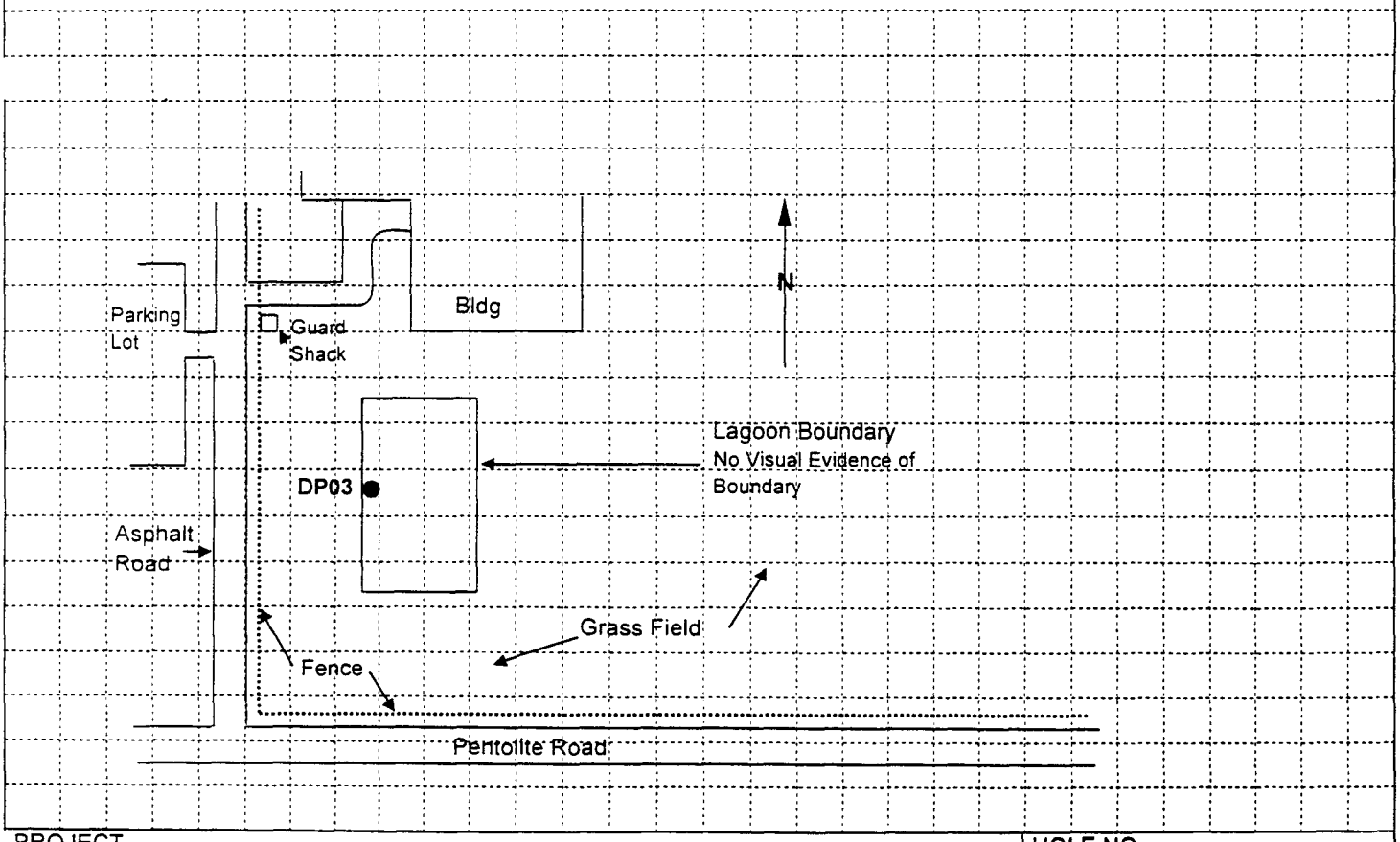
DISTRICT: Louisville		HOLE NUMBER: DP03
1. COMPANY NAME: *URS Greiner Woodward Clyde*	2. DRILLING CONTRACTOR: Terra Trace	SHEET 1 OF 2 SHEETS
3. PROJECT: PLUM BROOK ORDINANCE WORKS	4. LOCATION: Sandusky, Ohio	
5. NAME OF DRILLER: Kevin Conlon, Mike Marthaler	6. MANUFACTURER'S DESIGNATION OF DRILL: Hurricane Dual Sampler	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1-3/4" ID 4 Foot long Stainless Steel Sampler with acetate liner	8. HOLE LOCATION: Pentolite Lagoon Area	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 6-11-99	11. DATE COMPLETED: 6-11-99
12. OVERBURDEN THICKNESS: 8.0'	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 8.0 bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	—	—	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
2	—	X	2 Explosive	—	—	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Chips		—	

LOCATION SKETCH/COMMENTS SCALE: 1" = '



PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP03

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP03

PROJECT: PLUM BROOK ORDINANCE WORKS, Sandusky, Ohio

INSPECTOR: Michael Sonderman

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	Medium stiff, dry, brown, olive and yellow mottled, low plastic, CLAY (CL)					Grass cover Fill Pushed 0-2' Rec=2.0'
	1		No HS EXP= -5.2	Geotech Sample	PBOW99-DP0003-0002		1-4oz for Explosives 1-2oz for TAL Metals T=1350
	2	With crushed Limestone	No HS EXP= -5.015		PBOW99-DP03-0004		Pushed 2-4' Rec=1.9' 1-4oz for Explosives 1-2oz for TAL Metals T=1420 Lacustrine
		Loose, wet, reddish brown, fine-grained, Silty SAND (SP)					
	3						
	4	Medium stiff, moist, olive, low plastic, Silty CLAY (CL)	No HS or EXP		No Sample		Pushed 4-8' Rec=3.9' T=1447
		With organic material; wood fragments (plant material)					
	5	Becomes olive green and yellowish mottled					
	6						
		Fine Sand content increasing					
	7						
	8						Bottom of boring @ 8' bgs
	9						HS=Headspace Rec=Recovery T=Time EXP= Explosives oz=Ounce N/A=Not applicable bgs=Below ground surface ND=Not Detected
	10						

PROJECT: PLUM BROOK ORDINANCE WORKS Sandusky, Ohio

HOLE NO: DP03

HTRW DRILLING LOG

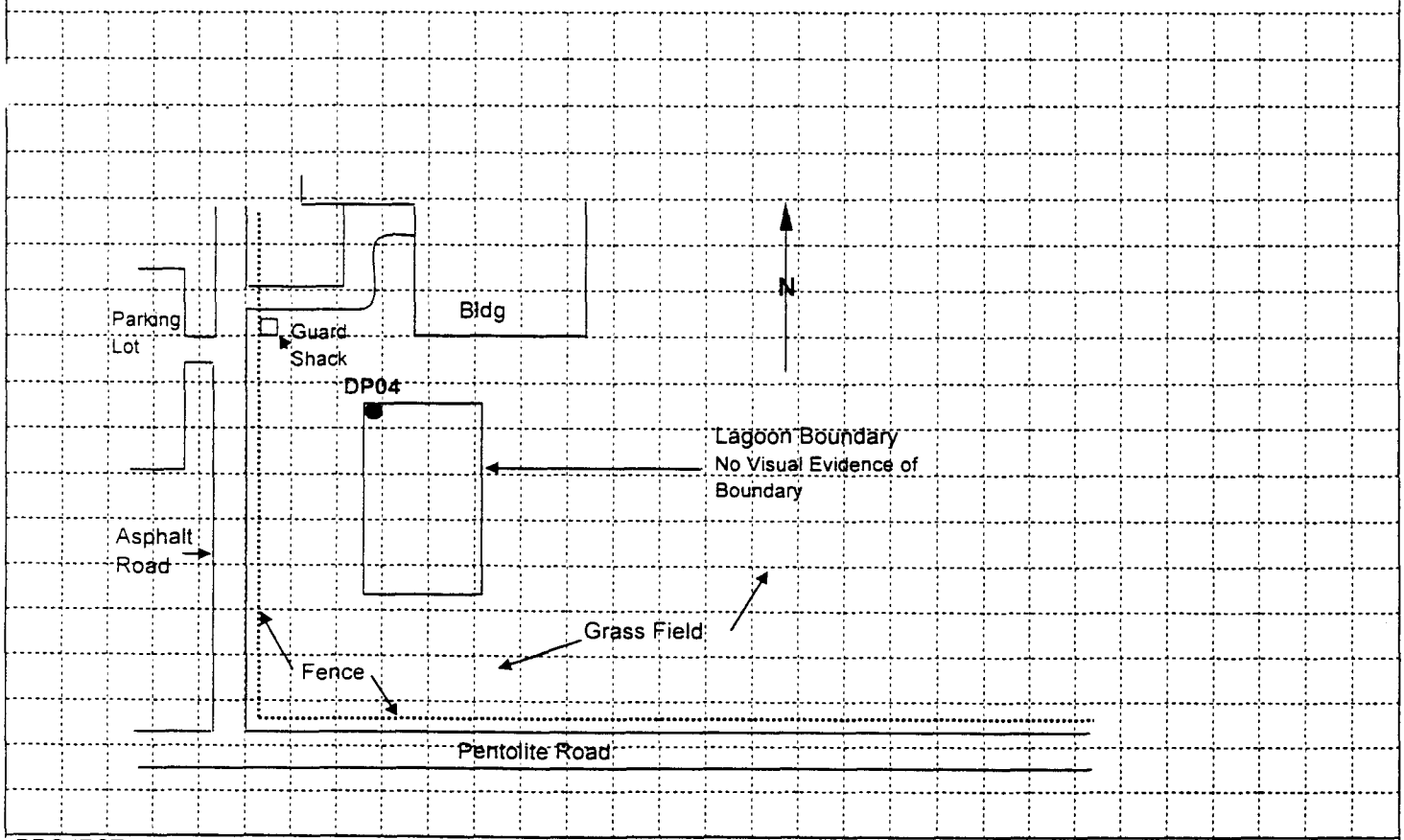
DISTRICT: Louisville		HOLE NUMBER: DP04
1. COMPANY NAME: *URS Greiner Woodward Clyde*	2. DRILLING CONTRACTOR: Terra Trace	SHEET 1 OF 4 SHEETS
3. PROJECT: PLUM BROOK ORDINANCE WORKS	4. LOCATION: Sandusky, Ohio	
5. NAME OF DRILLER: Kevin Conlon, Mike Marthaler	6. MANUFACTURER'S DESIGNATION OF DRILL: Hurricane Dual Sampler	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1-3/4" ID 4 Foot long Stainless Steel Sampler with acetate liner	8. HOLE LOCATION: Pentolite Lagoon Area	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 6-10-99	11. DATE COMPLETED: 6-10-99
12. OVERBURDEN THICKNESS: 22'	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 22.0 bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	—	—	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
1	X	X	1 Explosive	1 TOC	1 Radiation	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Chips		—	

LOCATION SKETCH/COMMENTS SCALE: 1" = '



PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP04

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	SHEET	SHEETS
DP04	2 OF	4

PROJECT	INSPECTOR
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	Michael Sonderman

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	Loose, dry, brown Silt, fine-grained, Silty SAND (SP) with some Clay	Background HS=0 HS=0 EXP= -0.217		PBOW-DP0004 -0002		Grass Cover Pushed 0-2' Rec=1.6' 1-4oz Explosives 1-4oz Radiation 1-2oz VOC's 1-2oz Metals 1-2oz TOC
	1						Explosives screen -.217ppm
	2	Becoming moist					
		Medium stiff, moist, brown, low plastic, CLAY (CL)	PBOW-DP004 -0004		PBOW99-DP004-0004		1-2oz VOC's 1-2oz TAL Metals 1-4oz Explosives 1-4oz TOC 1-4oz Radiation Pushed 2-4' Rec=1.7' T=1147 Explosive screen =0.124
		Loose, moist, brown, fine-grained Silty SAND (SP) with Clay	HS=0 EXP=0.124 ppm				
	3						
	4		HS=0				Pushed 4-8' Rec=2.9' T=1220
	5						
	6						No explosive screening, too much Clay
		Medium stiff, moist, olive, low plastic, Silty CLAY (CL)					
	7						
	8		HS=0				Pushed 8-12' Rec=3.2' T=1235
	9						
	10						

PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP04

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	SHEET	SHEETS
DP04	3 OF	4

PROJECT	INSPECTOR
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	Michael Sonderman

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	Same: Clay as above Medium stiff, moist, olive, low plastic, Silty CLAY (CL) Becomes Siltier	EXP= -5.20ppm Negative or ND				Lacustrine
	11						
	12		HS=0 No EXP Sample				Pushed 12-16' Rec=3.8' T=1320 All Clay Rec=3.8'
	13	Fine Sand seam					
	14						
		Higher Silt content					
	15						
	16		HS=0 No EXP Sample				Pushed 16-20' Rec=4.0' T=1344
	17	Loose, wet, olive, Silty, fine-grained SAND (SP) to Sandy Silt (ML)					
	18						
		Medium stiff, moist, olive, low plastic, Silty CLAY (CL)					
	19						
	20						

PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP04

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	SHEET	SHEETS
DP04	4 OF	4

PROJECT	INSPECTOR
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	Michael Sonderman

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	20	Same: Clay as above Medium stiff, moist, olive, low plastic, Silty CLAY (CL)	HS=0 No EXP				Lacustrine T=1400 Pushed 20-22' Rec=2.0
	21	Few pieces of Limestone					
	22	Limestone					Bottom of boring @ 22' bgs HS=Headspace Rec=Recovery T=Time EXP=Explosives N/A=Not Applicable bgs= Below ground surface
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						

PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP04

HTRW DRILLING LOG

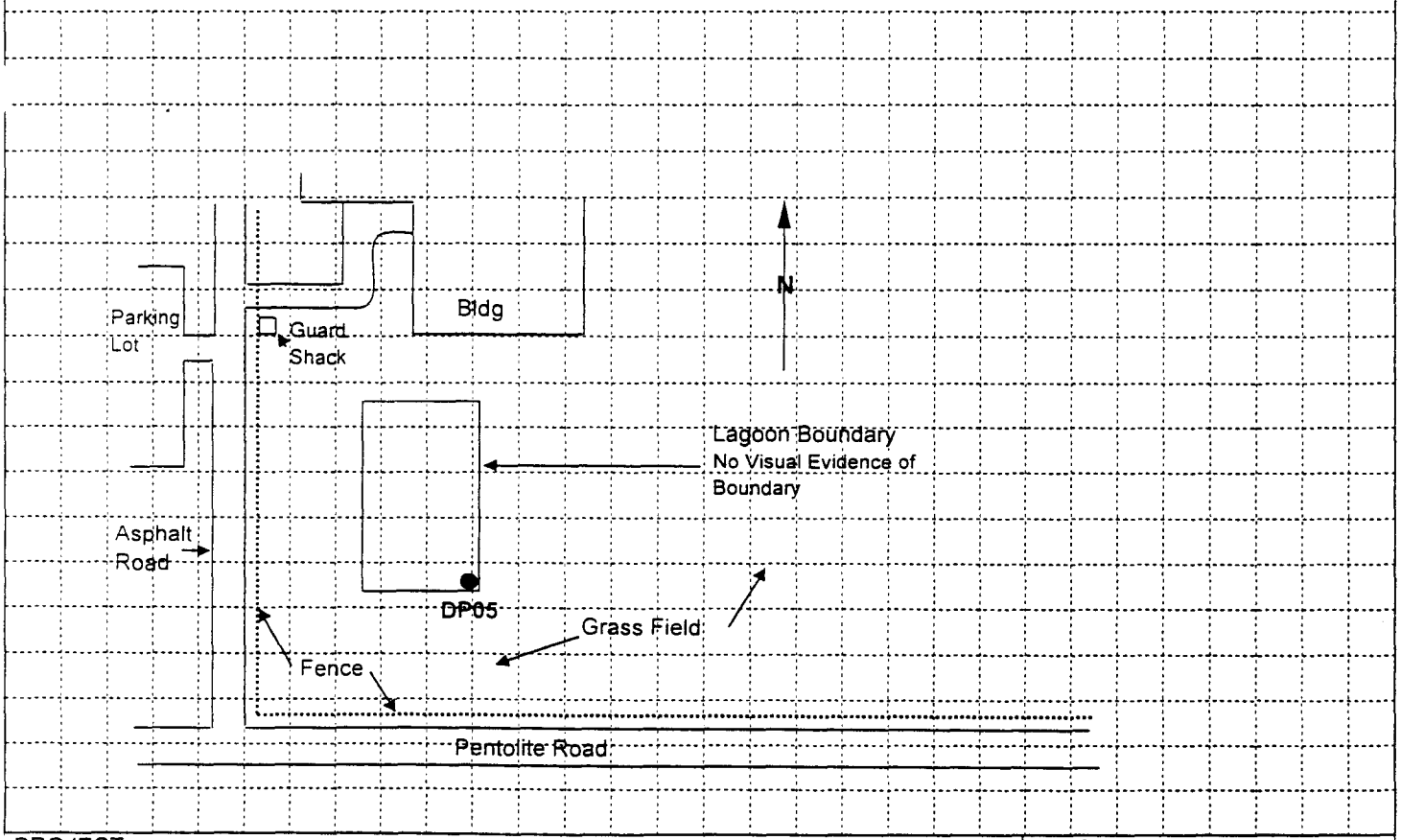
DISTRICT: Louisville		HOLE NUMBER: DP05
1. COMPANY NAME: *URS Greiner Woodward Clyde*	2. DRILLING CONTRACTOR: Terra Trace	SHEET 1 OF 2 SHEETS
3. PROJECT: PLUM BROOK ORDINANCE WORKS	4. LOCATION: Sandusky, Ohio	
5. NAME OF DRILLER: Kevin Conlon, Mike Marthaler	6. MANUFACTURER'S DESIGNATION OF DRILL: Hurricane Dual Sampler	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1-3/4" ID 4 Foot long Stainless Steel Sampler with acetate liner	8. HOLE LOCATION: Pentolite Lagoon Area	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 6-11-99	11. DATE COMPLETED: 6-11-99
12. OVERBURDEN THICKNESS: –	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 8.0 bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	—	—	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
2	X	X	2 Explosives	2 TOC	2 Radiation	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Chips		—	

LOCATION SKETCH/COMMENTS SCALE: 1" = '



PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP05

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	PROJECT	INSPECTOR	SHEET	SHEETS
DP05	PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	Michael Sonderman	2 OF	2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	Loose, moist, brown, fine-grained Silty SAND (SP) with numerous grass roots, trace Clay	No HS EXP= -0.588 (ND)	Geotech Sample	PBOW99 -DP05 -0002		Grass cover Fill 1-4oz Explosives 1-4oz Radiation 1-4oz TOC 1-2oz TAL Metals 1-2oz VOC's T=1210 Pushed 0-2' Rec=2.0'
	1	Clay content increasing Red, yellowish-green mottling					
	2		No HS EXP=ND				Pushed 0-2' Rec=1.8' T=1233
	3	Crushed Limestone					Fill to 4.3' bgs
	4	Medium stiff, moist, olive, black, greenish gray, low plastic, Silty CLAY (CL)	No HS EXP=ND	Geotech Sample	PBOW99-DP0005-0006		1-4oz for Explosives 1-4oz Radiation 1-4oz TOC 1-2oz VOC's 1-2oz TAL Metals Pushed 4-8' T=1300 Rec=4.0' Lacustrine below 4.3' bgs
		Loose, wet, brown, fine-grained Silty SAND (SP)					
	5	Soft, wet, brown to olive, Sandy SILT to loose, wet, fine grained Silty SAND (ML-SM)					
	6	Medium stiff, moist, olive, low plastic, Silty CLAY (CL) with trace of fine Sand	No HS No EXP Screening				
	7						
	8						Bottom of boring @ 8' bgs
	9						HS=Headspace Rec=Recovery T=Time EXP= Explosives oz=Ounce N/A=Not applicable bgs=Below ground surface ND=Not Detected
	10						

PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP05

HTRW DRILLING LOG

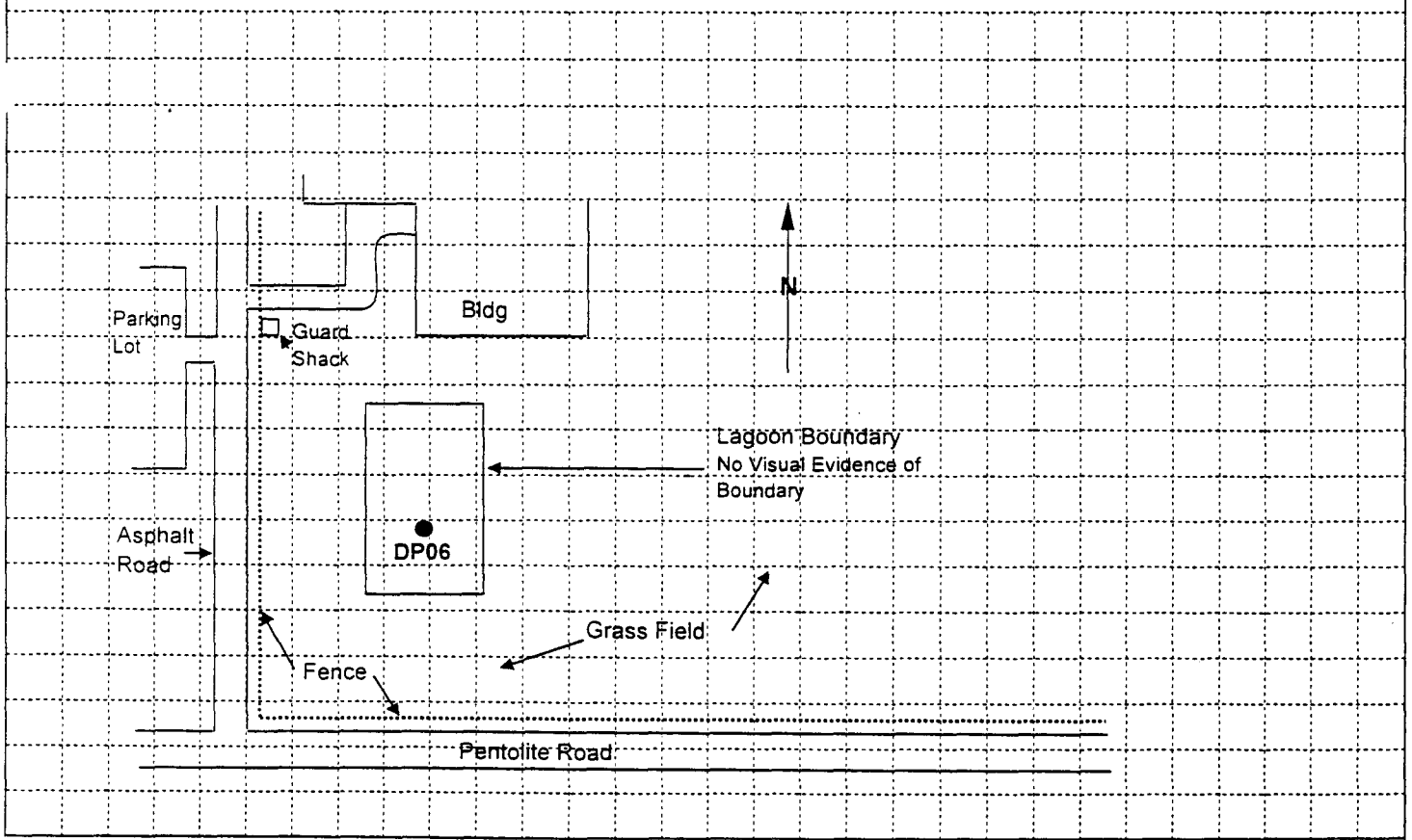
DISTRICT: Louisville		HOLE NUMBER: DP06
1. COMPANY NAME: *URS Greiner Woodward Clyde*	2. DRILLING CONTRACTOR: Terra Trace	SHEET 1 OF 2 SHEETS
3. PROJECT: PLUM BROOK ORDINANCE WORKS	4. LOCATION: Sandusky, Ohio	
5. NAME OF DRILLER: Kevin Conlon, Mike Marthaler	6. MANUFACTURER'S DESIGNATION OF DRILL: Hurricane Dual Sampler	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1-3/4" ID 4 Foot long Stainless Steel Sampler with acetate liner	8. HOLE LOCATION: Pentolite Lagoon Area	
	9. SURFACE ELEVATION:	
	10. DATE STARTED: 6-10-99	11. DATE COMPLETED: 6-10-99
12. OVERBURDEN THICKNESS: –	15. DEPTH GROUNDWATER ENCOUNTERED: N/A	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: N/A	
14. TOTAL DEPTH OF HOLE: 8.0 bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): N/A	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
0	—	—	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
3	X	X	3 Explosives	1 TOC	—	N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite Chips		—	

LOCATION SKETCH/COMMENTS SCALE: 1" = '



PROJECT: PLUM BROOK ORDINANCE WORKS Sandusky, Ohio

HOLE NO: DP06

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	SHEET	SHEETS
DP06	2 OF	2

PROJECT	INSPECTOR
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	Michael Sonderman

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	Loose, moist, brown, Silty, fine grained SAND (SM) with some Clay, numerous grass roots	Background HS=0 HS=0 EXP= 0.0301		PBOW99-DP006-0002		Grass Cover Fill Rec=2.0 T=1750 1-4oz Explosives 1-2oz TAL Metals
	1						
	2		HS=0 EXP= ND		PBOW99-DP006-0004		Rec=2.0' T=1810 1-4oz for Explosives
	3						
	4	Clay content increasing Sweet odor	HS=0 EXP=8.42 ppm		PBOW99-DP006-0006		1-2oz for VOC's 1-2oz TAL Metals 1-4oz Explosives 1-4oz TOC Rec=1.9' T=1840
	5	Medium stiff, moist, olive to black, low plastic, Silty CLAY (CL)					Fill Could be crushed Limestone
	6	Limestone chips					Bottom of boring @ 6' bgs HS=Headspace Rec=Recovery T=Time EXP= Explosives oz=Ounce N/A=Not applicable bgs=Below ground surface ND=Not Detected
	7						
	8						
	9						
	10						

PROJECT	HOLE NO
PLUM BROOK ORDINANCE WORKS Sandusky, Ohio	DP06

SAMPLE COLLECTION FIELD SHEET
PLUM BROOK ORDNANCE WORKS
Pentolite Waste Lagoon Area

SUMMARY OF ANALYTICAL SAMPLES COLLECTED
AT PENTOLITE AREA WASTE LAGOON
PLUM BROOK ORDNANCE WORKS - SANDUSKY, OHIO

Sampling Location	Sample Identification		Sample Date	Time	VOCs	TAL Metals	TOC	Explosives	Radiation
Pentolite Area Waste Lagoon									
DP02	PBOW99-DP002-0004		6/11/99	1515	X	X	X	X	X
	PBOW99-DP002-0006		6/11/99	1530	X	X	X	X	X
	PBOW99-DP008-0004	QC DUPLICATE	6/11/99	1600	X	X	X	X	X
	PBOW99-RN002-0001	Rinsate	6/11/99	1745	X	X	X	X	X
DP03	PBOW99-DP003-0002		6/11/99	1350		X		X	
	PBOW99-DP003-0004		6/11/99	1428		X		X	
DP04	PBOW99-DP004-0002		6/10/99	1125	X	X	X	X	X
	PBOW99-DP004-0004		6/10/99	1147	X	X	X	X	X
DP05	PBOW99-DP005-0002		6/11/99	1210	X	X	X	X	X
	PBOW99-DP005-0006		6/11/99	1300	X	X	X	X	X
DP06	PBOW99-DP006-0002		6/10/99	1750		X		X	
	PBOW99-DP006-0004		6/10/99	1810				X	
	PBOW99-DP006-0006		6/10/99	1840	X	X	X	X	

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area Waste Lagoon
Sandusky, OH

BORING NUMBER: DP02

SAMPLE NUMBER: PBOW99-DP002-0004

DATE and TIME OF COLLECTION: 6-11-99 / 1515

COLLECTED BY: Mike Sonderman

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 2'-4'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1 - 2oz glass jar	4°C	VOCs
1 - 2oz " "	4°C	TAL metals
1 - 4oz " "	4°C	Explosives
1 - 4oz " "	4°C	Radiation
1 - 4oz " "	4°C	TOC

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: med. stiff, moist, olive low plastic silty clay (CL) with crushed limestone in upper 0.4', grading to sandy clay

COMMENTS: PID not working; Explosives screen = ND

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoon, Sandusky, OH

BORING NUMBER: DP02

SAMPLE NUMBER: PBOW99-DP002-0006

DATE and TIME OF COLLECTION: 6-11-99 / 1530

COLLECTED BY: Mike Sonderman

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 4-5.8'

SAMPLING METHOD: direct push

QC SAMPLE No (Yes) QC SAMPLE NUMBER: PBOW99-DP008-0004 T=1600

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

RINSATE

Sample Container	Preservative	Analysis Requested
1-20z glass jar	4°c	VOCs
1-20z " "	4°c	TAL Metals
1-40z " "	4°c	Explosives
1-40z " "	4°c	Radiation
1-40z " "	4°c	TOC

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: Loose, moist, brown fine sand (SP) to med. stiff moist, olive-yellowish-red mottled, low plastic silty clay (CL)

COMMENTS: No headspace reading (PID down); Explosives screening nondetect

Collected Rinsate sample (PBOW99-RN002-0001); see separate sample collection field sheet

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook ordnance works - Pentolite Area Waste Lagoon Sandusky, OH

BORING NUMBER: DP02

SAMPLE NUMBER: PBOW 99-RN002-0001

DATE and TIME OF COLLECTION: 6-11-99 / 1745

COLLECTED BY: Mike Sonderman

SAMPLE MEDIA: Soil (distilled water) Sediment

SAMPLE DEPTH: —

SAMPLING METHOD: distilled water poured over sampling equipment

QC SAMPLE No Yes QC SAMPLE NUMBER:

QA SPLIT No Yes SPLIT SAMPLE NUMBER:

MS/MSD No Yes

Sample Container	Preservative	Analysis Requested
3 - 40 ml glass vials	4°C, HCl	VOCs
1 - 1L poly	4°C, HNO_3	TAL metals
1 - 1L amber glass	4°C	Explosives
1 - 1L amber glass	4°C	Radiation
1 - 1L amber glass	4°C	TOC

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: Deionized water

COMMENTS: Rinsate taken after sampling ~~PBOW~~ PBOW99-DP02-0006

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP03

SAMPLE NUMBER: PBOW99-DP003-0002

DATE and TIME OF COLLECTION: 6-11-99 / 1350

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 1-2'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°C	TAL metals
1-4oz " "	4°C	Explosives

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: med. stiff, dry, brown-olive-yellow mottled low plastic clay (CL) with crushed limestone

COMMENTS: PID not working, Explosives screening = nondetect (negative value)

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP03

SAMPLE NUMBER: PBOW99-DP003-0004

DATE and TIME OF COLLECTION: 6-11-99 / 1428

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 2-3.9'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2 oz glass jar	4°c	TAL Metals
1-4 oz " "	4°c	Explosives

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: loose; wet, reddish-brown; fine silty sand (SP) with some low plastic silty clay (CL)

COMMENTS: PID not working; Explosives screening = nondetect

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoons
Sandusky, OH

BORING NUMBER: DP04

SAMPLE NUMBER: PBOW 99-DP004-0002

DATE and TIME OF COLLECTION: 6-10-99 / 1125

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 0-1.6'

SAMPLING METHOD: direct push.

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°C	VOCs
1-2 oz " "	4°C	TAL metals
1-4oz " "	4°C	Explosives
1-4oz " "	4°C	Radiation
1-4oz " "	4°C	TOC

PID HEADSPACE RESULT (ppm): 0

SOIL SAMPLE DESCRIPTION: Loose, dry, brown, fine silty sand (SP) with some clay

COMMENTS: Explosives screening = 0.217 ppm

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP04

SAMPLE NUMBER: PBOW99-DP004-0004

DATE and TIME OF COLLECTION: 6-10-99 @ 1147

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 2 - 3.7'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°C	VOCs
1-2oz glass jar	4°C	TAL metals
1-4oz " "	4°C	Explosives
1-4oz " "	4°C	Radiation
1-4oz " "	4°C	TOC

PID HEADSPACE RESULT (ppm): 0

SOIL SAMPLE DESCRIPTION: Loose, moist, brown, fine silty sand. (SP) with clay

COMMENTS: Explosives screening = 0.124 ppm

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook ordnance works - Pentolite Area waste Lagoons
Sandusky, OH

BORING NUMBER: DP05

SAMPLE NUMBER: PB0099-DP005-002

DATE and TIME OF COLLECTION: 6-11-99 / 1210

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 0-2'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°C	VOCs
1-2oz " "	4°C	TAL metals
1-4oz " "	4°C	Explosives
1-4oz " "	4°C	Radiation
1-4oz " "	4°C	TOC

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: Loose, sl. moist, brown, fine sand (SP) with trace clay

COMMENTS: Explosives screening = nondetect

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook Ordnance Works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP05

SAMPLE NUMBER: PBOW99-BP005-0006

DATE and TIME OF COLLECTION: 6-11-99 / 1300

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 4'-6'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°c	VOCs
1-2oz " "	4°c	TAL Metals
1-4oz " "	4°c	Explosives
1-4oz " "	4°c	Radiation
1-4oz " "	4°c	TOC

PID HEADSPACE RESULT (ppm): —

SOIL SAMPLE DESCRIPTION: med. stiff, moist, olive-black-greenish gray, low plastic silty clay (CL), loose, wet, brown fine silty sand (SP), soft, wet, brown sandy silt - silty sand (ML-SM)

COMMENTS: PID not working, Explosives screening = nondetect

i:\fuds\SCFS FORM

6/7/99

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook ordnance works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP06

SAMPLE NUMBER: PBOW99-DP006-0002

DATE and TIME OF COLLECTION: ~~6/10~~ 6-10-99/1750

COLLECTED BY: mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 0-2'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°C	~~TO~~ TAL metals
1-4oz " "	4°C	Explosives

PID HEADSPACE RESULT (ppm): 0

SOIL SAMPLE DESCRIPTION: Loose, moist, brown fine silty sand (SM)

COMMENTS: Explosives screening = 0.0301 ppm

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook ordnance works - Pentolite Area waste Lagoons
Sandusky, OH

BORING NUMBER: DP06

SAMPLE NUMBER: PBOW99-DP006-0004

DATE and TIME OF COLLECTION: 6-10-99 / 1810

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: ~~4-6'~~ 2'-4'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1 - 4 oz glass jar	4°C	Explosives

PID HEADSPACE RESULT (ppm): 0

SOIL SAMPLE DESCRIPTION: Loose, moist, brown fine silty sand (SM)

COMMENTS: Explosives screening = non detect

SOIL SAMPLE COLLECTION FIELD SHEET

SITE INVESTIGATION

FUD SITES IN ILLINOIS, MICHIGAN, OHIO

SITE NAME AND LOCATION: Plum Brook ordnance works - Pentolite Area waste Lagoons Sandusky, OH

BORING NUMBER: DP06

SAMPLE NUMBER: PBOW99-DP006-0006

DATE and TIME OF COLLECTION: 6-10-99 / 1840

COLLECTED BY: Mike Sondermen

SAMPLE MEDIA: (Soil) Sediment

SAMPLE DEPTH: 4.0'-5.9'

SAMPLING METHOD: direct push

QC SAMPLE (No) Yes QC SAMPLE NUMBER:

QA SPLIT (No) Yes SPLIT SAMPLE NUMBER:

MS/MSD (No) Yes

Sample Container	Preservative	Analysis Requested
1-2oz glass jar	4°c	VOCs
1-2oz " "	4°c	TAL metals
1-4oz " "	4°c	Explosives
1-4oz " "	4°c	TOC

PID HEADSPACE RESULT (ppm): 0

SOIL SAMPLE DESCRIPTION: Loose, moist, brown fine silty sand (SM) ~~to~~ with sweet odor to med. stiff, moist, olive to black, low plastic silty clay (CL)

COMMENTS: Explosives screening = 8.42 ppm

Appendix I

Sieve & Plasticity Analysis Results

GEOTECHNICAL SOIL TESTING RESULTS
PLUM BROOK ORDNANCE WORKS

45FL99010A.00

Table B-1

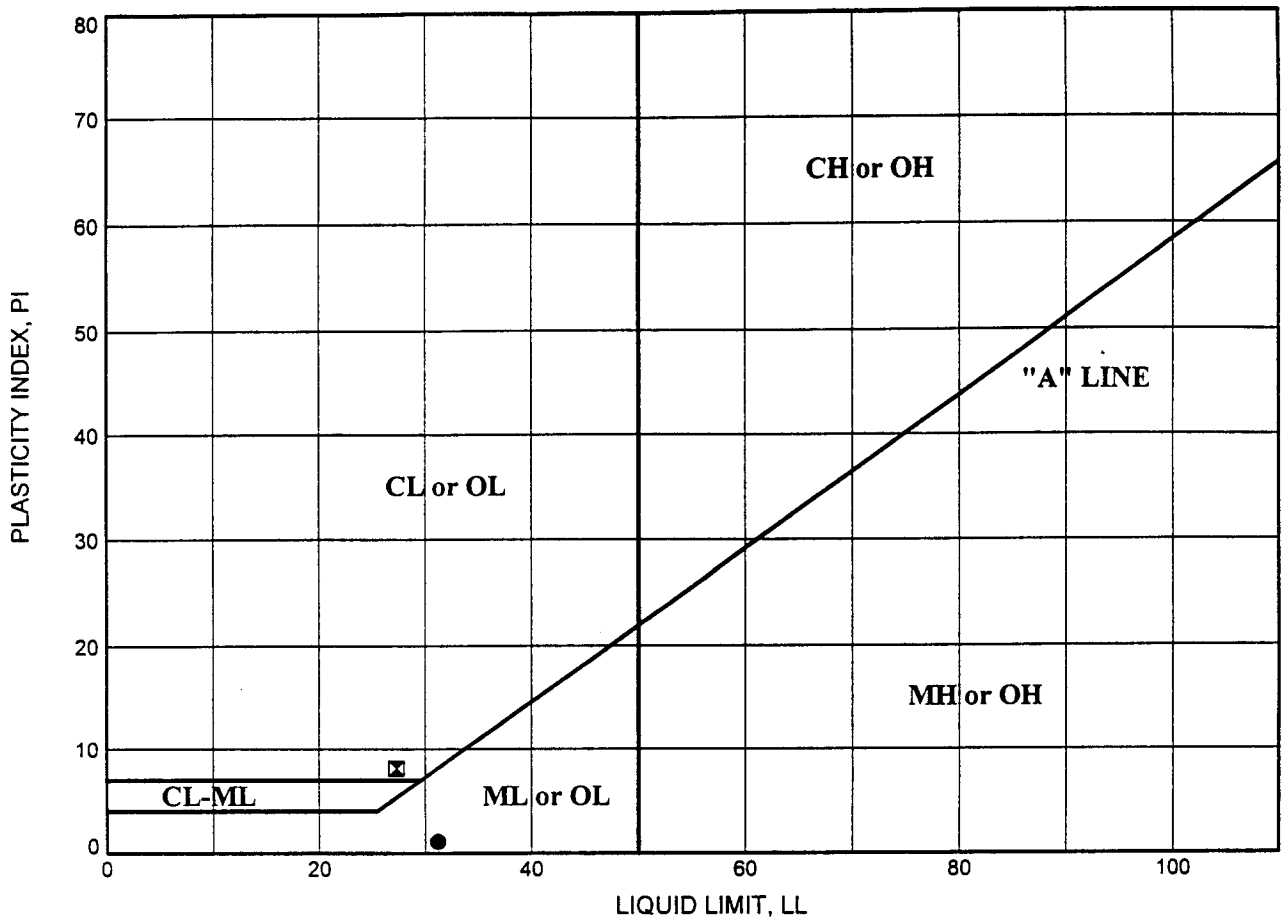
GEO FUDS

Plum Brook Ordnance Works - Pentolite Lagoon

Summary of Laboratory Test Data

Sandusky, Ohio

Boring No.	Sample Depth ft	Unified Soil Classification	Water Content %	Dry Unit Weight pcf	Liquid Limit %	Plastic Limit %	% Passing No. 200 Sieve	Grain Size Data Figure	Unconfined Compression Compressive Strength ksf	Unconfined Compression Strain at Failure %	Torvane Strength ksf	Penetrometer Strength ksf	Volume Change Data Figures
DP03	2	ML	10		31	30							
DP03	6	CL	24		27	19							
DP05	2	ML	14		19	21							
DP05	6	ML	21		20	18	68						



Boring Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
DP03	2	●	10	31	30	1	ML
DP03	6	⊠	24	27	19	8	CL

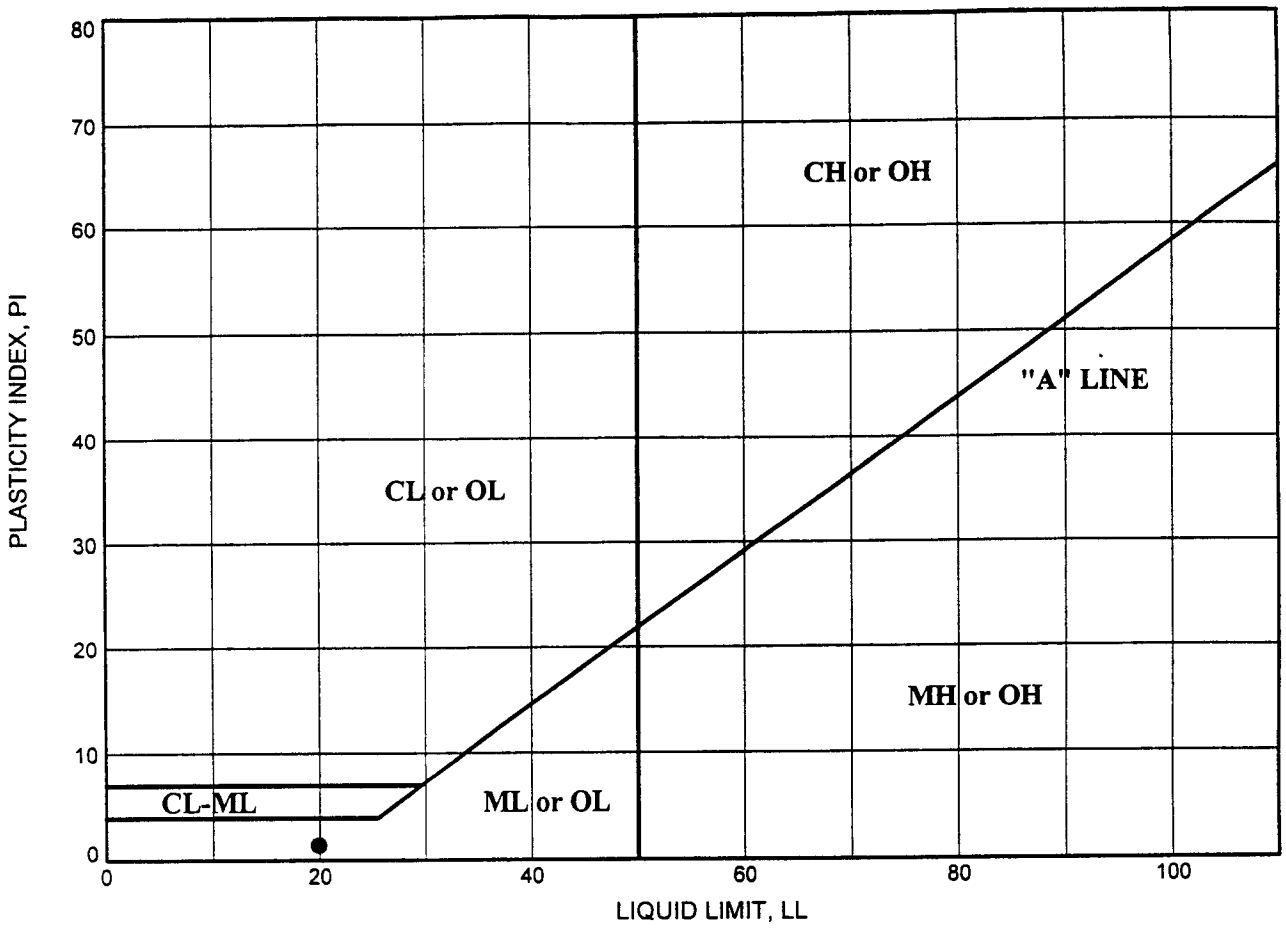
Project: GEO FUDS
Plum Brook Ordnance Works - Pentolite Lagoon
Sandusky, Ohio
Project Number: 45FL99010A.00

PLASTICITY CHART

Figure 1

URS Greiner Woodward Clyde

7/2/99 2ATT 45FL010A.GPJ DP03a



Boring Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
DP05	6	●	21	20	18	2	ML
DP05	6	⊠	14	19	21	-2	ML - Results indicate non-plastic soils

Project: GEO FUDS
Plum Brook Ordnance Works - Pentolite Lagoon
Sandusky, Ohio
Project Number: 45FL99010A.00

PLASTICITY CHART

Figure 1

URS Greiner Woodward Clyde

7/2/99 2ATT 45FL010A.GPJ DP05

Appendix J

Chemical Laboratory Analysis Results

Quanterra Incorporated
4101 Shuffel Drive, NW
North Canton, Ohio 44720

330 497-9396 Telephone
330 497-0772 Fax

ANALYTICAL REPORT

PLUM BROOK PENTOLITE LAGOON

Lot #: A9F160107

U.S. Army Corps of Engineers

QUANTERRA INCORPORATED

Debora A. Hula
Project Manager

July 28, 1999

CASE NARRATIVE
A9F160107

The following report contains the analytical results for twelve solid samples submitted to Quanterra-North Canton by the U.S. Army Corps of Engineers from the Plum Brook Pentolite Lagoon Site. The samples were received June 14, 1999, according to documented sample acceptance procedures.

Quanterra-North Canton utilizes USEPA approved methods in all analytical work. The samples presented in this report were analyzed for the parameters listed on the Analytical Methods Summary page in accordance with the method indicated.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan. All data have been found to be compliant with laboratory protocol.

SUPPLEMENTAL QC INFORMATION

SAMPLE RECEIVING

The cooler was received at the laboratory at a temperature of 1.2° C.

EXPLOSIVES

Surrogate recoveries for sample "PBOW99-DP002-006" were above the acceptance limits. However, since the recoveries were high, and there were no targets detected above the reporting limits, the validity of the data is unaffected.

RADIOLOGICALS

The QC Blank 201589 has PB-210 detected at a level greater than the MDA. However, the sample associated with this blank is clean. The PB-210 in the blank needs careful evaluation, taking into account the error and MDA associated with the isotope.

Sample "PBOW99-DP002-0006" has PB-210 detected at a level greater than the MDA. However a duplicate was run of the same sample on a different detector with no PB-210 detected.

Cesium-137 and Cobolt-60 are reported as requested. Also reported are any positively identified isotopes.

CASE NARRATIVE (continued)

METALS

Matrix spike recovery and relative percent difference (RPD) data were not calculated for some analytes due to the sample concentration readings greater than four times the spike amount. See the Matrix Spike Report for the affected analytes, which have been flagged with "NC, MSB". Matrix spike/spike duplicate recovery was outside the acceptance limits for some analytes. The acceptable LCS analysis data indicated that the analytical system was operating within control and this condition is most likely due to matrix interference. See the Matrix Spike Report for the affected analyte, which have been flagged with "N".

Matrix spike/spike duplicate relative percent difference (RPD) exceeded the acceptance limits for some analytes. The imprecision may be attributed to sample heterogeneity. See the Matrix Spike Report for the affected analytes, which have been flagged with "*".

Serial dilution of a sample in this lot indicates that physical and chemical interferences are present. See the sample report pages for the affected analytes, which have been flagged with "L".

ANALYTICAL METHODS SUMMARY

A9F160107

PARAMETER	ANALYTICAL METHOD
Inductively Coupled Plasma (ICP) Metals	SW846 6010B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A
Nitroaromatics and Nitramines by HPLC	SW846 8330
Total Organic Carbon	SMCA WALKLEY-BLACK
Total Residue as Percent Solids	MCAWW 160.3 MOD
Trace Inductively Coupled Plasma (ICP) Metals	SW846 6010B
Volatile Organics by GC/MS	SW846 8260B

References:

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SMCA 90-3, Standard Methods of Chemical Analysis, 6th Edition, D. Van Nostrand Co., Princeton, N.J., 1963.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

A9F160107

WO #	SAMPLE#	CLIENT SAMPLE ID	DATE	TIME
CWX6G	001	PBOW99-DP004-0002	06/10/99	11:25
CWX6L	002	PBOW99-DP006-0002	06/10/99	17:50
CWX6P	003	PBOW99-DP006-0004	06/10/99	18:10
CWX6T	004	PBOW99-DP006-0006	06/10/99	18:40
CWX71	005	PBOW99-DP005-0002	06/11/99	12:10
CWX72	006	PBOW99-DP005-0006	06/11/99	13:00
CWX75	007	PBOW99-DP003-0002	06/11/99	13:50
CWX76	008	PBOW99-DP003-0004	06/11/99	14:28
CWX77	009	PBOW99-DP002-0004	06/11/99	15:15
CWX78	010	PBOW99-DP008-0004	06/11/99	16:00
CWX79	011	PBOW99-DP002-0006	06/11/99	15:30
CWX7C	012	PBOW99-DP004-0004	06/10/99	11:47

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

GC/MS Volatiles

Lot-Sample #...: A9F160107-001 **Work Order #...:** CWX6G102 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99
Prep Date.....: 06/18/99 **Analysis Date..:** 06/18/99
Prep Batch #...: 9172184
Dilution Factor: 1
% Moisture.....: 11 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	11	ug/kg
Benzene	ND	5.6	ug/kg
Bromodichloromethane	ND	5.6	ug/kg
Bromoform	ND	5.6	ug/kg
Bromomethane	ND	5.6	ug/kg
2-Butanone	ND	11	ug/kg
Carbon disulfide	ND	5.6	ug/kg
Carbon tetrachloride	ND	5.6	ug/kg
Chlorobenzene	ND	5.6	ug/kg
Dibromochloromethane	ND	5.6	ug/kg
Chloroethane	ND	5.6	ug/kg
Chloroform	ND	5.6	ug/kg
Chloromethane	ND	5.6	ug/kg
1,1-Dichloroethane	ND	5.6	ug/kg
1,2-Dichloroethane	ND	5.6	ug/kg
1,1-Dichloroethene	ND	5.6	ug/kg
cis-1,2-Dichloroethene	ND	5.6	ug/kg
trans-1,2-Dichloroethene	ND	5.6	ug/kg
1,2-Dichloropropane	ND	5.6	ug/kg
cis-1,3-Dichloropropene	ND	5.6	ug/kg
trans-1,3-Dichloropropene	ND	5.6	ug/kg
Ethylbenzene	ND	5.6	ug/kg
2-Hexanone	ND	11	ug/kg
Methylene chloride	**7.1**	**5.6**	**ug/kg**
4-Methyl-2-pentanone	ND	11	ug/kg
Styrene	ND	5.6	ug/kg
1,1,2,2-Tetrachloroethane	ND	5.6	ug/kg
Tetrachloroethene	ND	5.6	ug/kg
Toluene	ND	5.6	ug/kg
1,1,1-Trichloroethane	ND	5.6	ug/kg
1,1,2-Trichloroethane	ND	5.6	ug/kg
Trichloroethene	ND	5.6	ug/kg
Vinyl chloride	ND	5.6	ug/kg
Xylenes (total)	ND	5.6	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	110	(70 - 135)
,2-Dichloroethane-d4	101	(75 - 117)
.oluene-d8	98	(86 - 122)
Bromofluorobenzene	92	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

GC/MS Volatiles

Lot-Sample #...: A9F160107-001 **Work Order #...:** CWX6G102 **Matrix.....:** SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

HPLC

Lot-Sample #...: A9F160107-001 **Work Order #...:** CWX6G10V **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 11 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	105	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

TOTAL Metals

Lot-Sample #...: A9F160107-001 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99
% Moisture.....: 11

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G10J
		Dilution Factor: 1				
Aluminum	**6530**	**22.5**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6G103**
		Dilution Factor: 1				
Arsenic	**4.9**	**1.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10K**
		Dilution Factor: 1				
Barium	**82.8**	**22.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G104**
		Dilution Factor: 1				
Beryllium	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G105
		Dilution Factor: 1				
Cadmium	ND	0.22	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G10L
		Dilution Factor: 1				
Calcium	**17500**	**562**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6G106**
		Dilution Factor: 1				
Chromium	**11.1**	**0.56**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10M**
		Dilution Factor: 1				
Cobalt	ND	5.6	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G107
		Dilution Factor: 1				
Lead	**14.4**	**0.34**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10N**
		Dilution Factor: 1				
Copper	**9.7**	**2.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G108**
		Dilution Factor: 1				
Antimony	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G10P
		Dilution Factor: 1				
Iron	**11300**	**11.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G109**
		Dilution Factor: 1				
Selenium	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G10Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

TOTAL Metals

Lot-Sample #...: A9F160107-001 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.11	mg/kg	SW846 7471A	07/01-07/06/99	CWX6G10T
		Dilution Factor: 1				
Potassium	**658**	**562**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6G10A**
		Dilution Factor: 1				
Thallium	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6G10R
		Dilution Factor: 1				
Magnesium	**5130**	**562**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6G10C**
		Dilution Factor: 1				
Manganese	**191**	**1.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10D**
		Dilution Factor: 1				
Sodium	ND	562	mg/kg	SW846 6010B	07/01-07/18/99	CWX6G10E
		Dilution Factor: 1				
Nickel	**11.1**	**4.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10F**
		Dilution Factor: 1				
Vanadium	**19.9**	**5.6**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10G**
		Dilution Factor: 1				
Zinc	**40.9**	**2.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6G10H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0002

General Chemistry

Lot-Sample #...: A9F160107-001 Work Order #...: CWX6G Matrix.....: SOLID
Date Sampled...: 06/10/99 11:25 Date Received..: 06/14/99
% Moisture.....: 11

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	89.0	0.10	%	MCAWW 160.3 MOD	06/26-06/28/99	9177122
	Dilution Factor: 1					
Total Organic Carbon	1100	110	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0002

HPLC

Lot-Sample #...: A9F160107-002 **Work Order #...:** CWX6L10T **Matrix.....:** SOLID
Date Sampled...: 06/10/99 17:50 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 14 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	102	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0002

TOTAL Metals

Lot-Sample #...: A9F160107-002 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 17:50 **Date Received..:** 06/14/99
% Moisture.....: 14

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.58 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L10G
Aluminum	**8710**	**23.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6L101**
Arsenic	**7.1**	**1.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10H**
Barium	**54.3**	**23.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L102**
Beryllium	ND	0.58 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L103
admium	ND	0.23 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L10J
Calcium	**28100**	**581** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6L104**
Chromium	**13.4**	**0.58** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10K**
Cobalt	**7.0**	**5.8** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L105**
Lead	**9.9**	**0.35** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10L**
Copper	**15.3**	**2.9** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L106**
Antimony	ND	1.2 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L10M
Iron	**16400**	**11.6** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L107**
Selenium	ND	0.58 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L10N

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0002

TOTAL Metals

Lot-Sample #...: A9F160107-002 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX6L10Q
		Dilution Factor: 1				
Potassium	**1200**	**581**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6L108**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX6L10P
		Dilution Factor: 1				
Magnesium	**9770**	**581**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6L109**
		Dilution Factor: 1				
Manganese	**395**	**1.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10A**
		Dilution Factor: 1				
Sodium	ND	581	mg/kg	SW846 6010B	07/01-07/18/99	CWX6L10C
		Dilution Factor: 1				
Nickel	**20.2**	**4.6**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10D**
		Dilution Factor: 1				
Vanadium	**22.4**	**5.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10E**
		Dilution Factor: 1				
Zinc	**48.9**	**2.3**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6L10F**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0004

HPLC

Lot-Sample #...: A9F160107-003 **Work Order #...:** CWX6P101 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 18:10 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	110	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-004 **Work Order #...:** CWX6T102 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 18:40 **Date Received..:** 06/14/99
Prep Date.....: 06/18/99 **Analysis Date..:** 06/18/99
Prep Batch #...: 9172184
Dilution Factor: 1
% Moisture.....: 21 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	13	ug/kg
Benzene	ND	6.4	ug/kg
Bromodichloromethane	ND	6.4	ug/kg
Bromoform	ND	6.4	ug/kg
Bromomethane	ND	6.4	ug/kg
2-Butanone	ND	13	ug/kg
Carbon disulfide	ND	6.4	ug/kg
Carbon tetrachloride	ND	6.4	ug/kg
Chlorobenzene	ND	6.4	ug/kg
Dibromochloromethane	ND	6.4	ug/kg
Chloroethane	ND	6.4	ug/kg
Chloroform	ND	6.4	ug/kg
Chloromethane	ND	6.4	ug/kg
1,1-Dichloroethane	ND	6.4	ug/kg
1,2-Dichloroethane	ND	6.4	ug/kg
1,1-Dichloroethene	ND	6.4	ug/kg
cis-1,2-Dichloroethene	ND	6.4	ug/kg
trans-1,2-Dichloroethene	ND	6.4	ug/kg
1,2-Dichloropropane	ND	6.4	ug/kg
cis-1,3-Dichloropropene	ND	6.4	ug/kg
trans-1,3-Dichloropropene	ND	6.4	ug/kg
Ethylbenzene	ND	6.4	ug/kg
2-Hexanone	ND	13	ug/kg
Methylene chloride	ND	6.4	ug/kg
4-Methyl-2-pentanone	ND	13	ug/kg
Styrene	ND	6.4	ug/kg
1,1,2,2-Tetrachloroethane	ND	6.4	ug/kg
Tetrachloroethene	ND	6.4	ug/kg
Toluene	ND	6.4	ug/kg
1,1,1-Trichloroethane	ND	6.4	ug/kg
1,1,2-Trichloroethane	ND	6.4	ug/kg
Trichloroethene	ND	6.4	ug/kg
Vinyl chloride	ND	6.4	ug/kg
Xylenes (total)	ND	6.4	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	113	(70 - 135)
1,2-Dichloroethane-d4	110	(75 - 117)
Toluene-d8	100	(86 - 122)
Bromofluorobenzene	92	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-004 Work Order #...: CWX6T102 Matrix.....: SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

HPLC

Lot-Sample #...: A9F160107-004 **Work Order #...:** CWX6T10V **Matrix.....:** SOLID
Date Sampled...: 06/10/99 18:40 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 21 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	104	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

TOTAL Metals

Lot-Sample #...: A9F160107-004 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 18:40 **Date Received..:** 06/14/99
% Moisture.....: 21

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.64 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T10J
Aluminum	**8010**	**25.4** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6T103**
Arsenic	**8.3**	**1.3** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10K**
Barium	**56.0**	**25.4** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T104**
Beryllium	ND	0.64 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T105
Cadmium	ND	0.25 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T10L
Calcium	**25900**	**636** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6T106**
Chromium	**13.0**	**0.64** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10M**
Cobalt	**8.3**	**6.4** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T107**
Lead	**13.4**	**0.38** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10N**
Copper	**18.9**	**3.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T108**
Antimony	ND	1.3 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T10P
Iron	**17600**	**12.7** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T109**
Selenium	ND	0.64 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T10Q

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

TOTAL Metals

Lot-Sample #...: A9F160107-004 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.13	mg/kg	SW846 7471A	07/01-07/06/99	CWX6T10T
		Dilution Factor: 1				
Potassium	**1210**	**636**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6T10A**
		Dilution Factor: 1				
Thallium	ND	1.3	mg/kg	SW846 6010B	07/01-07/19/99	CWX6T10R
		Dilution Factor: 1				
Magnesium	**7480**	**636**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX6T10C**
		Dilution Factor: 1				
Manganese	**357**	**1.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10D**
		Dilution Factor: 1				
Sodium	ND	636	mg/kg	SW846 6010B	07/01-07/18/99	CWX6T10E
		Dilution Factor: 1				
Nickel	**23.5**	**5.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10F**
		Dilution Factor: 1				
Vanadium	**18.5**	**6.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10G**
		Dilution Factor: 1				
Zinc	**52.0**	**2.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX6T10H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP006-0006

General Chemistry

Lot-Sample #...: A9F160107-004 Work Order #...: CWX6T Matrix.....: SOLID
Date Sampled...: 06/10/99 18:40 Date Received..: 06/14/99
% Moisture.....: 21

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	78.6	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
	Dilution Factor: 1					
Total Organic Carbon	8400	130	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

GC/MS Volatiles

Lot-Sample #...: A9F160107-005 **Work Order #...:** CWX71102 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 12:10 **Date Received..:** 06/14/99
Prep Date.....: 06/21/99 **Analysis Date..:** 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1
% Moisture.....: 12 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	11	ug/kg
Benzene	ND	5.7	ug/kg
Bromodichloromethane	ND	5.7	ug/kg
Bromoform	ND	5.7	ug/kg
Bromomethane	ND	5.7	ug/kg
2-Butanone	ND	11	ug/kg
Carbon disulfide	ND	5.7	ug/kg
Carbon tetrachloride	ND	5.7	ug/kg
Chlorobenzene	ND	5.7	ug/kg
Dibromochloromethane	ND	5.7	ug/kg
Chloroethane	ND	5.7	ug/kg
Chloroform	ND	5.7	ug/kg
Chloromethane	ND	5.7	ug/kg
1,1-Dichloroethane	ND	5.7	ug/kg
1,2-Dichloroethane	ND	5.7	ug/kg
1,1-Dichloroethene	ND	5.7	ug/kg
cis-1,2-Dichloroethene	ND	5.7	ug/kg
trans-1,2-Dichloroethene	ND	5.7	ug/kg
1,2-Dichloropropane	ND	5.7	ug/kg
cis-1,3-Dichloropropene	ND	5.7	ug/kg
trans-1,3-Dichloropropene	ND	5.7	ug/kg
Ethylbenzene	ND	5.7	ug/kg
2-Hexanone	ND	11	ug/kg
Methylene chloride	ND	5.7	ug/kg
4-Methyl-2-pentanone	ND	11	ug/kg
Styrene	ND	5.7	ug/kg
1,1,2,2-Tetrachloroethane	ND	5.7	ug/kg
Tetrachloroethene	ND	5.7	ug/kg
Toluene	ND	5.7	ug/kg
1,1,1-Trichloroethane	ND	5.7	ug/kg
1,1,2-Trichloroethane	ND	5.7	ug/kg
Trichloroethene	ND	5.7	ug/kg
Vinyl chloride	ND	5.7	ug/kg
Xylenes (total)	ND	5.7	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	107	(70 - 135)
1,2-Dichloroethane-d4	106	(75 - 117)
Toluene-d8	98	(86 - 122)
Bromofluorobenzene	93	(60 - 137)

(Continued on next page)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

GC/MS Volatiles

Lot-Sample #...: A9F160107-005 **Work Order #...:** CWX71102 **Matrix.....:** SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

HPLC

Lot-Sample #...: A9F160107-005 **Work Order #...:** CWX7110V **Matrix.....:** SOLID
Date Sampled...: 06/11/99 12:10 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 12 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	91	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

TOTAL Metals

Lot-Sample #...: A9F160107-005 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 12:10 **Date Received..:** 06/14/99
% Moisture.....: 12

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.57	mg/kg	SW846 6010B	07/01-07/19/99	CWX7110J
		Dilution Factor: 1				
Aluminum	**9410**	**22.7**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX71103**
		Dilution Factor: 1				
Arsenic	**7.4**	**1.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110K**
		Dilution Factor: 1				
Barium	**49.7**	**22.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX71104**
		Dilution Factor: 1				
Beryllium	ND	0.57	mg/kg	SW846 6010B	07/01-07/19/99	CWX71105
		Dilution Factor: 1				
admium	ND	0.23	mg/kg	SW846 6010B	07/01-07/19/99	CWX7110L
		Dilution Factor: 1				
Calcium	**23900**	**566**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX71106**
		Dilution Factor: 1				
Chromium	**13.8**	**0.57**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110M**
		Dilution Factor: 1				
Cobalt	**7.1**	**5.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX71107**
		Dilution Factor: 1				
Lead	**9.6**	**0.34**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110N**
		Dilution Factor: 1				
Copper	**13.1 L**	**2.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX71108**
		Dilution Factor: 1				
Antimony	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7110P
		Dilution Factor: 1				
Iron	**15100**	**11.3**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX71109**
		Dilution Factor: 1				
Selenium	ND	0.57	mg/kg	SW846 6010B	07/01-07/19/99	CWX7110Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

TOTAL Metals

Lot-Sample #...: A9F160107-005 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.11	mg/kg	SW846 7471A	07/01-07/06/99	CWX7110T
		Dilution Factor: 1				
Potassium	**1290**	**566**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7110A**
		Dilution Factor: 1				
Thallium	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7110R
		Dilution Factor: 1				
Magnesium	**8160**	**566**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7110C**
		Dilution Factor: 1				
Manganese	**382**	**1.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110D**
		Dilution Factor: 1				
Sodium	ND	566	mg/kg	SW846 6010B	07/01-07/18/99	CWX7110E
		Dilution Factor: 1				
ıckel	**18.3**	**4.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110F**
		Dilution Factor: 1				
Vanadium	**22.0**	**5.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110G**
		Dilution Factor: 1				
Zinc	**45.6**	**2.3**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7110H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

L Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0002

General Chemistry

Lot-Sample #...: A9F160107-005 **Work Order #...:** CWX71 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 12:10 **Date Received..:** 06/14/99
% Moisture.....: 12

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	88.3	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
	Dilution Factor: 1					
Total Organic Carbon	7600	110	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-006 **Work Order #...:** CWX72102 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 13:00 **Date Received..:** 06/14/99
Prep Date.....: 06/18/99 **Analysis Date..:** 06/18/99
Prep Batch #...: 9172184
Dilution Factor: 1
% Moisture.....: 19 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	**38**	**12**	**ug/kg**
Benzene	ND	6.2	ug/kg
Bromodichloromethane	ND	6.2	ug/kg
Bromoform	ND	6.2	ug/kg
Bromomethane	ND	6.2	ug/kg
2-Butanone	**13**	**12**	**ug/kg**
Carbon disulfide	ND	6.2	ug/kg
Carbon tetrachloride	ND	6.2	ug/kg
Chlorobenzene	ND	6.2	ug/kg
Dibromochloromethane	ND	6.2	ug/kg
Chloroethane	ND	6.2	ug/kg
Chloroform	ND	6.2	ug/kg
Chloromethane	ND	6.2	ug/kg
1,1-Dichloroethane	ND	6.2	ug/kg
1,2-Dichloroethane	ND	6.2	ug/kg
1,1-Dichloroethene	ND	6.2	ug/kg
cis-1,2-Dichloroethene	ND	6.2	ug/kg
trans-1,2-Dichloroethene	ND	6.2	ug/kg
1,2-Dichloropropane	ND	6.2	ug/kg
cis-1,3-Dichloropropene	ND	6.2	ug/kg
trans-1,3-Dichloropropene	ND	6.2	ug/kg
Ethylbenzene	ND	6.2	ug/kg
2-Hexanone	ND	12	ug/kg
Methylene chloride	ND	6.2	ug/kg
4-Methyl-2-pentanone	ND	12	ug/kg
Styrene	ND	6.2	ug/kg
1,1,2,2-Tetrachloroethane	ND	6.2	ug/kg
Tetrachloroethene	ND	6.2	ug/kg
Toluene	ND	6.2	ug/kg
1,1,1-Trichloroethane	ND	6.2	ug/kg
1,1,2-Trichloroethane	ND	6.2	ug/kg
Trichloroethene	ND	6.2	ug/kg
Vinyl chloride	ND	6.2	ug/kg
Xylenes (total)	ND	6.2	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	114	(70 - 135)
,2-Dichloroethane-d4	115	(75 - 117)
Toluene-d8	99	(86 - 122)
Bromofluorobenzene	92	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-006 **Work Order #...:** CWX72102 **Matrix.....:** SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

HPLC

Lot-Sample #...: A9F160107-006 **Work Order #...:** CWX7210V **Matrix.....:** SOLID
Date Sampled...: 06/11/99 13:00 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 19 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	88	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

TOTAL Metals

Lot-Sample #...: A9F160107-006 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 13:00 **Date Received..:** 06/14/99
% Moisture.....: 19

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.62	mg/kg	SW846 6010B	07/01-07/19/99	CWX7210J
		Dilution Factor: 1				
Aluminum	**6170**	**24.7**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX72103**
		Dilution Factor: 1				
Arsenic	**5.9**	**1.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210K**
		Dilution Factor: 1				
Barium	**53.7**	**24.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX72104**
		Dilution Factor: 1				
Beryllium	ND	0.62	mg/kg	SW846 6010B	07/01-07/19/99	CWX72105
		Dilution Factor: 1				
admium	ND	0.25	mg/kg	SW846 6010B	07/01-07/19/99	CWX7210L
		Dilution Factor: 1				
Calcium	**44900**	**618**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX72106**
		Dilution Factor: 1				
Chromium	**10.9**	**0.62**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210M**
		Dilution Factor: 1				
Cobalt	**6.6**	**6.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX72107**
		Dilution Factor: 1				
Lead	**9.3**	**0.37**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210N**
		Dilution Factor: 1				
Copper	**15.4**	**3.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX72108**
		Dilution Factor: 1				
Antimony	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7210P
		Dilution Factor: 1				
Iron	**15100**	**12.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX72109**
		Dilution Factor: 1				
Selenium	ND	0.62	mg/kg	SW846 6010B	07/01-07/19/99	CWX7210Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

TOTAL Metals

Lot-Sample #...: A9F160107-006 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7210T
		Dilution Factor: 1				
Potassium	**1180**	**618**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7210A**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7210R
		Dilution Factor: 1				
Magnesium	**13800**	**618**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7210C**
		Dilution Factor: 1				
Manganese	**520**	**1.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210D**
		Dilution Factor: 1				
Sodium	ND	618	mg/kg	SW846 6010B	07/01-07/18/99	CWX7210E
		Dilution Factor: 1				
ckel	**18.9**	**4.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210F**
		Dilution Factor: 1				
Vanadium	**17.6**	**6.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210G**
		Dilution Factor: 1				
Zinc	**44.5**	**2.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7210H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP005-0006

General Chemistry

Lot-Sample #...: A9F160107-006 Work Order #...: CWX72 Matrix.....: SOLID
Date Sampled...: 06/11/99 13:00 Date Received..: 06/14/99
% Moisture.....: 19

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	80.8	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
	Dilution Factor: 1					
Total Organic Carbon	5300	120	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0002

HPLC

Lot-Sample #...: A9F160107-007 **Work Order #...:** CWX7510T **Matrix.....:** SOLID
Date Sampled...: 06/11/99 13:50 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 15 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	104	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0002

TOTAL Metals

Lot-Sample #...: A9F160107-007 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 13:50 **Date Received..:** 06/14/99
% Moisture.....: 15

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.59 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7510G
Aluminum	**8560**	**23.5** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX75101**
Arsenic	**9.4**	**1.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510H**
Barium	**49.6**	**23.5** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX75102**
Beryllium	ND	0.59 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX75103
Cadmium	ND	0.24 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7510J
Calcium	**88200**	**588** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX75104**
Chromium	**13.5**	**0.59** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510K**
Cobalt	**9.1**	**5.9** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX75105**
Lead	**13.2**	**0.35** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510L**
Copper	**41.7**	**2.9** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX75106**
Antimony	ND	1.2 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7510M
Iron	**20000**	**11.8** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX75107**
Selenium	ND	0.59 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7510N

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0002

TOTAL Metals

Lot-Sample #...: A9F160107-007 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7510Q
		Dilution Factor: 1				
Potassium	**2310**	**588**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX75108**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7510P
		Dilution Factor: 1				
Magnesium	**14700**	**588**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX75109**
		Dilution Factor: 1				
Manganese	**632**	**1.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510A**
		Dilution Factor: 1				
Sodium	ND	588	mg/kg	SW846 6010B	07/01-07/18/99	CWX7510C
		Dilution Factor: 1				
Nickel	**26.7**	**4.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510D**
		Dilution Factor: 1				
Vanadium	**18.5**	**5.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510E**
		Dilution Factor: 1				
Zinc	**67.9**	**2.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7510F**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0004

HPLC

Lot-Sample #...: A9F160107-008 **Work Order #...:** CWX7610T **Matrix.....:** SOLID
Date Sampled...: 06/11/99 14:28 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 18 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	112	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0004

TOTAL Metals

Lot-Sample #...: A9F160107-008 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 14:28 **Date Received..:** 06/14/99
% Moisture.....: 18

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.61 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7610G
Aluminum	**4790**	**24.4** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX76101**
Arsenic	**5.7**	**1.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610H**
Barium	**35.6**	**24.4** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX76102**
Beryllium	ND	0.61 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX76103
Cadmium	ND	0.24 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7610J
Calcium	**35600**	**610** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX76104**
Chromium	**8.8**	**0.61** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610K**
Cobalt	**6.1**	**6.1** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX76105**
Lead	**7.8**	**0.37** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610L**
Copper	**13.4**	**3.1** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX76106**
Antimony	ND	1.2 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7610M
Iron	**12900**	**12.2** Dilution Factor: 1	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX76107**
Selenium	ND	0.61 Dilution Factor: 1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7610N

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP003-0004

TOTAL Metals

Lot-Sample #...: A9F160107-008 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7610Q
		Dilution Factor: 1				
Potassium	**738**	**610**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX76108**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7610P
		Dilution Factor: 1				
Magnesium	**11000**	**610**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX76109**
		Dilution Factor: 1				
Manganese	**389**	**1.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610A**
		Dilution Factor: 1				
Sodium	ND	610	mg/kg	SW846 6010B	07/01-07/18/99	CWX7610C
		Dilution Factor: 1				
ickel	**17.6**	**4.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610D**
		Dilution Factor: 1				
Vanadium	**14.0**	**6.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610E**
		Dilution Factor: 1				
Zinc	**38.6**	**2.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7610F**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-009 **Work Order #...:** CWX77102 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:15 **Date Received..:** 06/14/99
Prep Date.....: 06/21/99 **Analysis Date..:** 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1
% Moisture.....: 16 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	12	ug/kg
Benzene	ND	5.9	ug/kg
Bromodichloromethane	ND	5.9	ug/kg
Bromoform	ND	5.9	ug/kg
Bromomethane	ND	5.9	ug/kg
2-Butanone	ND	12	ug/kg
Carbon disulfide	ND	5.9	ug/kg
Carbon tetrachloride	ND	5.9	ug/kg
Chlorobenzene	ND	5.9	ug/kg
Dibromochloromethane	ND	5.9	ug/kg
Chloroethane	ND	5.9	ug/kg
Chloroform	ND	5.9	ug/kg
Chloromethane	ND	5.9	ug/kg
1,1-Dichloroethane	ND	5.9	ug/kg
1,2-Dichloroethane	ND	5.9	ug/kg
1,1-Dichloroethene	ND	5.9	ug/kg
cis-1,2-Dichloroethene	ND	5.9	ug/kg
trans-1,2-Dichloroethene	ND	5.9	ug/kg
1,2-Dichloropropane	ND	5.9	ug/kg
cis-1,3-Dichloropropene	ND	5.9	ug/kg
trans-1,3-Dichloropropene	ND	5.9	ug/kg
Ethylbenzene	ND	5.9	ug/kg
2-Hexanone	ND	12	ug/kg
Methylene chloride	ND	5.9	ug/kg
4-Methyl-2-pentanone	ND	12	ug/kg
Styrene	ND	5.9	ug/kg
1,1,2,2-Tetrachloroethane	ND	5.9	ug/kg
Tetrachloroethene	ND	5.9	ug/kg
Toluene	ND	5.9	ug/kg
1,1,1-Trichloroethane	ND	5.9	ug/kg
1,1,2-Trichloroethane	ND	5.9	ug/kg
Trichloroethene	ND	5.9	ug/kg
Vinyl chloride	ND	5.9	ug/kg
Xylenes (total)	ND	5.9	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	112	(70 - 135)
1,2-Dichloroethane-d4	111	(75 - 117)
Toluene-d8	95	(86 - 122)
Bromofluorobenzene	90	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-009 Work Order #...: CWX77102 Matrix.....: SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

HPLC

Lot-Sample #...: A9F160107-009 **Work Order #...:** CWX7710V **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:15 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 16 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	115	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

TOTAL Metals

Lot-Sample #...: A9F160107-009 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:15 **Date Received..:** 06/14/99
% Moisture.....: 16

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.59	mg/kg	SW846 6010B	07/01-07/19/99	CWX7710J
		Dilution Factor: 1				
Aluminum	**10100**	**23.8**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX77103**
		Dilution Factor: 1				
Arsenic	**7.0**	**1.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710K**
		Dilution Factor: 1				
Barium	**77.1**	**23.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX77104**
		Dilution Factor: 1				
Beryllium	ND	0.59	mg/kg	SW846 6010B	07/01-07/19/99	CWX77105
		Dilution Factor: 1				
Cadmium	ND	0.24	mg/kg	SW846 6010B	07/01-07/19/99	CWX7710L
		Dilution Factor: 1				
Calcium	**15900**	**594**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX77106**
		Dilution Factor: 1				
Chromium	**15.0**	**0.59**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710M**
		Dilution Factor: 1				
Cobalt	**6.5**	**5.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX77107**
		Dilution Factor: 1				
Lead	**13.8**	**0.36**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710N**
		Dilution Factor: 1				
Copper	**18.0**	**3.0**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX77108**
		Dilution Factor: 1				
Antimony	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7710P
		Dilution Factor: 1				
Iron	**17100**	**11.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX77109**
		Dilution Factor: 1				
Selenium	ND	0.59	mg/kg	SW846 6010B	07/01-07/19/99	CWX7710Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

TOTAL Metals

Lot-Sample #...: A9F160107-009 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7710T
		Dilution Factor: 1				
Potassium	**857**	**594**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7710A**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7710R
		Dilution Factor: 1				
Magnesium	**5710**	**594**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7710C**
		Dilution Factor: 1				
Manganese	**226**	**1.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710D**
		Dilution Factor: 1				
Sodium	ND	594	mg/kg	SW846 6010B	07/01-07/18/99	CWX7710E
		Dilution Factor: 1				
Nickel	**21.0**	**4.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710F**
		Dilution Factor: 1				
Vanadium	**26.2**	**5.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710G**
		Dilution Factor: 1				
Zinc	**50.0**	**2.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7710H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0004

General Chemistry

Lot-Sample #...: A9F160107-009 Work Order #...: CWX77 Matrix.....: SOLID
Date Sampled...: 06/11/99 15:15 Date Received..: 06/14/99
% Moisture.....: 16

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	84.2	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
	Dilution Factor: 1					
Total Organic Carbon	7700	120	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-010 **Work Order #...:** CWX78102 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 16:00 **Date Received..:** 06/14/99
Prep Date.....: 06/21/99 **Analysis Date..:** 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1
% Moisture.....: 14 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	12	ug/kg
Benzene	ND	5.8	ug/kg
Bromodichloromethane	ND	5.8	ug/kg
Bromoform	ND	5.8	ug/kg
Bromomethane	ND	5.8	ug/kg
2-Butanone	ND	12	ug/kg
Carbon disulfide	ND	5.8	ug/kg
Carbon tetrachloride	ND	5.8	ug/kg
Chlorobenzene	ND	5.8	ug/kg
Dibromochloromethane	ND	5.8	ug/kg
Chloroethane	ND	5.8	ug/kg
Chloroform	ND	5.8	ug/kg
Chloromethane	ND	5.8	ug/kg
1,1-Dichloroethane	ND	5.8	ug/kg
1,2-Dichloroethane	ND	5.8	ug/kg
1,1-Dichloroethene	ND	5.8	ug/kg
cis-1,2-Dichloroethene	ND	5.8	ug/kg
trans-1,2-Dichloroethene	ND	5.8	ug/kg
1,2-Dichloropropane	ND	5.8	ug/kg
cis-1,3-Dichloropropene	ND	5.8	ug/kg
trans-1,3-Dichloropropene	ND	5.8	ug/kg
Ethylbenzene	ND	5.8	ug/kg
2-Hexanone	ND	12	ug/kg
Methylene chloride	**5.9**	**5.8**	**ug/kg**
4-Methyl-2-pentanone	ND	12	ug/kg
Styrene	ND	5.8	ug/kg
1,1,2,2-Tetrachloroethane	ND	5.8	ug/kg
Tetrachloroethene	ND	5.8	ug/kg
Toluene	ND	5.8	ug/kg
1,1,1-Trichloroethane	ND	5.8	ug/kg
1,1,2-Trichloroethane	ND	5.8	ug/kg
Trichloroethene	ND	5.8	ug/kg
Vinyl chloride	ND	5.8	ug/kg
Xylenes (total)	ND	5.8	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	103	(70 - 135)
1,2-Dichloroethane-d4	100	(75 - 117)
Toluene-d8	92	(86 - 122)
Bromofluorobenzene	88	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-010 Work Order #...: CWX78102 Matrix.....: SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

HPLC

Lot-Sample #...: A9F160107-010 **Work Order #...:** CWX7810V **Matrix.....:** SOLID
Date Sampled...: 06/11/99 16:00 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/24/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 14 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	98	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

TOTAL Metals

Lot-Sample #...: A9F160107-010 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 16:00 **Date Received..:** 06/14/99
% Moisture.....: 14

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.58	mg/kg	SW846 6010B	07/01-07/19/99	CWX7810J
		Dilution Factor: 1				
Aluminum	**6960**	**23.4**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX78103**
		Dilution Factor: 1				
Arsenic	**6.7**	**1.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810K**
		Dilution Factor: 1				
Barium	**56.6**	**23.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX78104**
		Dilution Factor: 1				
Beryllium	ND	0.58	mg/kg	SW846 6010B	07/01-07/19/99	CWX78105
		Dilution Factor: 1				
Cadmium	ND	0.23	mg/kg	SW846 6010B	07/01-07/19/99	CWX7810L
		Dilution Factor: 1				
Calcium	**19000**	**584**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX78106**
		Dilution Factor: 1				
Chromium	**11.2**	**0.58**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810M**
		Dilution Factor: 1				
Cobalt	**6.8**	**5.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX78107**
		Dilution Factor: 1				
Lead	**20.8**	**0.35**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810N**
		Dilution Factor: 1				
Copper	**17.4**	**2.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX78108**
		Dilution Factor: 1				
Antimony	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7810P
		Dilution Factor: 1				
Iron	**15300**	**11.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX78109**
		Dilution Factor: 1				
Selenium	ND	0.58	mg/kg	SW846 6010B	07/01-07/19/99	CWX7810Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

TOTAL Metals

Lot-Sample #...: A9F160107-010 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7810T
		Dilution Factor: 1				
Potassium	**651**	**584**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7810A**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7810R
		Dilution Factor: 1				
Magnesium	**6030**	**584**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7810C**
		Dilution Factor: 1				
Manganese	**391**	**1.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810D**
		Dilution Factor: 1				
Sodium	ND	584	mg/kg	SW846 6010B	07/01-07/18/99	CWX7810E
		Dilution Factor: 1				
ickel	**17.7**	**4.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810F**
		Dilution Factor: 1				
Vanadium	**18.7**	**5.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810G**
		Dilution Factor: 1				
Zinc	**52.8**	**2.3**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7810H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP008-0004

General Chemistry

Lot-Sample #...: A9F160107-010 Work Order #...: CWX78 Matrix.....: SOLID
Date Sampled...: 06/11/99 16:00 Date Received..: 06/14/99
% Moisture.....: 14

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	85.6	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
	Dilution Factor: 1					
Total Organic Carbon	8300	120	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-011 **Work Order #...:** CWX79102 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:30 **Date Received..:** 06/14/99
Prep Date.....: 06/21/99 **Analysis Date..:** 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1
% Moisture.....: 18 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	**13**	**12**	**ug/kg**
Benzene	ND	6.1	ug/kg
Bromodichloromethane	ND	6.1	ug/kg
Bromoform	ND	6.1	ug/kg
Bromomethane	ND	6.1	ug/kg
2-Butanone	ND	12	ug/kg
Carbon disulfide	ND	6.1	ug/kg
Carbon tetrachloride	ND	6.1	ug/kg
Chlorobenzene	ND	6.1	ug/kg
Dibromochloromethane	ND	6.1	ug/kg
Chloroethane	ND	6.1	ug/kg
Chloroform	ND	6.1	ug/kg
Chloromethane	ND	6.1	ug/kg
1,1-Dichloroethane	ND	6.1	ug/kg
1,2-Dichloroethane	ND	6.1	ug/kg
1,1-Dichloroethene	ND	6.1	ug/kg
cis-1,2-Dichloroethene	ND	6.1	ug/kg
trans-1,2-Dichloroethene	ND	6.1	ug/kg
1,2-Dichloropropane	ND	6.1	ug/kg
cis-1,3-Dichloropropene	ND	6.1	ug/kg
trans-1,3-Dichloropropene	ND	6.1	ug/kg
Ethylbenzene	ND	6.1	ug/kg
2-Hexanone	ND	12	ug/kg
Methylene chloride	ND	6.1	ug/kg
4-Methyl-2-pentanone	ND	12	ug/kg
Styrene	ND	6.1	ug/kg
1,1,2,2-Tetrachloroethane	ND	6.1	ug/kg
Tetrachloroethene	ND	6.1	ug/kg
Toluene	ND	6.1	ug/kg
1,1,1-Trichloroethane	ND	6.1	ug/kg
1,1,2-Trichloroethane	ND	6.1	ug/kg
Trichloroethene	ND	6.1	ug/kg
Vinyl chloride	ND	6.1	ug/kg
Xylenes (total)	ND	6.1	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	110	(70 - 135)
1,2-Dichloroethane-d4	105	(75 - 117)
Toluene-d8	94	(86 - 122)
Bromofluorobenzene	89	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

GC/MS Volatiles

Lot-Sample #...: A9F160107-011 Work Order #...: CWX79102 Matrix.....: SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

HPLC

Lot-Sample #...: A9F160107-011 **Work Order #...:** CWX7910V **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:30 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 07/02/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 18 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	131 *	(76 - 124)

NOTE(S):

* Surrogate recovery is outside stated control limits.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

TOTAL Metals

Lot-Sample #...: A9F160107-011 **Matrix.....:** SOLID
Date Sampled...: 06/11/99 15:30 **Date Received..:** 06/14/99
% Moisture.....: 18

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.61	mg/kg	SW846 6010B	07/01-07/19/99	CWX7910J
		Dilution Factor: 1				
Aluminum	**7260**	**24.3**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX79103**
		Dilution Factor: 1				
Arsenic	**6.4**	**1.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910K**
		Dilution Factor: 1				
Barium	**64.8**	**24.3**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX79104**
		Dilution Factor: 1				
Beryllium	ND	0.61	mg/kg	SW846 6010B	07/01-07/19/99	CWX79105
		Dilution Factor: 1				
admium	ND	0.24	mg/kg	SW846 6010B	07/01-07/19/99	CWX7910L
		Dilution Factor: 1				
Calcium	**27800**	**606**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX79106**
		Dilution Factor: 1				
Chromium	**12.1**	**0.61**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910M**
		Dilution Factor: 1				
Cobalt	**6.2**	**6.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX79107**
		Dilution Factor: 1				
Lead	**14.9**	**0.36**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910N**
		Dilution Factor: 1				
Copper	**16.0**	**3.0**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX79108**
		Dilution Factor: 1				
Antimony	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7910P
		Dilution Factor: 1				
Iron	**13400**	**12.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX79109**
		Dilution Factor: 1				
Selenium	ND	0.61	mg/kg	SW846 6010B	07/01-07/19/99	CWX7910Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

TOTAL Metals

Lot-Sample #...: A9F160107-011 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.12	mg/kg	SW846 7471A	07/01-07/06/99	CWX7910T
		Dilution Factor: 1				
Potassium	**751**	**606**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7910A**
		Dilution Factor: 1				
Thallium	ND	1.2	mg/kg	SW846 6010B	07/01-07/19/99	CWX7910R
		Dilution Factor: 1				
Magnesium	**9100**	**606**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7910C**
		Dilution Factor: 1				
Manganese	**348**	**1.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910D**
		Dilution Factor: 1				
Sodium	ND	606	mg/kg	SW846 6010B	07/01-07/18/99	CWX7910E
		Dilution Factor: 1				
ickel	**17.9**	**4.9**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910F**
		Dilution Factor: 1				
Vanadium	**18.9**	**6.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910G**
		Dilution Factor: 1				
Zinc	**46.2**	**2.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7910H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP002-0006

General Chemistry

Lot-Sample #...: A9F160107-011 Work Order #...: CWX79 Matrix.....: SOLID
Date Sampled...: 06/11/99 15:30 Date Received..: 06/14/99
% Moisture.....: 18

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	82.5	0.10	%	MCAWW 160.3 MOD	06/28-06/29/99	9179143
	Dilution Factor: 1					
Total Organic Carbon	14000	120	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-012 **Work Order #...:** CWX7C102 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:47 **Date Received..:** 06/14/99
Prep Date.....: 06/21/99 **Analysis Date..:** 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1
% Moisture.....: 11 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	11	ug/kg
Benzene	ND	5.6	ug/kg
Bromodichloromethane	ND	5.6	ug/kg
Bromoform	ND	5.6	ug/kg
Bromomethane	ND	5.6	ug/kg
2-Butanone	ND	11	ug/kg
Carbon disulfide	ND	5.6	ug/kg
Carbon tetrachloride	ND	5.6	ug/kg
Chlorobenzene	ND	5.6	ug/kg
Dibromochloromethane	ND	5.6	ug/kg
Chloroethane	ND	5.6	ug/kg
Chloroform	ND	5.6	ug/kg
Chloromethane	ND	5.6	ug/kg
1,1-Dichloroethane	ND	5.6	ug/kg
1,2-Dichloroethane	ND	5.6	ug/kg
1,1-Dichloroethene	ND	5.6	ug/kg
cis-1,2-Dichloroethene	ND	5.6	ug/kg
trans-1,2-Dichloroethene	ND	5.6	ug/kg
1,2-Dichloropropane	ND	5.6	ug/kg
cis-1,3-Dichloropropene	ND	5.6	ug/kg
trans-1,3-Dichloropropene	ND	5.6	ug/kg
Ethylbenzene	ND	5.6	ug/kg
2-Hexanone	ND	11	ug/kg
Methylene chloride	ND	5.6	ug/kg
4-Methyl-2-pentanone	ND	11	ug/kg
Styrene	ND	5.6	ug/kg
1,1,2,2-Tetrachloroethane	ND	5.6	ug/kg
Tetrachloroethene	ND	5.6	ug/kg
Toluene	ND	5.6	ug/kg
1,1,1-Trichloroethane	ND	5.6	ug/kg
1,1,2-Trichloroethane	ND	5.6	ug/kg
Trichloroethene	ND	5.6	ug/kg
Vinyl chloride	ND	5.6	ug/kg
Xylenes (total)	ND	5.6	ug/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	110	(70 - 135)
1,2-Dichloroethane-d4	110	(75 - 117)
Toluene-d8	98	(86 - 122)
Bromofluorobenzene	93	(60 - 137)

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

GC/MS Volatiles

Lot-Sample #...: A9F160107-012 **Work Order #...:** CWX7C102 **Matrix.....:** SOLID

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

HPLC

Lot-Sample #...: A9F160107-012 **Work Order #...:** CWX7C10V **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:47 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1
% Moisture.....: 11 **Method.....:** SW846 8330

PARAMETER	RESULT	REPORTING LIMIT	UNITS
HMX	ND	0.50	mg/kg
RDX	ND	0.50	mg/kg
1,3,5-Trinitrobenzene	ND	0.25	mg/kg
1,3-Dinitrobenzene	ND	0.25	mg/kg
Tetryl	ND	0.65	mg/kg
Nitrobenzene	ND	0.25	mg/kg
2,4,6-Trinitrotoluene	ND	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	ND	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	ND	0.25	mg/kg
2,6-Dinitrotoluene	ND	0.25	mg/kg
2,4-Dinitrotoluene	ND	0.25	mg/kg
2-Nitrotoluene	ND	0.25	mg/kg
4-Nitrotoluene	ND	0.25	mg/kg
3-Nitrotoluene	ND	0.25	mg/kg

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	97	(76 - 124)

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

TOTAL Metals

Lot-Sample #...: A9F160107-012 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:47 **Date Received..:** 06/14/99
% Moisture.....: 11

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 9182106						
Silver	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C10J
		Dilution Factor: 1				
Aluminum	**5310**	**22.4**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7C103**
		Dilution Factor: 1				
Arsenic	**4.8**	**1.1**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10K**
		Dilution Factor: 1				
Barium	**27.6**	**22.4**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C104**
		Dilution Factor: 1				
Beryllium	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C105
		Dilution Factor: 1				
admium	ND	0.22	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C10L
		Dilution Factor: 1				
Calcium	**12400**	**560**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7C106**
		Dilution Factor: 1				
Chromium	**8.7**	**0.56**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10M**
		Dilution Factor: 1				
Cobalt	ND	5.6	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C107
		Dilution Factor: 1				
Lead	**11.5**	**0.34**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10N**
		Dilution Factor: 1				
Copper	**8.6**	**2.8**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C108**
		Dilution Factor: 1				
Antimony	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C10P
		Dilution Factor: 1				
Iron	**11400**	**11.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C109**
		Dilution Factor: 1				
Selenium	ND	0.56	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C10Q
		Dilution Factor: 1				

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U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

TOTAL Metals

Lot-Sample #...: A9F160107-012 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Mercury	ND	0.11	mg/kg	SW846 7471A	07/01-07/06/99	CWX7C10T
		Dilution Factor: 1				
Potassium	ND	560	mg/kg	SW846 6010B	07/01-07/18/99	CWX7C10A
		Dilution Factor: 1				
Thallium	ND	1.1	mg/kg	SW846 6010B	07/01-07/19/99	CWX7C10R
		Dilution Factor: 1				
Magnesium	**3840**	**560**	**mg/kg**	**SW846 6010B**	**07/01-07/18/99**	**CWX7C10C**
		Dilution Factor: 1				
Manganese	**186**	**1.7**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10D**
		Dilution Factor: 1				
Sodium	ND	560	mg/kg	SW846 6010B	07/01-07/18/99	CWX7C10E
		Dilution Factor: 1				
'ickel	**10.7**	**4.5**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10F**
		Dilution Factor: 1				
Vanadium	**17.3**	**5.6**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10G**
		Dilution Factor: 1				
Zinc	**35.5**	**2.2**	**mg/kg**	**SW846 6010B**	**07/01-07/19/99**	**CWX7C10H**
		Dilution Factor: 1				

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

U.S. ARMY CORPS OF ENGINEERS

Client Sample ID: PBOW99-DP004-0004

General Chemistry

Lot-Sample #...: A9F160107-012 Work Order #...: CWX7C Matrix.....: SOLID
Date Sampled...: 06/10/99 11:47 Date Received..: 06/14/99
% Moisture.....: 11

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids	89.3	0.10	%	MCAWW 160.3 MOD	06/28-06/29/99	9179143
	Dilution Factor: 1					
Total Organic Carbon	3800	110	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
	Dilution Factor: 1					

NOTE(S):

RL Reporting Limit

Results and reporting limits have been adjusted for dry weight.

QUALITY CONTROL SECTION

QUALITY CONTROL ELEMENTS OF SW-846 METHODS

Quanterra® Incorporated conducts a quality assurance/quality control (QA/QC) program designed to provide scientifically valid and legally defensible data. Toward this end, several types of quality control indicators are incorporated into the QA/QC program. These indicators are introduced into the sample testing process to provide a mechanism for the assessment of the analytical data.

QC BATCH

Environmental samples are taken through the testing process in groups called QUALITY CONTROL BATCHES (QC batches). A QC batch contains up to twenty environmental samples of a similar matrix (water, soil) that are processed using the same reagents and standards. Quanterra requires that each environmental sample be associated with a QC batch.

Several quality control samples are included in each QC batch and are processed identically to the twenty environmental samples. These QC samples include a METHOD BLANK (MB), a LABORATORY CONTROL SAMPLE (LCS) and, where appropriate, a MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) pair or a MATRIX SPIKE/SAMPLE DUPLICATE (MS/DU) pair. If there is insufficient sample to perform an MS/MSD or an MS/DU, then a LABORATORY CONTROL SAMPLE DUPLICATE (LCSD) is included in the QC batch.

LABORATORY CONTROL SAMPLE

The Laboratory Control Sample is a QC sample that is created by adding known concentrations of a full or partial set of target analytes to a matrix similar to that of the environmental samples in the QC batch. The LCS analyte recovery results are used to monitor the analytical process and provide evidence that the laboratory is performing the method within acceptable guidelines. Failure to meet the established recovery guidelines requires the repreparation and reanalysis of all samples in the QC batch. The only exception is that if the LCS recoveries are biased high and the associated sample is ND for the parameter(s) of interest, the batch is acceptable.

At times, a Laboratory Control Sample Duplicate (LCSD) is also included in the QC batch. An LCSD is a QC sample that is created and handled identically to the LCS. Analyte recovery data from the LCSD is assessed in the same way as that of the LCS. The LCSD recoveries, together with the LCS recoveries, are used to determine the reproducibility (precision) of the analytical system. Precision data are expressed as relative percent differences (RPDs). Failure of the RPDs to fall within the laboratory-generated acceptance windows requires the repreparation and reanalysis of all samples in the QC batch. The only exception is that if the MS/MSD RPDs are within acceptance criteria, the batch is acceptable.

METHOD BLANK

The Method Blank is a QC sample consisting of all the reagents used in analyzing the environmental samples contained in the QC batch. Method Blank results are used to determine if interference or contamination in the analytical system could lead to the reporting of false positive data or elevated analyte concentrations. All target analytes must be below the reporting limits (RL) or the associated sample(s) must be ND except for the common laboratory contaminants indicated below.

Volatile (GC or GC/MS)	Semivolatile (GC/MS)	Metals
Methylene chloride	Phthalate Esters	Copper
Acetone		Iron
2-Butanone		Zinc
		Lead*

* *for analyses run on TJA Trace ICP or GFAA only*

QUALITY CONTROL ELEMENTS OF SW-846 METHODS
(Continued)

The listed volatile and semivolatile compounds may be present in concentrations up to 5 times the reporting limits. The listed metals may be present in concentrations up to 2 times the reporting limit or must be twenty fold less than the results of the environmental samples. Failure to meet these Method Blank criteria requires the repreparation and reanalysis of all samples in the QC batch.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A Matrix Spike and a Matrix Spike Duplicate are a pair of environmental samples to which known concentrations of a full or partial set of target analytes are added. The MS/MSD results are determined in the same manner as the results of the environmental sample used to prepare the MS/MSD. The analyte recoveries and the relative percent differences (RPDs) of the recoveries are calculated and used to evaluate the effect of the sample matrix on the analytical results. When these values fail to meet acceptance criteria, the data is reviewed to determine the cause. If, in the analyst's judgment, sample matrix effects are indicated, no corrective action is performed. Otherwise, the MS/MSD and the environmental sample used to prepare them are reprepared and reanalyzed.

For certain methods, a Matrix Spike/Sample Duplicate (MS/DU) may be included in the QC batch in place of the MS/MSD. For the parameters (i.e. pH, ignitability) where it is not possible to prepare a spiked sample, a Sample Duplicate may be included in the QC batch.

SURROGATE COMPOUNDS

In addition to these batch-related QC indicators, each organic environmental and QC sample are spiked with surrogate compounds. Surrogates are organic chemicals that behave similarly to the analytes of interest and that are rarely present in the environment. Surrogate recoveries are used to monitor the individual performance of a sample in the analytical system.

The acceptance criteria do not apply to samples that are diluted. All other surrogate recoveries will be reported. If the LCS, LCSD, or the Method Blank surrogates fail to meet recovery criteria (exception for dilutions), the entire batch of samples is reprepared and reanalyzed.

If the surrogate recoveries are biased high in the LCS, LCSD, or the Method Blank and the associated sample(s) are ND, the batch is acceptable. If the surrogate recoveries are outside criteria for environmental or MS/MSD samples, the batch may be acceptable based on the analyst's judgment that sample matrix effects are indicated.

For the GC/MS BNA methods, the surrogate criteria is that two of the three surrogates for each fraction must meet acceptance criteria. The third surrogate must have a recovery of ten percent or greater.

For the Pesticide/PCB, PAH, TPH, and Herbicide methods, the surrogate criteria is that one of two surrogate compounds meet acceptance criteria.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 Work Order #...: CX5P0102 Matrix.....: SOLID
LCS Lot-Sample#: A9F210000-281
Prep Date.....: 06/21/99 Analysis Date..: 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Acetone	110	(80 - 120)	SW846 8260B
Benzene	98	(85 - 120)	SW846 8260B
Bromodichloromethane	97	(35 - 155)	SW846 8260B
Bromoform	94	(45 - 169)	SW846 8260B
Bromomethane	65	(10 - 242)	SW846 8260B
2-Butanone	82 a	(85 - 119)	SW846 8260B
Carbon disulfide	95	(81 - 125)	SW846 8260B
Carbon tetrachloride	106	(70 - 140)	SW846 8260B
Chlorobenzene	96	(88 - 119)	SW846 8260B
Dibromochloromethane	95	(53 - 149)	SW846 8260B
Chloroethane	94	(82 - 114)	SW846 8260B
Chloroform	102	(51 - 138)	SW846 8260B
Chloromethane	75	(10 - 273)	SW846 8260B
1,1-Dichloroethane	98	(59 - 155)	SW846 8260B
1,2-Dichloroethane	103	(49 - 155)	SW846 8260B
1,1-Dichloroethene	98	(76 - 128)	SW846 8260B
cis-1,2-Dichloroethene	109	(50 - 150)	SW846 8260B
trans-1,2-Dichloroethene	92	(54 - 156)	SW846 8260B
1,2-Dichloropropane	96	(10 - 210)	SW846 8260B
cis-1,3-Dichloropropene	89	(10 - 227)	SW846 8260B
trans-1,3-Dichloropropene	90	(17 - 183)	SW846 8260B
Ethylbenzene	92	(37 - 162)	SW846 8260B
2-Hexanone	99	(87 - 129)	SW846 8260B
Methylene chloride	96	(10 - 221)	SW846 8260B
4-Methyl-2-pentanone	98	(90 - 125)	SW846 8260B
Styrene	87	(79 - 100)	SW846 8260B
1,1,2,2-Tetrachloroethane	91	(46 - 157)	SW846 8260B
Tetrachloroethene	100	(64 - 148)	SW846 8260B
Toluene	96	(86 - 118)	SW846 8260B
1,1,1-Trichloroethane	104	(52 - 162)	SW846 8260B
1,1,2-Trichloroethane	97	(52 - 150)	SW846 8260B
Trichloroethene	97	(86 - 116)	SW846 8260B
Vinyl chloride	86	(10 - 251)	SW846 8260B
Xylenes (total)	95	(83 - 129)	SW846 8260B

(Continued on next page)

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CX5P0102 **Matrix.....:** SOLID
LCS Lot-Sample#: A9F210000-281

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	110	(70 - 135)
1,2-Dichloroethane-d4	108	(75 - 117)
Toluene-d8	101	(86 - 122)
Bromofluorobenzene	98	(60 - 137)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

a Spiked analyte recovery is outside stated control limits.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 Work Order #...: CX575102 Matrix.....: SOLID
LCS Lot-Sample#: A9F210000-184
Prep Date.....: 06/18/99 Analysis Date..: 06/18/99
Prep Batch #...: 9172184
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD
Acetone	94	(80 - 120)	SW846 8260B
Benzene	93	(85 - 120)	SW846 8260B
Bromodichloromethane	92	(35 - 155)	SW846 8260B
Bromoform	91	(45 - 169)	SW846 8260B
Bromomethane	56	(10 - 242)	SW846 8260B
2-Butanone	82 a	(85 - 119)	SW846 8260B
Carbon disulfide	85	(81 - 125)	SW846 8260B
Carbon tetrachloride	99	(70 - 140)	SW846 8260B
Chlorobenzene	92	(88 - 119)	SW846 8260B
Dibromochloromethane	91	(53 - 149)	SW846 8260B
Chloroethane	84	(82 - 114)	SW846 8260B
Chloroform	97	(51 - 138)	SW846 8260B
Chloromethane	60	(10 - 273)	SW846 8260B
1,1-Dichloroethane	93	(59 - 155)	SW846 8260B
1,2-Dichloroethane	99	(49 - 155)	SW846 8260B
1,1-Dichloroethene	91	(76 - 128)	SW846 8260B
cis-1,2-Dichloroethene	104	(50 - 150)	SW846 8260B
trans-1,2-Dichloroethene	88	(54 - 156)	SW846 8260B
1,2-Dichloropropane	91	(10 - 210)	SW846 8260B
cis-1,3-Dichloropropene	87	(10 - 227)	SW846 8260B
trans-1,3-Dichloropropene	90	(17 - 183)	SW846 8260B
Ethylbenzene	93	(37 - 162)	SW846 8260B
2-Hexanone	91	(87 - 129)	SW846 8260B
Methylene chloride	87	(10 - 221)	SW846 8260B
4-Methyl-2-pentanone	96	(90 - 125)	SW846 8260B
Styrene	85	(79 - 100)	SW846 8260B
1,1,2,2-Tetrachloroethane	91	(46 - 157)	SW846 8260B
Tetrachloroethene	96	(64 - 148)	SW846 8260B
Toluene	93	(86 - 118)	SW846 8260B
1,1,1-Trichloroethane	99	(52 - 162)	SW846 8260B
1,1,2-Trichloroethane	95	(52 - 150)	SW846 8260B
Trichloroethene	91	(86 - 116)	SW846 8260B
Vinyl chloride	72	(10 - 251)	SW846 8260B
Xylenes (total)	91	(83 - 129)	SW846 8260B

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LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CX575102 **Matrix.....:** SOLID
LCS Lot-Sample#: A9F210000-184

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	109	(70 - 135)
1,2-Dichloroethane-d4	107	(75 - 117)
Toluene-d8	101	(86 - 122)
Bromofluorobenzene	101	(60 - 137)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

n Spiked analyte recovery is outside stated control limits.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: A9F160107 **Work Order #...:** CX50J102-LCS **Matrix.....:** SOLID
LCS Lot-Sample#: H9F200000-101 CX50J103-LCSD
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
HMX	**107**	**(77 - 122)**			**SW846 8330**
	104	**(77 - 122)**	**3.1**	**(0-17)**	**SW846 8330**
RDX	**105**	**(83 - 121)**			**SW846 8330**
	103	**(83 - 121)**	**2.8**	**(0-16)**	**SW846 8330**
1,3,5-Trinitrobenzene	**99**	**(81 - 120)**			**SW846 8330**
	97	**(81 - 120)**	**1.9**	**(0-15)**	**SW846 8330**
1,3-Dinitrobenzene	**105**	**(82 - 117)**			**SW846 8330**
	103	**(82 - 117)**	**1.9**	**(0-15)**	**SW846 8330**
Tetryl	**70**	**(51 - 120)**			**SW846 8330**
	69	**(51 - 120)**	**2.1**	**(0-20)**	**SW846 8330**
Nitrobenzene	**105**	**(83 - 117)**			**SW846 8330**
	102	**(83 - 117)**	**3.2**	**(0-15)**	**SW846 8330**
2,4,6-Trinitrotoluene	**106**	**(74 - 126)**			**SW846 8330**
	103	**(74 - 126)**	**2.3**	**(0-15)**	**SW846 8330**
4-Amino-2,6-dinitrotoluene	**105**	**(81 - 123)**			**SW846 8330**
	102	**(81 - 123)**	**3.1**	**(0-15)**	**SW846 8330**
2-Amino-4,6-dinitrotoluene	**105**	**(80 - 121)**			**SW846 8330**
	102	**(80 - 121)**	**3.2**	**(0-16)**	**SW846 8330**
2,6-Dinitrotoluene	**107**	**(82 - 121)**			**SW846 8330**
	105	**(82 - 121)**	**2.5**	**(0-15)**	**SW846 8330**
2,4-Dinitrotoluene	**106**	**(81 - 120)**			**SW846 8330**
	102	**(81 - 120)**	**3.3**	**(0-15)**	**SW846 8330**
2-Nitrotoluene	**108**	**(81 - 117)**			**SW846 8330**
	101	**(81 - 117)**	**6.5**	**(0-15)**	**SW846 8330**
4-Nitrotoluene	**106**	**(81 - 117)**			**SW846 8330**
	101	**(81 - 117)**	**4.5**	**(0-15)**	**SW846 8330**
3-Nitrotoluene	**106**	**(80 - 118)**			**SW846 8330**
	105	**(80 - 118)**	**1.4**	**(0-15)**	**SW846 8330**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	114	(76 - 124)
	109	(76 - 124)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: A9G010000-106 **Prep Batch #...:** 9182106					
Silver	109	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12J
		Dilution Factor: 1			
Aluminum	91	(80 - 113)	SW846 6010B	07/01-07/18/99	CXJNP12U
		Dilution Factor: 1			
Arsenic	95	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12K
		Dilution Factor: 1			
Barium	106	(80 - 109)	SW846 6010B	07/01-07/19/99	CXJNP12V
		Dilution Factor: 1			
Cadmium	102	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12L
		Dilution Factor: 1			
Beryllium	98	(80 - 105)	SW846 6010B	07/01-07/19/99	CXJNP12W
		Dilution Factor: 1			
Chromium	103	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12M
		Dilution Factor: 1			
Calcium	89	(80 - 109)	SW846 6010B	07/01-07/18/99	CXJNP12X
		Dilution Factor: 1			
Lead	97	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12N
		Dilution Factor: 1			
Cobalt	92	(80 - 104)	SW846 6010B	07/01-07/19/99	CXJNP130
		Dilution Factor: 1			
Antimony	95	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12P
		Dilution Factor: 1			
Copper	99	(80 - 113)	SW846 6010B	07/01-07/19/99	CXJNP131
		Dilution Factor: 1			
Selenium	92	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12Q
		Dilution Factor: 1			
Iron	106	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP132
		Dilution Factor: 1			

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LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Potassium	90	(80 - 103)	SW846 6010B	07/01-07/18/99	CXJNP12A
		Dilution Factor: 1			
Thallium	97	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12R
		Dilution Factor: 1			
Mercury	83	(70 - 130)	SW846 7471A	07/01-07/06/99	CXJNP12T
		Dilution Factor: 1			
Magnesium	92	(80 - 109)	SW846 6010B	07/01-07/18/99	CXJNP12C
		Dilution Factor: 1			
Manganese	111	(80 - 114)	SW846 6010B	07/01-07/19/99	CXJNP12D
		Dilution Factor: 1			
Sodium	93	(80 - 107)	SW846 6010B	07/01-07/18/99	CXJNP12E
		Dilution Factor: 1			
ickel	103	(80 - 112)	SW846 6010B	07/01-07/19/99	CXJNP12F
		Dilution Factor: 1			
Vanadium	100	(80 - 111)	SW846 6010B	07/01-07/19/99	CXJNP12G
		Dilution Factor: 1			
Zinc	109	(80 - 120)	SW846 6010B	07/01-07/19/99	CXJNP12H
		Dilution Factor: 1			

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Total Organic Carbon		Work Order #: CXP6E102	LCS Lot-Sample#: A9G050000-133		
	124	(69 - 130)	SMCA WALKLEY-BLAC	07/05/99	9186133
		Dilution Factor: 1			

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CX575101 **Matrix.....:** SOLID
MB Lot-Sample #: A9F210000-184

Prep Date.....: 06/18/99
Analysis Date..: 06/18/99 **Prep Batch #...:** 9172184
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Acetone	ND	10	ug/kg	SW846 8260B
Benzene	ND	5.0	ug/kg	SW846 8260B
Bromodichloromethane	ND	5.0	ug/kg	SW846 8260B.
Bromoform	ND	5.0	ug/kg	SW846 8260B
Bromomethane	ND	5.0	ug/kg	SW846 8260B
2-Butanone	ND	10	ug/kg	SW846 8260B
Carbon disulfide	ND	5.0	ug/kg	SW846 8260B
Carbon tetrachloride	ND	5.0	ug/kg	SW846 8260B
Chlorobenzene	ND	5.0	ug/kg	SW846 8260B
Dibromochloromethane	ND	5.0	ug/kg	SW846 8260B
Chloroethane	ND	5.0	ug/kg	SW846 8260B
Chloroform	ND	5.0	ug/kg	SW846 8260B
Chloromethane	ND	5.0	ug/kg	SW846 8260B
1,1-Dichloroethane	ND	5.0	ug/kg	SW846 8260B
.,2-Dichloroethane	ND	5.0	ug/kg	SW846 8260B
1,1-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
cis-1,2-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
trans-1,2-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
1,2-Dichloropropane	ND	5.0	ug/kg	SW846 8260B
cis-1,3-Dichloropropene	ND	5.0	ug/kg	SW846 8260B
trans-1,3-Dichloropropene	ND	5.0	ug/kg	SW846 8260B
Ethylbenzene	ND	5.0	ug/kg	SW846 8260B
2-Hexanone	ND	10	ug/kg	SW846 8260B
Methylene chloride	ND	5.0	ug/kg	SW846 8260B
4-Methyl-2-pentanone	ND	10	ug/kg	SW846 8260B
Styrene	ND	5.0	ug/kg	SW846 8260B
1,1,2,2-Tetrachloroethane	ND	5.0	ug/kg	SW846 8260B
Tetrachloroethene	ND	5.0	ug/kg	SW846 8260B
Toluene	ND	5.0	ug/kg	SW846 8260B
1,1,1-Trichloroethane	ND	5.0	ug/kg	SW846 8260B
1,1,2-Trichloroethane	ND	5.0	ug/kg	SW846 8260B
Trichloroethene	ND	5.0	ug/kg	SW846 8260B
Vinyl chloride	ND	5.0	ug/kg	SW846 8260B
Xylenes (total)	ND	5.0	ug/kg	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	110	(70 - 135)
1,2-Dichloroethane-d4	109	(75 - 117)
oluene-d8	101	(86 - 122)
romofluorobenzene	98	(60 - 137)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CX5P0101 **Matrix.....:** SOLID
MB Lot-Sample #: A9F210000-281

Prep Date.....: 06/21/99
Analysis Date..: 06/21/99 **Prep Batch #...:** 9172281
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Acetone	ND	10	ug/kg	SW846 8260B
Benzene	ND	5.0	ug/kg	SW846 8260B
Bromodichloromethane	ND	5.0	ug/kg	SW846 8260B
Bromoform	ND	5.0	ug/kg	SW846 8260B
Bromomethane	ND	5.0	ug/kg	SW846 8260B
2-Butanone	ND	10	ug/kg	SW846 8260B
Carbon disulfide	ND	5.0	ug/kg	SW846 8260B
Carbon tetrachloride	ND	5.0	ug/kg	SW846 8260B
Chlorobenzene	ND	5.0	ug/kg	SW846 8260B
Dibromochloromethane	ND	5.0	ug/kg	SW846 8260B
Chloroethane	ND	5.0	ug/kg	SW846 8260B
Chloroform	ND	5.0	ug/kg	SW846 8260B
Chloromethane	ND	5.0	ug/kg	SW846 8260B
1,1-Dichloroethane	ND	5.0	ug/kg	SW846 8260B
1,2-Dichloroethane	ND	5.0	ug/kg	SW846 8260B
1,1-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
cis-1,2-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
trans-1,2-Dichloroethene	ND	5.0	ug/kg	SW846 8260B
1,2-Dichloropropane	ND	5.0	ug/kg	SW846 8260B
cis-1,3-Dichloropropene	ND	5.0	ug/kg	SW846 8260B
trans-1,3-Dichloropropene	ND	5.0	ug/kg	SW846 8260B
Ethylbenzene	ND	5.0	ug/kg	SW846 8260B
2-Hexanone	ND	10	ug/kg	SW846 8260B
Methylene chloride	ND	5.0	ug/kg	SW846 8260B
4-Methyl-2-pentanone	ND	10	ug/kg	SW846 8260B
Styrene	ND	5.0	ug/kg	SW846 8260B
1,1,2,2-Tetrachloroethane	ND	5.0	ug/kg	SW846 8260B
Tetrachloroethene	ND	5.0	ug/kg	SW846 8260B
Toluene	ND	5.0	ug/kg	SW846 8260B
1,1,1-Trichloroethane	ND	5.0	ug/kg	SW846 8260B
1,1,2-Trichloroethane	ND	5.0	ug/kg	SW846 8260B
Trichloroethene	ND	5.0	ug/kg	SW846 8260B
Vinyl chloride	ND	5.0	ug/kg	SW846 8260B
Xylenes (total)	ND	5.0	ug/kg	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	100	(70 - 135)
1,2-Dichloroethane-d4	100	(75 - 117)
Toluene-d8	91	(86 - 122)
Bromofluorobenzene	88	(60 - 137)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

HPLC

Client Lot #...: A9F160107 **Work Order #...:** CX50J101 **Matrix.....:** SOLID
MB Lot-Sample #: H9F200000-101

Prep Date.....: 06/20/99
Analysis Date..: 06/23/99 **Prep Batch #...:** 9171101
Dilution Factor: 1

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
HMX	ND	0.50	mg/kg	SW846 8330
RDX	ND	0.50	mg/kg	SW846 8330
1,3,5-Trinitrobenzene	ND	0.25	mg/kg	SW846 8330
1,3-Dinitrobenzene	ND	0.25	mg/kg	SW846 8330
Tetryl	ND	0.65	mg/kg	SW846 8330
Nitrobenzene	ND	0.25	mg/kg	SW846 8330
2,4,6-Trinitrotoluene	ND	0.25	mg/kg	SW846 8330
4-Amino-2,6-dinitrotoluen	ND	0.25	mg/kg	SW846 8330
2-Amino-4,6-dinitrotoluen	ND	0.25	mg/kg	SW846 8330
2,6-Dinitrotoluene	ND	0.25	mg/kg	SW846 8330
2,4-Dinitrotoluene	ND	0.25	mg/kg	SW846 8330
2-Nitrotoluene	ND	0.25	mg/kg	SW846 8330
4-Nitrotoluene	ND	0.25	mg/kg	SW846 8330
3-Nitrotoluene	ND	0.25	mg/kg	SW846 8330

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	103	(76 - 124)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: A9G010000-106 **Prep Batch #...:** 9182106						
Aluminum	ND	20.0	mg/kg	SW846 6010B	07/01-07/18/99	CXJNP123
		Dilution Factor: 1				
Silver	ND	0.50	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11R
		Dilution Factor: 1				
Arsenic	ND	1.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11T
		Dilution Factor: 1				
Barium	ND	20.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP124
		Dilution Factor: 1				
Beryllium	ND	0.50	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP125
		Dilution Factor: 1				
Cadmium	ND	0.20	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11U
		Dilution Factor: 1				
Calcium	ND	500	mg/kg	SW846 6010B	07/01-07/18/99	CXJNP126
		Dilution Factor: 1				
Chromium	ND	0.50	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11V
		Dilution Factor: 1				
Cobalt	ND	5.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP127
		Dilution Factor: 1				
Lead	ND	0.30	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11W
		Dilution Factor: 1				
Antimony	ND	1.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11X
		Dilution Factor: 1				
Copper	ND	2.5	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP128
		Dilution Factor: 1				
Iron	ND	10.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP129
		Dilution Factor: 1				
Selenium	ND	0.50	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP120
		Dilution Factor: 1				
Mercury	ND	0.10	mg/kg	SW846 7471A	07/01-07/06/99	CXJNP122
		Dilution Factor: 1				

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METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Potassium	ND	500	mg/kg	SW846 6010B	07/01-07/18/99	CXJNP11J
		Dilution Factor: 1				
Thallium	ND	1.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP121
		Dilution Factor: 1				
Magnesium	ND	500	mg/kg	SW846 6010B	07/01-07/18/99	CXJNP11K
		Dilution Factor: 1				
Manganese	ND	1.5	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11L
		Dilution Factor: 1				
Sodium	ND	500	mg/kg	SW846 6010B	07/01-07/18/99	CXJNP11M
		Dilution Factor: 1				
Nickel	ND	4.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11N
		Dilution Factor: 1				
Vanadium	ND	5.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11P
		Dilution Factor: 1				
Zinc	ND	2.0	mg/kg	SW846 6010B	07/01-07/19/99	CXJNP11Q
		Dilution Factor: 1				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT

General Chemistry

Client Lot #...: A9F160107 **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids		Work Order #:	CXDXP101	MB Lot-Sample #:	A9F260000-122	
	ND	0.10	%	MCAWW 160.3 MOD	06/26-06/28/99	9177122
		Dilution Factor: 1				
Percent Solids		Work Order #:	CXF4R101	MB Lot-Sample #:	A9F280000-143	
	ND	0.10	%	MCAWW 160.3 MOD	06/28-06/29/99	9179143
		Dilution Factor: 1				
Percent Solids		Work Order #:	CXG97101	MB Lot-Sample #:	A9F290000-221	
	ND	0.10	%	MCAWW 160.3 MOD	06/29-06/30/99	9180221
		Dilution Factor: 1				
Total Organic Carbon		Work Order #:	CXP6E101	MB Lot-Sample #:	A9G050000-133	
	ND	100	mg/kg	SMCA WALKLEY-BLAC	07/05/99	9186133
		Dilution Factor: 1				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 Work Order #...: CWX78110-MS Matrix.....: SOLID
MS Lot-Sample #: A9F160107-010 CWX78111-MSD
Date Sampled...: 06/11/99 16:00 Date Received..: 06/14/99
Prep Date.....: 06/21/99 Analysis Date..: 06/21/99
Prep Batch #...: 9172281
Dilution Factor: 1 % Moisture.....: 14

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Acetone	101	(80 - 120)			SW846 8260B
	103	(80 - 120)	1.4	(0-18)	SW846 8260B
Benzene	95	(84 - 121)			SW846 8260B
	93	(84 - 121)	2.4	(0-10)	SW846 8260B
Bromodichloromethane	90	(35 - 155)			SW846 8260B
	90	(35 - 155)	0.91	(0-21)	SW846 8260B
Bromoform	97	(45 - 169)			SW846 8260B
	100	(45 - 169)	3.3	(0-22)	SW846 8260B
Bromomethane	71	(10 - 242)			SW846 8260B
	71	(10 - 242)	0.53	(0-11)	SW846 8260B
2-Butanone	114	(85 - 119)			SW846 8260B
	120 a	(85 - 119)	4.4	(0-17)	SW846 8260B
Carbon disulfide	90	(81 - 125)			SW846 8260B
	89	(81 - 125)	0.94	(0-9.0)	SW846 8260B
Carbon tetrachloride	89	(70 - 140)			SW846 8260B
	89	(70 - 140)	0.12	(0-18)	SW846 8260B
Chlorobenzene	91	(76 - 122)			SW846 8260B
	90	(76 - 122)	1.5	(0-11)	SW846 8260B
Dibromochloromethane	93	(53 - 149)			SW846 8260B
	93	(53 - 149)	0.22	(0-16)	SW846 8260B
Chloroethane	94	(82 - 114)			SW846 8260B
	91	(82 - 114)	3.6	(0-11)	SW846 8260B
Chloroform	96	(51 - 138)			SW846 8260B
	94	(51 - 138)	2.6	(0-15)	SW846 8260B
Chloromethane	74	(10 - 273)			SW846 8260B
	71	(10 - 273)	4.1	(0-18)	SW846 8260B
1,1-Dichloroethane	97	(33 - 137)			SW846 8260B
	95	(33 - 137)	1.8	(0-14)	SW846 8260B
1,2-Dichloroethane	92	(49 - 155)			SW846 8260B
	91	(49 - 155)	0.87	(0-16)	SW846 8260B
1,1-Dichloroethene	97	(75 - 131)			SW846 8260B
	95	(75 - 131)	2.0	(0-17)	SW846 8260B
cis-1,2-Dichloroethene	107	(50 - 150)			SW846 8260B
	105	(50 - 150)	2.2	(0-50)	SW846 8260B
trans-1,2-Dichloroethene	89	(54 - 156)			SW846 8260B
	87	(54 - 156)	2.4	(0-10)	SW846 8260B
1,2-Dichloropropane	95	(10 - 210)			SW846 8260B
	91	(10 - 210)	3.6	(0-13)	SW846 8260B
s-1,3-Dichloropropene	87	(10 - 227)			SW846 8260B
	86	(10 - 227)	1.5	(0-14)	SW846 8260B

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MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CWX78110-MS **Matrix.....:** SOLID
MS Lot-Sample #: A9F160107-010 CWX78111-MSD

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
trans-1,3-Dichloropropene	90	(17 - 183)			SW846 8260B
	91	(17 - 183)	1.3	(0-14)	SW846 8260B
Ethylbenzene	89	(37 - 162)			SW846 8260B
	89	(37 - 162)	0.19	(0-14)	SW846 8260B
2-Hexanone	116	(87 - 129)			SW846 8260B
	124	(87 - 129)	7.0	(0-17)	SW846 8260B
Methylene chloride	83	(10 - 221)			SW846 8260B
	80	(10 - 221)	3.5	(0-22)	SW846 8260B
4-Methyl-2-pentanone	116	(90 - 125)			SW846 8260B
	128 a	(90 - 125)	9.9	(0-12)	SW846 8260B
Styrene	84	(79 - 100)			SW846 8260B
	82	(79 - 100)	1.4	(0-10)	SW846 8260B
1,1,2,2-Tetrachloroethane	108	(46 - 157)			SW846 8260B
	109	(46 - 157)	1.3	(0-24)	SW846 8260B
Tetrachloroethene	90	(64 - 148)			SW846 8260B
	90	(64 - 148)	0.39	(0-10)	SW846 8260B
Toluene	95	(79 - 129)			SW846 8260B
	93	(79 - 129)	2.0	(0-10)	SW846 8260B
1,1,1-Trichloroethane	93	(52 - 162)			SW846 8260B
	91	(52 - 162)	2.0	(0-12)	SW846 8260B
1,1,2-Trichloroethane	99	(52 - 150)			SW846 8260B
	99	(52 - 150)	0.72	(0-19)	SW846 8260B
Trichloroethene	90	(78 - 121)			SW846 8260B
	89	(78 - 121)	1.0	(0-11)	SW846 8260B
Vinyl chloride	78	(10 - 251)			SW846 8260B
	76	(10 - 251)	2.6	(0-24)	SW846 8260B
Xylenes (total)	90	(83 - 129)			SW846 8260B
	88	(83 - 129)	2.7	(0-10)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	103	(70 - 135)
	97	(70 - 135)
1,2-Dichloroethane-d4	100	(75 - 117)
	96	(75 - 117)
Toluene-d8	97	(86 - 122)
	94	(86 - 122)
Bromofluorobenzene	90	(60 - 137)
	87	(60 - 137)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

Results and reporting limits have been adjusted for dry weight.

a Spiked analyte recovery is outside stated control limits.

MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 Work Order #...: CWV9K10X-MS Matrix.....: SOLID
MS Lot-Sample #: A9F140142-033 CWV9K110-MSD
Date Sampled...: 06/10/99 Date Received..: 06/12/99
Prep Date.....: 06/18/99 Analysis Date..: 06/18/99
Prep Batch #...: 9172184
Dilution Factor: 1 % Moisture.....: 8.5

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Acetone	142 a	(80 - 120)			SW846 8260B
	148 a	(80 - 120)	3.6	(0-18)	SW846 8260B
Benzene	112	(84 - 121)			SW846 8260B
	107	(84 - 121)	4.1	(0-10)	SW846 8260B
Bromodichloromethane	114	(35 - 155)			SW846 8260B
	108	(35 - 155)	5.0	(0-21)	SW846 8260B
Bromoform	122	(45 - 169)			SW846 8260B
	114	(45 - 169)	7.3	(0-22)	SW846 8260B
Bromomethane	78	(10 - 242)			SW846 8260B
	75	(10 - 242)	3.9	(0-11)	SW846 8260B
2-Butanone	119	(85 - 119)			SW846 8260B
	131 a	(85 - 119)	10	(0-17)	SW846 8260B
Carbon disulfide	102	(81 - 125)			SW846 8260B
	98	(81 - 125)	3.8	(0-9.0)	SW846 8260B
Carbon tetrachloride	123	(70 - 140)			SW846 8260B
	114	(70 - 140)	7.3	(0-18)	SW846 8260B
Chlorobenzene	109	(76 - 122)			SW846 8260B
	103	(76 - 122)	5.9	(0-11)	SW846 8260B
Dibromochloromethane	119	(53 - 149)			SW846 8260B
	113	(53 - 149)	5.1	(0-16)	SW846 8260B
Chloroethane	113	(82 - 114)			SW846 8260B
	113	(82 - 114)	0.06	(0-11)	SW846 8260B
Chloroform	119	(51 - 138)			SW846 8260B
	116	(51 - 138)	2.2	(0-15)	SW846 8260B
Chloromethane	84	(10 - 273)			SW846 8260B
	84	(10 - 273)	0.27	(0-18)	SW846 8260B
1,1-Dichloroethane	112	(33 - 137)			SW846 8260B
	114	(33 - 137)	1.5	(0-14)	SW846 8260B
1,2-Dichloroethane	122	(49 - 155)			SW846 8260B
	116	(49 - 155)	5.4	(0-16)	SW846 8260B
1,1-Dichloroethene	111	(75 - 131)			SW846 8260B
	110	(75 - 131)	1.2	(0-17)	SW846 8260B
cis-1,2-Dichloroethene	125	(50 - 150)			SW846 8260B
	120	(50 - 150)	3.7	(0-50)	SW846 8260B
trans-1,2-Dichloroethene	104	(54 - 156)			SW846 8260B
	100	(54 - 156)	3.3	(0-10)	SW846 8260B
1,2-Dichloropropane	110	(10 - 210)			SW846 8260B
	110	(10 - 210)	0.12	(0-13)	SW846 8260B
cis-1,3-Dichloropropene	101	(10 - 227)			SW846 8260B
	90	(10 - 227)	12	(0-14)	SW846 8260B

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MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: A9F160107 **Work Order #...:** CWV9K10X-MS **Matrix.....:** SOLID
MS Lot-Sample #: A9F140142-033 CWV9K110-MSD

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
trans-1,3-Dichloropropene	110	(17 - 183)			SW846 8260B
	101	(17 - 183)	8.9	(0-14)	SW846 8260B
Ethylbenzene	111	(37 - 162)			SW846 8260B
	104	(37 - 162)	6.3	(0-14)	SW846 8260B
2-Hexanone	145 a	(87 - 129)			SW846 8260B
	142 a	(87 - 129)	2.0	(0-17)	SW846 8260B
Methylene chloride	100	(10 - 221)			SW846 8260B
	101	(10 - 221)	1.7	(0-22)	SW846 8260B
4-Methyl-2-pentanone	135 a	(90 - 125)			SW846 8260B
	134 a	(90 - 125)	1.1	(0-12)	SW846 8260B
Styrene	101 a	(79 - 100)			SW846 8260B
	92	(79 - 100)	9.5	(0-10)	SW846 8260B
1,1,2,2-Tetrachloroethane	128	(46 - 157)			SW846 8260B
	132	(46 - 157)	3.2	(0-24)	SW846 8260B
Tetrachloroethene	116	(64 - 148)			SW846 8260B
	107	(64 - 148)	7.9	(0-10)	SW846 8260B
oluene	114	(79 - 129)			SW846 8260B
	109	(79 - 129)	4.2	(0-10)	SW846 8260B
1,1,1-Trichloroethane	121	(52 - 162)			SW846 8260B
	116	(52 - 162)	4.7	(0-12)	SW846 8260B
1,1,2-Trichloroethane	123	(52 - 150)			SW846 8260B
	120	(52 - 150)	2.6	(0-19)	SW846 8260B
Trichloroethene	113	(78 - 121)			SW846 8260B
	102	(78 - 121)	10	(0-11)	SW846 8260B
Vinyl chloride	109	(10 - 251)			SW846 8260B
	105	(10 - 251)	3.6	(0-24)	SW846 8260B
Xylenes (total)	111	(83 - 129)			SW846 8260B
	104	(83 - 129)	6.5	(0-10)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	114	(70 - 135)
	116	(70 - 135)
1,2-Dichloroethane-d4	118 *	(75 - 117)
	118 *	(75 - 117)
Toluene-d8	104	(86 - 122)
	102	(86 - 122)
Bromofluorobenzene	94	(60 - 137)
	92	(60 - 137)

NOTE(S):

culations are performed before rounding to avoid round-off errors in calculated results.

d print denotes control parameters

* Surrogate recovery is outside stated control limits.

a Spiked analyte recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

MATRIX SPIKE SAMPLE EVALUATION REPORT

HPLC

Client Lot #...: A9F160107 **Work Order #...:** CWX72110-MS **Matrix.....:** SOLID
MS Lot-Sample #: A9F160107-006 CWX72111-MSD
Date Sampled...: 06/11/99 13:00 **Date Received..:** 06/14/99
Prep Date.....: 06/20/99 **Analysis Date..:** 06/23/99
Prep Batch #...: 9171101
Dilution Factor: 1 **% Moisture.....:** 19

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
HMX	**97**	**(72 - 122)**			**SW846 8330**
	101	**(72 - 122)**	**3.8**	**(0-17)**	**SW846 8330**
RDX	**94**	**(71 - 121)**			**SW846 8330**
	98	**(71 - 121)**	**3.6**	**(0-16)**	**SW846 8330**
1,3,5-Trinitrobenzene	**94**	**(81 - 120)**			**SW846 8330**
	98	**(81 - 120)**	**4.0**	**(0-15)**	**SW846 8330**
1,3-Dinitrobenzene	**97**	**(82 - 117)**			**SW846 8330**
	101	**(82 - 117)**	**4.1**	**(0-15)**	**SW846 8330**
Tetryl	**87**	**(51 - 124)**			**SW846 8330**
	93	**(51 - 124)**	**7.1**	**(0-20)**	**SW846 8330**
Nitrobenzene	**98**	**(83 - 117)**			**SW846 8330**
	101	**(83 - 117)**	**2.5**	**(0-15)**	**SW846 8330**
2,4,6-Trinitrotoluene	**95**	**(74 - 126)**			**SW846 8330**
	100	**(74 - 126)**	**4.4**	**(0-15)**	**SW846 8330**
4-Amino-2,6-dinitrotoluen	**98**	**(71 - 123)**			**SW846 8330**
	98	**(71 - 123)**	**0.05**	**(0-15)**	**SW846 8330**
2-Amino-4,6-dinitrotoluen	**98**	**(75 - 121)**			**SW846 8330**
	98	**(75 - 121)**	**0.31**	**(0-16)**	**SW846 8330**
2,6-Dinitrotoluene	**102**	**(78 - 125)**			**SW846 8330**
	101	**(78 - 125)**	**0.78**	**(0-15)**	**SW846 8330**
2,4-Dinitrotoluene	**97**	**(81 - 120)**			**SW846 8330**
	100	**(81 - 120)**	**3.4**	**(0-15)**	**SW846 8330**
2-Nitrotoluene	**96**	**(81 - 117)**			**SW846 8330**
	101	**(81 - 117)**	**5.0**	**(0-15)**	**SW846 8330**
4-Nitrotoluene	**100**	**(80 - 117)**			**SW846 8330**
	105	**(80 - 117)**	**4.3**	**(0-15)**	**SW846 8330**
3-Nitrotoluene	**95**	**(80 - 118)**			**SW846 8330**
	97	**(80 - 118)**	**1.8**	**(0-15)**	**SW846 8330**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1-Chloro-3-nitrobenzene	97	(76 - 124)
	104	(76 - 124)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: A9F160107-001 **Prep Batch #...:** 9182106							
Aluminum	NC,MSB	(80 - 120)			SW846 6010B	07/01-07/18/99	CWX6G13K
	NC,MSB	(80 - 120)		(0-20)	SW846 6010B	07/01-07/18/99	CWX6G13L
		Dilution Factor: 1					
Silver	104	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G130
	98	(80 - 120)	5.5	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G131
		Dilution Factor: 1					
Arsenic	94	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G132
	91	(80 - 120)	2.5	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G133
		Dilution Factor: 1					
Barium	87	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13M
	114	(80 - 120)	19	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13N
		Dilution Factor: 1					
Beryllium	96	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13P
	92	(80 - 120)	4.1	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13Q
		Dilution Factor: 1					
Cadmium	98	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G134
	95	(80 - 120)	3.3	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G135
		Dilution Factor: 1					
Calcium	0.0 N	(80 - 120)			SW846 6010B	07/01-07/18/99	CWX6G13R
	256 N,*	(80 - 120)	200	(0-20)	SW846 6010B	07/01-07/18/99	CWX6G13T
		Dilution Factor: 1					
Chromium	85	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G136
	99	(80 - 120)	9.7	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G137
		Dilution Factor: 1					
Cobalt	88	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13U
	91	(80 - 120)	3.6	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13V
		Dilution Factor: 1					
Lead	83	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G138
	88	(80 - 120)	4.6	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G139
		Dilution Factor: 1					
Antimony	69 N	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13A
	57 N	(80 - 120)	18	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13C
		Dilution Factor: 1					

(Continued on next page)

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Copper	85	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13W
	99	(80 - 120)	11	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13X
		Dilution Factor: 1					
Iron	NC,MSB	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G140
	NC,MSB	(80 - 120)		(0-20)	SW846 6010B	07/01-07/19/99	CWX6G141
		Dilution Factor: 1					
Selenium	91	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13D
	87	(80 - 120)	4.4	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13E
		Dilution Factor: 1					
Mercury	101	(70 - 130)			SW846 7471A	07/01-07/06/99	CWX6G13H
	98	(70 - 130)	2.4	(0-20)	SW846 7471A	07/01-07/06/99	CWX6G13J
		Dilution Factor: 1					
Potassium	88	(80 - 120)			SW846 6010B	07/01-07/18/99	CWX6G12H
	94	(80 - 120)	5.9	(0-20)	SW846 6010B	07/01-07/18/99	CWX6G12J
		Dilution Factor: 1					
Thallium	94	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G13F
	90	(80 - 120)	5.0	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G13G
		Dilution Factor: 1					
Magnesium	58 N	(80 - 120)			SW846 6010B	07/01-07/18/99	CWX6G12K
	97 *	(80 - 120)	23	(0-20)	SW846 6010B	07/01-07/18/99	CWX6G12L
		Dilution Factor: 1					
Manganese	0.0 N	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G12M
	302 N,*	(80 - 120)	200	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G12N
		Dilution Factor: 1					
Sodium	92	(80 - 120)			SW846 6010B	07/01-07/18/99	CWX6G12P
	93	(80 - 120)	0.56	(0-20)	SW846 6010B	07/01-07/18/99	CWX6G12Q
		Dilution Factor: 1					
Nickel	93	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G12R
	105	(80 - 120)	10	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G12T
		Dilution Factor: 1					
Vanadium	88	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G12U
	100	(80 - 120)	9.3	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G12V
		Dilution Factor: 1					

(Continued on next page)

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: A9F160107 **Matrix.....:** SOLID
Date Sampled...: 06/10/99 11:25 **Date Received..:** 06/14/99

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Zinc	76 N	(80 - 120)			SW846 6010B	07/01-07/19/99	CWX6G12W
	101	(80 - 120)	16	(0-20)	SW846 6010B	07/01-07/19/99	CWX6G12X

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

NC The recovery and/or RPD were not calculated.

MSB The recovery and RPD were not calculated because the sample amount was greater than four times the spike amount.

N Spiked analyte recovery is outside stated control limits.

* Relative percent difference (RPD) is outside stated control limits.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CWX5C-SMP CWX5C-DUP **Matrix.....:** SOLID

Date Sampled...: 06/11/99 09:35 **Date Received..:** 06/14/99

% Moisture.....: 20

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F160105-001	
	80.0	81.3	%	1.6	(0-20)	MCAWW 160.3 MOD	06/26-06/28/99	9177122

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CWX6T-SMP CWX6T-DUP **Matrix.....:** SOLID

Date Sampled...: 06/10/99 18:40 **Date Received..:** 06/14/99

% Moisture.....: 21

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F160107-004	
	78.6	78.6	%	0.10	(0-20)	MCAWW 160.3 MOD	06/29-06/30/99	9180221

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CWX7C-SMP CWX7C-DUP **Matrix.....:** SOLID

Date Sampled...: 06/10/99 11:47 **Date Received..:** 06/14/99

% Moisture.....: 11

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F160107-012	
	89.3	89.5	%	0.17	(0-20)	MCAWW 160.3 MOD	06/28-06/29/99	9179143

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CWX78-SMP CWX78-DUP **Matrix.....:** SOLID

Date Sampled...: 06/11/99 16:00 **Date Received..:** 06/14/99

% Moisture.....: 14

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Total Organic Carbon						SD Lot-Sample #: A9F160107-010		
	8300	8600	mg/kg	3.0	(0-20)	SMCA WALKLEY-BLAC	07/05/99	9186133

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CXCWE-SMP CXCWE-DUP **Matrix.....:** SOLID

Date Sampled...: 06/01/99 15:45 **Date Received..:** 06/03/99

% Moisture.....: 16

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F250195-004	
	83.5	81.0	%	3.0	(0-20)	MCAWW 160.3 MOD	06/26-06/28/99	9177122

Dilution Factor: 1

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CX0H2-SMP CX0H2-DUP **Matrix.....:** SOLID

Date Sampled...: 06/11/99 12:50 **Date Received..:** 06/14/99

% Moisture.....: 20

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F160224-010	
	80.2	81.2	%	1.2	(0-20)	MCAWW 160.3 MOD	06/28-06/29/99	9179143

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CX1JE-SMP CX1JE-DUP **Matrix.....:** SOLID

Date Sampled...: 06/14/99 14:55 **Date Received..:** 06/16/99

% Moisture.....: 21

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Total Organic Carbon						SD Lot-Sample #: A9F170189-006		
	7500	8400	mg/kg	11	(0-20)	SMCA WALKLEY-BLAC	07/05/99	9186133

Dilution Factor: 1

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: A9F160107 **Work Order #...:** CX57H-SMP CX57H-DUP **Matrix.....:** SOLID

Date Sampled...: 06/18/99 10:45 **Date Received..:** 06/21/99

% Moisture.....: 11

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Percent Solids						SD Lot-Sample #:	A9F210112-006	
	88.6	88.4	%	0.28	(0-20)	MCAWW 160.3 MOD	06/29-06/30/99	9180221

Dilution Factor: 1

Chain of Custody Record

Quanterra

QUA-4124

Client: USACE - Louisville District	Project Manager: Doug Meadors	Date: 6-12-99	Chain Of Custody Number: 50603
Address: 600 Dr. Martin Luther King Jr. Pl	Telephone Number (Area Code)/Fax Number: 502-582-5573	Lab Number:	Page 1 of 3
City: Louisville; State: Ky; Zip Code: 40202	Site Contact: Doug Meadors		
Project Name: Plum Brook Ordnance Pentolite Area Waste Lagoon	Carrier/Waybill Number: 813404698828		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Preservative	Condition on Receipt	VOCs	TAL Metals	Explosives	Radiation	TOC
PBOW99-DP004-0002	6-10-99	1125	Soil		2oz	1	4°C		X				
"	"	"	"		2oz	1	4°C			X			
"	"	"	"		4oz	1	4°C				X		
"	"	"	"		4oz	1	4°C					X	
"	"	"	"		4oz	1	4°C						X
PBOW99-DP006-0002	6-10-99	1750	Soil		2oz	1	4°C			X			
"	"	1750	"		4oz	1	4°C				X		
PBOW99-DP006-0004	6-10-99	1810	"		4oz	1	4°C				X		
PBOW99-DP006-0006	6-10-99	1840	Soil		2oz	1	4°C		X				
"	"	1840	"		2oz	1	4°C			X			
"	"	1840	"		4oz	1	4°C				X		
"	"	184	"		4oz	1	4°C						X
PBOW99-DP005-0002	6-11-99	1210	Soil		2oz	1	4°C		X				
"	"	1210	"		2oz	1	4°C			X			
"	"	1210	"		4oz	1	4°C				X		
"	"	1210	"		4oz	1	4°C					X	

Special Instructions

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Turn Around Time Required: ☐ Normal ☐ Rush

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific (Specify)

	Date	Time
1. Relinquished By: Michael McSonderman	6-12-99	1430
2. Relinquished By:		
3. Relinquished By:		

	Date	Time
1. Received By:		
2. Received By: [signature]	6-14-99	920
3. Received By:		

Comments

DISTRIBUTION: WHITE - Stays with Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Chain of Custody Record

Quanterra

QUA 4124

Client: USACE Louisville District	Project Manager: Doug Meadors	Date: 6-12-99	Chain Of Custody Number: 56609
Address: 600 Dr. Martin Luther King Jr. Pl.	Telephone Number (Area Code)/Fax Number: 502-582-5573	Lab Number:	Page 2 of 3
City: Louisville; State: KY; Zip Code: 40202	Site Contact: Doug Meadors		
Project Name: Plum Brook Ordnance Pentolite Lagoon	Carrier/Waybill Number: 813404698828		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Preservative	Condition on Receipt	VOCs	TAL metals	Explosives	Radiation	TOC
PBOW99-DP005-0002	6-11-99	1210	soil		4oz	1	4°C						X
PBOW99-DP005-0006	"	1300	"		2oz	1	4°C		X				
"	"	1300	"		2oz	1	4°C			X			
"	"	1300	"		4oz	1	4°C				X		
"	"	1300	"		4oz	1	4°C					X	
"	"	1300	"		4oz	1	4°C						X
PBOW99-DP003-0002	6-11-99	1350	"		2oz	1	4°C			X			
"	"	1350	"		4oz	1	4°C				X		
PBOW99-DP003-0004	6-11-99	1428	"		2oz	1	4°C			X			
"	"	1428	"		4oz	1	4°C				X		
PBOW99-DP002-0004	6-11-99	1515	"		2oz	1	4°C		X				
"	6-11-99	1515	"		2oz	1	4°C			X			
"	"	1515	"		4oz	1	4°C				X		
"	"	1515	"		4oz	1	4°C					X	
"	"	1515	"		4oz	1	4°C						X

Special Instructions

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Turn Around Time Required: ☐ Normal ☐ Rush

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific (Specify):

	Date	Time		Date	Time
1. Relinquished By: Michael McFondown	6-12-99	1430	1. Received By:		
2. Relinquished By:			2. Received By:	6-14-99	920 AM
3. Relinquished By:			3. Received By:		

Comments

DISTRIBUTION: TE - Stays with Sample, CANARY - Returned to Client with Report, PINK - Field Copy

Chain of Custody Record

Quanterra

QUA 4124

Client: U.S. Army Engineer District Louisville	Project Manager: Douglas Meadors	Date: 6-12-99	Chain Of Custody Number: 50610
Address: 600 Dr. Martin Luther King Pl.	Telephone Number (Area Code)/Fax Number: 502 - 582 - 5573	Lab Number	Page 3 of 3
City: Louisville; State: Ky; Zip Code: 40202	Site Contact: Doug Meadors		
Project Name: PBOW Pentolite Area Waste Lagoon ~~Decommission Maintenance~~	Carrier/Waybill Number: 813 4046988 28		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Preservative	Condition on Receipt	VOCs	TAL metals	Explosives	Radiation	TOC
PBOW99-DP008-0004	6-11-99	1600	Soil		2oz	1	4°C		X				
"	"	1600	"		2oz	1	4°C			X			
"	"	1600	"		4oz	1	4°C				X		
"	"	1600	"		4oz	1	4°C					X	
"	"	1600	"		4oz	1	4°C						X
PBOW99-DP002-0006	6-11-99	1530	"		2oz	1	4°C		X				
"	"	1530	"		2oz	1	4°C			X			
"	"	1530	"		4oz	1	4°C				X		
"	"	1530	"		4oz	1	4°C					X	
"	"	1530	"		4oz	1	4°C						X
PBOW99-DP004-0004	6-10-99	1147	"		2oz	1	4°C		X				
"	"	1147	"		2oz	1	4°C			X			
"	"	1147	"		4oz	1	4°C				X		
"	"	1147	"		4oz	1	4°C					X	
"	"	1147	"		4oz	1	4°C						X

Special Instructions

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months

Turn Around Time Required: ☐ Normal ☐ Rush

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific (Specify)

	Date	Time
1. Relinquished By: Michael Sondermann	6-12-99	1430
2. Relinquished By:		
3. Relinquished By:		

	Date	Time
1. Received By:		
2. Received By:	6-14-99	9:20 AM
3. Received By:		

Comments

DISTRIBUTION: WHITE - Stays with Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Data is Incomplete without Case Narrative

Quanterra
13 July 1999

Quanterra North Canton
4101 Shuffel Drive
North Canton, OH 44720

Project: 614.01

Category: Gamma Spec.
Method: HASL 300

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Prep Date	Date Analyzed	Parameter	Result	Sigma Error (+/-)	MDA	Units
A9F160107-001	21582-001	Soil	06/10/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.17	PCI/G
PBOW99-DP004-0002							Cobalt-60	ND	---	0.18	PCI/G
							Potassium-40	14.9	2.9	0.87	PCI/G
							Lead-212	0.26	0.13	0.15	PCI/G
							Lead-214	0.59	0.14	0.14	PCI/G
A9F160107-005	21582-002	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.21	PCI/G
PBOW99-DP006-0006							Cobalt-60	ND	---	0.20	PCI/G
							Potassium-40	15.4	3.8	1.59	PCI/G
							Lead-212	0.41	0.15	0.14	PCI/G
							Thallium-208	0.19	0.11	0.13	PCI/G
							Lead-214	0.68	0.21	0.20	PCI/G
A9F160107-006	21582-003	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.13	PCI/G
PBOW99-DP005-0002							Cobalt-60	ND	---	0.15	PCI/G
							Potassium-40	16.4	3.2	1.46	PCI/G
							Lead-210	2.63	1.13	1.12	PCI/G
							Lead-212	0.45	0.19	0.13	PCI/G
							Lead-214	0.81	0.24	0.22	PCI/G
A9F160107-009	21582-005	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.15	PCI/G
PBOW99-DP002-0004							Cobalt-60	ND	---	0.21	PCI/G
							Potassium-40	15.9	3.9	1.54	PCI/G
							Lead-212	0.34	0.21	0.20	PCI/G
							Lead-214	0.61	0.28	0.21	PCI/G
A9F160107-010	21582-006	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.15	PCI/G
PBOW99-DP008-0004							Cobalt-60	ND	---	0.24	PCI/G

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Data is Incomplete without Case Narrative

Quanterra
13 July 1999

Quanterra North Canton
4101 Shuffel Drive
North Canton, OH 44720

Project: 614.01

Category: Gamma Spec.
Method: NASL 300

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Prep Date	Date Analyzed	Parameter	Result	Sigma Error (+/-)	MDA	Units
A9F160107-010	21582-006	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Potassium-40	14.6	3.1	1.50	PCI/G
PBOW99-DP008-0004							Lead-210	3.13	1.53	1.51	PCI/G
							Lead-212	0.42	0.17	1.90	PCI/G
							Lead-214	0.81	0.18	0.23	PCI/G
A9F160107-011	21582-007	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.17	PCI/G
~~PBOW99-DP008-0004~~							Cobalt-60	ND	---	0.25	PCI/G
PBOW99-DP002-0006							Potassium-40	12.9	3.5	1.76	PCI/G
							Lead-210	2.21	0.99	1.04	PCI/G
							Lead-212	0.45	0.14	0.19	PCI/G
							Lead-214	0.83	0.18	0.22	PCI/G
A9F160107-012	21582-008	Soil	06/11/99	06/19/99	07/08/99	07/08/99	Cesium-137	ND	---	0.17	PCI/G
PBOW99-DP004-0004							Cobalt-60	ND	---	0.20	PCI/G
							Potassium-40	17.2	3.5	1.29	PCI/G
							Lead-212	0.35	0.16	0.18	PCI/G
							Lead-214	0.61	0.21	0.19	PCI/G
A9F160107-013	21582-010	Water	06/11/99	06/19/99	06/29/99	06/30/99	Cesium-137	ND	---	11.0	PCI/L
PBOW99-RN002-0001							Cobalt-60	ND	---	18.0	PCI/L
NA	QCBLK201589-1	Water	NA	NA	06/29/99	06/29/99	Cesium-137	ND	---	11.8	PCI/L
							Cobalt-60	ND	---	13.4	PCI/L
							Lead-210	220	113	132	PCI/L
NA	QCBLK201953-1	Soil	NA	NA	07/08/99	07/08/99	Cesium-137	ND	---	0.86	PCI/G
							Cobalt-60	ND	---	1.23	PCI/G
NA	QCLCS201589-1	Water	NA	NA	06/29/99	06/29/99	Americium-241	101	---	---	%REC

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Data is Incomplete without Case Narrative

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Quanterra
13 July 1999

Quanterra North Canton
4101 Shuffel Drive
North Canton, OH 44720

Project: 614.01

Category: Gamma Spec.
Method: HASL 300

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Prep Date	Date Analyzed	Parameter	Result	Sigma Error (+/-)	MDA	Units
NA	QCLCS201589-1	Water	NA	NA	06/29/99	06/29/99	Cesium-137	105	---	---	%REC
							Cobalt-60	104	---	---	%REC
NA	QCLCS201953-1	Soil	NA	NA	07/08/99	07/08/99	Americium-241	88	---	---	%REC
							Cesium-137	94	---	---	%REC
							Cobalt-60	93	---	---	%REC

Appendix K

Independent Data Validation Report

DATA REVIEW AND VAILDATION REPORT - PENTOLITE WASTE LAGOONS

PLUM BROOK ORDNANCE WORKS SITE INVESTIGATIONS

Contract Number DACA27-98-D-0029
Delivery Order 0006

June 1, 2000

Prepared For:
U.S. Army Corps of Engineers
Louisville District

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1.0 INTRODUCTION

URS Corporation was contracted by the United States Army Corps of Engineers (USACE), Louisville District, to complete a data review and validation for chemical data generated by Quanterra Incorporated, from soil and groundwater samples collected at the Plum Brook Ordnance Works (PBOW), Pentolite Waste Lagoons. Pursuant to the USACE scope of work (SOW), one hundred percent of the data underwent a data review and 10 percent of the data for selected parameters underwent full validation. The data review and validation followed the general guidance provided in National Functional Guidelines for Organic Review (EPA, 1999) and National Functional Guidelines for Inorganic Review (EPA 1994). While these guidance documents were written for methods following the Contract Laboratory Program (CLP) Statement of Work (SOW), the guidelines were used where appropriate for the validated methods.

The data review included the review of the sample results and the quality control summary forms, while the data validation additionally included the review of raw data. The specific elements included in the data review and validation processes are identified in the subsequent sections. Where required, data were qualified as **U** (nondetect), **J** (estimated) or **R** (rejected) based on the data review and validation procedures.

This report is organized such that Section 1 summarizes the results of the data review and validations and the data usability for each Site. Section 2 provides the details of the data review. Sections 3 through 5 provide the details of the data validation for volatile organic compounds (VOCs), explosives and metals, respectively.

1.1 Data Review Summary

Data were qualified based on blank contamination, and laboratory control sample (LCS) and matrix spike/matrix spike duplicate (MS/MSD) recoveries outside evaluation criteria. All qualifications for the Plum Brook Ordnance Works Pentolite Waste Lagoons are presented in Table 1-1.

1.2 Data Validation Summary

In addition to the outlying parameters identified in the data review, data were qualified based on the initial calibration. All qualifications for the Plum Brook Ordnance Works Pentolite Waste Lagoons are presented in Table 1-1.

1.3 Data Usability

While data were qualified as estimated due to outlying QC parameters, all data should be used for their intended purposes. The data validation of explosives indicated that the retention time (RT) windows were established using nonstandard procedures. While the methods employed to determine RT were not standard procedures, the windows appear appropriate for proper identification since the standard compounds eluted during the windows.

TABLE 1-1

PENTOLITE WASTE LAGOONS
DATA QUALIFICATIONS

Sample Identification #	Analysis	Compound	Qualifier	Code
PBOW99-DP004-0002	Metals	antimony	UJ	MS
PBOW99-DP004-0002	Metals	calcium, magnesium, manganese	J	MS
PBOW99-DP004-0002	Metals	potassium	U	CB
PBOW99-DP005-0002	Metals	copper	J	SD
POBW99-DP006-0002	Metals	potassium	U	CB
PBOW99-DP002-0004	VOC	2-butanone	UJ	LCS
PBOW99-DP002-0006	VOC	2-butanone	UJ	LCS
PBOW99-DP003-0002	VOC	2-butanone	UJ	LCS
PBOW99-DP003-0004	VOC	2-butanone	UJ	LCS
PBOW99-DP004-0002	VOC	methylene chloride	U	MB
PBOW99-DP004-0002	VOC	2-butanone	UJ	LCS
PBOW99-DP004-0004	VOC	2-butanone	UJ	LCS
PBOW99-DP005-0002	VOC	2-butanone	UJ	LCS
PBOW99-DP005-0006	VOC	2-butanone	J	LCS
PBOW99-DP006-0002	VOC	2-butanone	UJ	LCS
PBOW99-DP006-0004	VOC	2-butanone	UJ	LCS
PBOW99-DP006-0006	VOC	2-butanone	UJ	LCS
PBOW99-DP008-0004	VOC	methylene chloride	U	MB
PBOW99-DP008-0004	VOC	2-butanone	UJ	LCS
PBOW99-DP008-0004	VOC	bromomethane, acetone, 2-hexanone	UJ	ICAL

U – Compound non-detect.
UJ – Estimated non-detect.
J – Estimated quantitation.
CB – Calibration blank criteria.
MB – Method blank criteria.
MS – Matrix spike outside criteria.
LCS – Laboratory control spike outside criteria
SD – Serial dilution outside criteria.
ICAL – Initial calibration outside criteria.

2.0 PLUM BROOK DATA REVIEW - SDG A9F160107

Sample Identification #	Sample Identification #	Sample Identification #
PBOW99-DP004-0002	PBOW99-DP005-0002	PBOW99-DP002-0004
PBOW99-DP006-0002	PBOW99-DP005-0006	PBOW99-DP008-0004
PBOW99-DP006-0004	PBOW99-DP003-0002	PBOW99-DP002-0006
PBOW99-DP006-0006	PBOW99-DP003-0004	PBOW99-DP004-0004

2.1 Data Package Completeness

Were all items delivered as specified in the QAPP and COC?

Yes.

2.2 Laboratory Case Narrative

Were problems noted in the laboratory case narrative or cooler receipt form, which are not discussed in subsequent sections?

The laboratory case narrative indicated the following:

- The serial dilution and matrix spike samples were outside evaluation criteria. Qualifications based on serial dilutions are beyond the scope of this review and are addressed in the corresponding validations.
- The explosive surrogate recovery for sample PBOW99-DP002-006 was above evaluation criteria.
- The temperature of the sample cooler at time of receipt was at 1.2°C, outside the 4 ± 2 °C criteria. These issues are discussed in the appropriate sections below.

2.3 Sample Preservation and Holding Times

Were samples extracted/analyzed within QAPP limits?

Yes, however the laboratory received the samples at 1.2 °C, outside the 4 ± 2 °C criteria; however, no qualification of the data was required since the samples were intact and not frozen.

2.4 Blank Contamination

Were any analytes detected in the Method Blanks, Field Blanks or Trip Blanks?

Yes.

Blank ID	Analyte	Conc.
VBLK 6/18/99	Methylene chloride	1.24 ug/kg
VBLK 6/18/99	1,2-dichlorobenzene	0.288 ug/kg
VBLK 6/21/99	Methylene chloride	2.314 ug/kg
VBLK 6/21/99	1,2-dichlorobenzene	0.145 ug/kg

Since the 1,2-dichlorobenzene data for all associated samples were reported as non-detect, no qualification of the data was required. Methylene chloride data

was qualified non-detect (U) with elevated reporting limits as summarized below:

Field ID	Analyte	New RL	Qualification
PBOW99-DP004-0002	Methylene chloride	7.1	U
PBOW99-DP008-0004	Methylene chloride	5.9	U

2.5 Laboratory Control Sample

Were LCS recoveries within evaluation criteria?

No.

LCS ID	Method	LCS Compound	LCS Recovery	LCS Criteria
9172184	VOCs	2-Butanone	82	85-119
9172281	VOCs	2-Butanone	82	85-119

Analytical data, which required qualification based on LCS data, are included in the table below:

Field ID	Analyte	Qualifier
PBOW99-DP004-0002	2-Butanone	UJ
PBOW99-DP006-0002	2-Butanone	UJ
PBOW99-DP006-0004	2-Butanone	UJ
PBOW99-DP006-0006	2-Butanone	UJ
PBOW99-DP005-0002	2-Butanone	UJ
PBOW99-DP005-0006	2-Butanone	J
PBOW99-DP003-0002	2-Butanone	UJ
PBOW99-DP003-0004	2-Butanone	UJ
PBOW99-DP002-0004	2-Butanone	UJ
PBOW99-DP008-0004	2-Butanone	UJ
PBOW99-DP002-0006	2-Butanone	UJ
PBOW99-DP004-0004	2-Butanone	UJ

2.6 Surrogate Recoveries

Were surrogate recoveries within evaluation criteria?

No.

Field ID	Surrogate	Recovery	Criteria
PBOW99-DP002-0006	1-chloro-3-nitrobenzene	131	76-124

No qualifications of the data were necessary since all of the explosive data for sample PBOW99-DP002-006 were reported non-detect (U) and the surrogate recovery was biased high.

2.7 Matrix Spike and Matrix Spike Duplicate Recoveries

Were MS/MSD samples reported as part of this SDG?

Yes.

Were all MS/MSD recoveries within evaluation criteria?

No.

MS/MSD ID	Analyte	MS/MSD Recovery (%)	RPD	Criteria %R/RPD
LAB MS/MSD	Acetone	**142/148**	3.6	80-**120**/18
LAB MS/MSD	4-Methyl-2-pentanone	**135/134**	1.1	90-**125**/12
LAB MS/MSD	2-Hexanone	**145/142**	2.0	87-**129**/17
LAB MS/MSD	Styrene	**101**/92	9.5	79-**100**/10
LAB MS/MSD	2-Butanone	119/**131**	10	85-**119**/17
PBOW99-DP008-0004	2-Butanone	114/**120**	4.4	85-**119**/17
PBOW99-DP008-0004	4-methyl-2-pentanone	116/**128**	9.9	90-**125**/12
PBOW99-DP004-0002	Calcium	**0/256**	**200**	**80-120/20**
PBOW99-DP004-0002	Antimony	**69/57**	18	**80**-120/20
PBOW99-DP004-0002	Magnesium	**58**/97	**23**	**80**-120/**20**
PBOW99-DP004-0002	Manganese	**0/302**	**200**	**80-120/20**

Analytical data, which required qualification based on MS/MSD data, are included in the table below.

Field ID	Analyte	Qual.
PBOW99-DP004-0002	Antimony	**UJ**
	Calcium	**J**
	Magnesium	**J**
	Manganese	**J**

The target analyte 2-butanone was previously qualified due to a low LCS recovery. Since Functional Guidelines indicates no qualification of organic data based on MS/MSD data alone, and LCS and surrogate data were within evaluation criteria, no qualification of the VOC data was required for additional target analytes.

2.8 Lab Duplicate Results

Were lab duplicates samples collected as part of this SDG?

Yes, samples PBOW99-DP006-0006 and PBOW99-DP004-0004 for percent solids, and sample PBOW99-DP008-0004 for TOC.

Were laboratory duplicate sample RPDs within criteria?

Yes.

2.9 Field Duplicate Results

Were field duplicates samples collected as part of this SDG?

No.

Were field duplicates within evaluation criteria?

N/A.

2.10 Sample Dilutions

Were samples diluted which exceed 10X QAPP limits?

No.

2.11 Additional Qualifications

Were additional qualifications applied?

No.

3.0 FULL VALIDATION OF VOC DATA - SDG A9F160107

This section describes the full validation for one soil sample which was analyzed for volatile organic compounds by EPA SW-846 Method 8260B. The sample was analyzed by Quanterra Incorporated of North Canton, Ohio and submitted as part of SDG A9F160107. The sample included as part of this validation is listed below:

Sample Identification #
PBOW99-DP008-0004

Evaluation of the analytical data followed procedures outlined in the USEPA Contract Program National Functional Guidelines for Organic Data Review (USEPA 1999) where applicable to SW-846 Method 8260B. The evaluation criteria used during the validation were a combination of those criteria presented in Method 8260B and laboratory criteria based on historical data.

Criteria evaluated included the following method performance criteria:

- Completeness of data package
- Laboratory case narrative
- Sample preservation and holding times
- GC/MS instrument performance (tuning)
- Initial calibration
- Calibration verification
- Method blank
- Surrogate recoveries
- Laboratory control samples
- MS/MSD samples
- Internal Standard areas and retention times
- Target compound identification and quantitation
- System performance and overall assessment of data
- Transcription errors

3.1 Data Package Completeness

The data package was reviewed to make certain that it contained the data contractually required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested QC documentation for the respective methods. The VOC data package was complete for this validation.

3.2 Problems Identified in the Laboratory Case Narrative

The laboratory case narrative indicated that the sample cooler was received at a temperature of 1.2 °C. This issue is addressed in the appropriate section below. No additional problems were noted in the case narrative.

3.3 Sample Preservation and Holding Times

Review of the sample collection and analysis dates involved comparing the chain-of-custody, the summary forms, the raw data forms, and the chromatograms for accuracy, consistency, and holding time compliance. The samples were preserved properly and analyzed within 14 days of sample collection. The case narrative indicated that the sample cooler was received at a temperature of 1.2 °C, outside the criteria of 4 ± 2 °C; however, no qualification of the data was required since the samples were intact and not frozen.

3.4 Instrument Performance

GC/MS instrument performance checks were performed to ensure mass resolution, identification, and instrument sensitivity. Criteria for evaluation of instrument performance included possible transcription/calculation errors, adherence to instrument tuning frequency requirements, mass assignments, and ion abundance criteria. Instrument performance check samples were evaluated against criteria established in USEPA SW-846 Method 8260B.

Based on the raw data, the ion abundance criteria were within evaluation criteria for all masses, and no calculation or transcription errors were noted.

3.5 Initial Calibration

Calibration criteria were established to assess whether the instrument was capable of producing acceptable qualitative and quantitative data for volatile analyses. An initial calibration was analyzed at the beginning of the run sequence. At least five concentration standards were used to establish the initial calibration curve as required by Method 8260B. For the initial calibration, the response factors (RFs) were reviewed and were greater than 0.05 for all analytes.

Review of the initial calibration summary forms indicated %RSDs were ≤ 30 percent for calibration check compounds (CCCs) and less than 15 percent for non-CCCs with the exception of the following compounds:

Analyte	%RSD
Bromomethane	15.7
Acetone	34.5
Methylene chloride	22.9
2-Butanone	23.5
2-Hexanone	18.1

The following table identifies qualification of data due to outlying %RSD recoveries:

Field ID	Analyte	Qualification
PBOW99-DP008-0004	Bromomethane	UJ
PBOW99-DP008-0004	Acetone	UJ
PBOW99-DP008-0004	Methylene chloride	UJ
PBOW99-DP008-0004	2-Butanone	UJ
PBOW99-DP008-0004	2-Hexanone	UJ

Review of the ICAL summary form indicated one other analyte (acrolein) had a %RSD value greater than 15 percent; however, this analyte was not a target compound for this project.

A recalculation of the RFs and %RSD for four compounds for each standard was performed, and no calculation or transcription errors were noted.

3.6 Calibration Verification

Review of the sample chromatograms indicated the calibration verifications (CVs) were performed at the beginning of each 12-hour analytical shift as required by the methodology. Review of continuing calibration summary form indicated all RFs met the evaluation criteria of greater than 0.05 for all analytes with the exception of 1,4-dioxane (0.004) and acrolein (0.022). Since 1,4-dioxane and acrolein were not target analytes, no qualification of the data was required. In addition, percent differences (%Ds) met the evaluation criteria of $\leq$ 20 percent for CCCs and < 50 percent for all other analytes. Recalculation of the RRF and %D of four compounds was completed, and no calculation or transcription errors were noted.

3.7 Blank Samples

The purpose of the method blank samples is to evaluate the existence and magnitude of contamination problems emanating from laboratory activities. Method blank samples were analyzed with each analytical batch as required by USEPA SW-846 Method 8260B. All target compounds were reported as non-detect with the exception of methylene chloride (2.31 ug/kg) and 1,2-dichlorobenzene (0.145 ug/kg). Since 1,2-dichlorobenzene for the validated sample was reported as non-detect, no qualification of the data was required. Methylene chloride was reported in the validated sample at a concentration less than ten times (10X) the blank concentration, therefore the methylene chloride data was qualified non-detect (U) with an elevated reporting limit as summarized below:

Field ID	Analyte	New RL	Qualification
PBOW99-DP008-0004	Methylene chloride	5.9 ug/kg	U

Review of chromatograms indicated all peaks present were accounted or the concentrations reported were below the method detection limit with the exception of those noted above.

3.8 Surrogate Spike Recoveries

Surrogate compounds were used to evaluate the overall laboratory sample preparation efficiency on a per sample basis. All surrogate recoveries were within the method

acceptance criteria for the validated samples. One hundred percent of the recoveries for the validated sample were recalculated, and the summary forms versus the raw data were verified. No calculation or transcription errors were noted.

3.9 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

MS/MSD samples were analyzed to assess accuracy and precision for the analyses. The MS/MSD spike was performed on sample PBOW99-DP008-0004. The MS/MSD recoveries and RPDs were within the evaluation criteria with the exception of 2-butanone and 4-methyl-2-pentanone, which are summarized in the following table:

Field ID	Analyte	MS/MSD %R	Criteria
PBOW99-DP008-0004	2-butanone	114/120	85-119
PBOW99-DP008-0004	4-methyl-2-pentanone	116/128	90-125

The target compound 2-butanone was previously qualified due to a low LCS recovery. Since Functional Guidelines indicates no qualification of organic data based on MS/MSD data alone, and LCS and surrogate data were within evaluation criteria, no qualification of the VOC data was required for additional target analytes. Ten percent of the MS/MSD recoveries and RPD values were recalculated from the raw data and no calculation errors were noted.

3.10 Internal Standards

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during each analytical run. IS areas must be within -50 percent to +100 percent, and the IS retention times must be within 30 seconds of the IS continuing calibration retention time. IS areas and retention times for the samples in this SDG were within evaluation criteria. The summary forms were verified to the raw data, and no transcription errors were noted.

3.11 Laboatory Control Samples (LCS)

LCS's were analyzed to assess the accuracy of the analytical process. All LCS data were within evaluation criteria with the exception of the following:

LCS I.D.	Compound	% Recovery	Criteria
9172281	2-Butanone	82	85-119

The 2-butanone data for sample PBOW99-DP008-0004 was previously qualified based on the LCS data. Four of the spiking compound recoveries for the LCS were recalculated using the LCS summary forms, and no calculation or transcription errors were noted.

3.12 Target Compound Identification and Quantitation

For validation of the compound identification, chromatograms were reviewed to verify the major peaks were identified, the spectra of the identified compounds were verified against the library spectra, and the relative retention time was no greater than 0.06

different from the associated continuing calibration retention times. No target compounds were detected above the reporting limit in the validated samples, therefore identification of surrogate and internal standard compounds were verified and no anomalies were noted.

Four compounds (methylene chloride, toluene, acetone and 2-butanone) were detected at concentrations below the reporting limit. For the validation of compound quantitation, one hundred percent of the detected results were recalculated from the raw data, and no calculation errors were noted. Additionally, the reporting limits were verified to determine if reporting limits were adjusted for dilutions. Review of the raw data indicated that not all compounds were quantified using the closest internal standard as recommended in the method; however, the laboratory did select an internal standard that was close to the target analyte. No qualification of data was required.

3.13 Overall Data Assessment

Based on the criteria outlined, it is recommended that the results reported for these analyses be accepted for their intended use. Acceptable levels of accuracy and precision, based on MS/MSD, LCS, and surrogate data were achieved for this SDG. In addition, completeness defined to be the percentage of analytical results which are judged to be valid, including estimated (J) data, was 100 percent for this SDG.

4.0 FULL VALIDATION OF EXPLOSIVES DATA – SDG 160107

This section describes the full data validation for the analysis of two soil samples analyzed for explosives following SW-846 Method 8330. Quanterra Environmental Services (QES) of Knoxville, Tennessee completed the analyses. The samples included as part of this validation are listed below:

Sample Identification #
PBOW99-DP004-0002
PBOW99-DP006-0002

The data were validated following the guidance outlined in USEPA Contract Laboratory Program National Functional Guidelines for Organic Review (USEPA 1999) where applicable to SW-846 methodologies. The evaluation criteria used during the validation were a combination of those criteria presented in Method 8330 and laboratory criteria based on historical data.

Criteria evaluated included the following method performance criteria:

- Completeness of data package
- Laboratory case narrative
- Sample preservation and holding times
- Initial calibration
- Retention time windows
- Calibration verification
- Method blank contamination
- Laboratory control samples
- MS/MSD samples
- Target compound identification and quantitation
- System performance and overall assessment of data
- Transcription errors

4.1 Data Package Completeness

The data package was reviewed to make certain that it contained the data contractually required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested QC documentation for the respective methods. The data package was complete for this validation.

4.2 Laboratory Case Narrative

The laboratory case narrative indicated the surrogate recovery for sample PBOW99-DP002-006 was above evaluation criteria. This sample was not included in the

validation; however, this issue was addressed in the data review. No additional problems were noted in the case narrative.

4.3 Sample Preservation and Holding Times

Review of the sample collection and analysis dates involved comparing the chain-of-custody and the analytical run log for accuracy, consistency, and holding time compliance. All samples were extracted within 14 days of sample collection and analyzed within 40 days of sample extraction. Therefore, no qualification of data was required.

4.4 Initial Calibration

Initial calibration criteria were established to assess whether the instrument was capable of producing acceptable qualitative and quantitative data for VOC analyses. As required by the method, the linearity of the calibration curve was established using at least five standard concentrations for each target compound. All correlation coefficients (r^2 values) were above the required 0.990, showing linearity of the calibration curve. Ten percent of the r^2 values were recalculated and compared to the raw data. No transcription or calculation errors were noted.

4.5 Retention Times

Retention time (RT) windows are crucial to the identification of target compounds. EPA SW-846 specifies the RT windows as plus or minus three standard deviations of the mean absolute retention time from the initial calibration. The laboratory established the RT window as ± 2 percent of the retention time of the midlevel calibration standard from the initial calibration. This approach was used if the samples were analyzed on the day the initial calibration was established. If the samples were not analyzed on the day the initial calibration was established, the RT windows were ± 2 percent of the RT of the associated calibration verification sample. All results for the validated sample were reported as non-detect. Review of the chromatograms indicated all peaks present were either outside the RT window or the analyte concentration was below the reporting limit. The RT windows were recalculated and no transcription or calculation errors were noted. No qualification of data was required.

4.6 Calibration Verification

Continuing calibrations were performed at the required frequency of every 12 hours of analysis. Review of continuing calibration summary form indicated all percent differences (%Ds) met the evaluation criteria of < 15 percent.

Ten percent of the %Ds were recalculated for every continuing calibration sample and no calculation or transcription errors were noted.

4.7 Blank Samples

The purpose of the method blank samples is to evaluate the existence and magnitude of contamination problems emanating from laboratory activities. A method blank sample was analyzed as part of the analytical batch. All target analytes were reported as non-detect for the method blank sample. The chromatogram was reviewed and all peaks present were either surrogate compound peaks or detection's of target analytes below the reporting limit.

4.8 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

MS/MSD samples were analyzed to assess the accuracy and precision for the analyses. The laboratory spiked a sample that was not included in the data validation (PBOW99-DP005-0006). All MS/MSD recoveries and RPDs were within evaluation criteria presented on the MS/MSD summary forms. Approximately ten percent of the MS/MSD recoveries and RPD values were recalculated, and no calculation or transcription errors were noted.

4.9 Laboratory Control Sample (LCS)

The laboratory analyzed a laboratory control sample (LCS) as part of the analytical batch. The LCS is a laboratory prepared standard which is prepared in the same manner as the investigative samples and contains all target analytes. Review of the LCS summary form indicated all recoveries were within the evaluation criteria presented on the LCS summary forms.

Ten percent of the recoveries for the LCS were recalculated from the raw data, and no calculation or transcription errors were noted.

4.10 Surrogate Spike Recoveries

A surrogate compound (1-chloro-3-nitrobenzene) was used to evaluate the overall laboratory sample preparation efficiency on a per-sample basis. Method 8330M requires the explosive surrogate recovery to meet method acceptance criteria. The surrogate recovery for the validated sample was within the evaluation criteria of 76 to 124 percent. The surrogate recovery on the summary form was recalculated and compared to raw data; no calculation or transcription errors were noted.

4.11 Target Compound Identification and Quantitation

All target analytes were reported as non-detect for the validation samples. Therefore, LCS recoveries were reviewed to verify the peaks identified as target compounds fell within the retention time. As required by SW-846 Method 8330, compounds detected using the primary column were confirmed using a secondary column. The concentrations quantified from the primary column were reported in all cases. The secondary column was used for qualitative identification only. All results and reporting limits were reported on a wet weight basis.

For the validation of compound quantitation, approximately 10 percent of the LCS target analytes were recalculated from the raw data, and no calculation errors were noted.

4.12 Overall Data Assessment

Based on the criteria outlined, it is recommended that the results reported for these analyses be accepted for their intended use. Acceptable levels of accuracy and precision, based on MS/MSD, LCS, and surrogate data were achieved for this SDG. In addition, completeness, defined to be the percentage of analytical results which are judged to be valid, including estimated (J) data, was 100 percent for this SDG and should be used for their intended purpose. Note that the RT windows were established using nonstandard procedures. While the methods employed to determine RT were not standard procedures, the windows appear appropriate for proper identification since the standard compounds eluted during the windows.

5.0 FULL VALIDATION OF METALS DATA – SDG A9F160107

This section describes the full data validation for two soil samples, which were analyzed for metals by EPA Method 3010A/6010B and EPA Method 7471. Samples were analyzed by Quanterra Incorporated of North Canton, Ohio and submitted as part of SDG A9F160107. Per the statement of work (SOW), 10 percent of this SDG was fully validated. Samples included as part of this validation are listed below:

Sample Identification #
PBOW99-DP004-0002
PBOW99-DP006-0002

The data were validated following the guidance outlined in USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review (USEPA 1999) where applicable to SW-846 methodologies. The evaluation criteria used during the validation were a combination of those criteria presented in Method 6010B and 7471 and laboratory criteria based on historical data.

Criteria evaluated included the following method performance criteria:

- Completeness of data package
- Laboratory case narrative
- Sample preservation and holding times
- Blank contamination
- Initial calibration verification
- Continuing calibration verification
- Laboratory control samples (LCS)
- Laboratory duplicate analysis
- Matrix spike/Matrix spike duplicate samples (MS/MSD)
- ICP serial dilution
- ICP interference check samples (ICS)
- Sample result verification
- Reporting limits

5.1 Data Package Completeness

The data package was reviewed to make certain that it contained the data contractually required in the deliverable. This included checking the data package for the results of each analyte requested for each field sample submitted in the analytical batch, along with requested QC documentation for the respective methods. The data package was complete for this validation.

5.2 Laboratory Case Narrative

The metals laboratory case narrative indicated that the serial dilution and matrix spike samples were outside evaluation criteria. These issues are discussed in the appropriate section below. No additional problems were noted in the metals case narrative.

5.3 Sample Preservation and Holding Times

Review of the sample collection and analysis dates involved comparing the chain-of-custody, the sample preparation logs, the analysis run logs, and raw data forms for holding time compliance. The samples were persevered and analyzed within the evaluation criteria of 28 days (mercury) and 6 months (other metals). No qualification of data was required based on holding time criteria.

5.4 Blank Contamination

The purpose of blank samples was to evaluate the existence and magnitude of contamination problems emanating from laboratory activities. Initial calibration, continuing calibration, and preparation blanks associated with the validated samples were analyzed at the method recommended frequency and reported below the method detection limit for all metals with the exceptions listed below:

Blank ID	Analyte	Conc. (µg/L)	Comments
ICB	Barium	0.9	Sample results 5x >than blank contamination
ICB	Beryllium	2.0	All associated samples ND
ICB	Cadmium	0.5	All associated samples ND
ICB	Cobalt	1.2	All associated samples ND/5x > than blank
ICB	Copper	6.0	Sample results 5 >than blank contamination
ICB	Manganese	1.0	Sample results 5 >than blank contamination
ICB	Nickel	1.7	Sample results 5 >than blank contamination
ICB	Selenium	2.6	All associated samples ND
ICB	Vanadium	0.9	Sample results 5 >than blank contamination
ICB	Zinc	-0.5	Sample results 5 >than blank contamination
CCB(b)	Barium	0.8	Sample results 5 >than blank contamination
CCB(b)	Beryllium	0.9	All associated samples ND
CCB(b)	Cadmium	0.3	All associated samples ND
CCB(b)	Cobalt	0.9	All associated samples ND/5x > than blank
CCB(b)	Copper	-3.9	Sample results 5 >than blank contamination

CCB(b)	Manganese	0.8	Sample results 5 >than blank contamination
CCB(b)	Potassium	-314.9	QUAL
CCB(b)	Sodium	-160.6	All associated samples ND
CCB(a)	Barium	0.8	Sample results 5 >than blank contamination
CCB(a)	Beryllium	0.8	All associated samples ND
CCB(a)	Copper	-4.0	Sample results 5 >than blank contamination
CCB(a)	Iron	18.0	Sample results 5 >than blank contamination
CCB(a)	Manganese	1.2	Sample results 5 >than blank contamination
CCB(a)	Potassium	-374.8	QUAL
CCB(a)	Selenium	2.9	All associated samples ND
CCB(a)	Sodium	-232	All associated samples ND
CCB(a)	Vanadium	0.8	Sample results 5 >than blank contamination

The validated sample results for barium, beryllium, cadmium, cobalt, copper, iron, manganese, nickel, selenium, sodium, vanadium, and zinc were reported as non-detect or were fives times greater than the blank contamination; therefore, no qualification of data was required.

The potassium results for validated samples PBOW99-DP004-0002 and PBOW99-DP006-0002 were reported at a concentration less than five times the blank contamination; therefore, the potassium results for PBOW99-DP004-0002 and PBOW99-DP006-0002 were qualified as non-detect (U) based on blank contamination. One hundred percent of the blank sample results associated with the validated samples were compared to the raw data; no transcription errors were noted.

5.5 Initial Calibration Verification

Initial calibration verification (ICV) criteria were established to assess whether the instrument was capable of producing acceptable qualitative and quantitative data for metals analyses. All ICV recoveries were within evaluation criteria and no qualification was required based on ICV recoveries. One hundred percent of the ICV recoveries, associated with the validated samples, were recalculated and compared to the raw data; no calculation or transcription errors were noted.

A blank and one standard were used to establish the initial calibration curve for Method 6010B; a blank and five standards were used to establish the calibration curve for mercury. Review of the initial calibration data indicated the r^2 values were greater than 0.995 for all metals; therefore no qualification of data was required. One hundred percent of the initial calibrations were recalculated and compared to the raw data; no calculation or transcription errors were noted.

5.6 Continuing Calibration Verification

Continuing calibration verification (CCV) criteria were established to assess whether the instrument was capable of producing acceptable qualitative and quantitative data established by the initial calibration curve. CCV samples associated with the validated samples were analyzed at the method recommended frequency and had recoveries within the evaluation criteria; therefore, no qualifications were required based on CCV recoveries. One hundred percent of the CCV sample recoveries, associated with the validated samples, were recalculated and compared to the raw data; no calculation or transcription errors were noted.

5.7 Laboratory Control Sample

Laboratory control samples (LCS) were analyzed to assess the accuracy of the analytical method and to demonstrate laboratory performance. LCS recoveries were within evaluation criteria and no qualification of data was required based on LCS recoveries. One hundred percent of LCS recoveries were recalculated and compared to the raw data; no calculation or transcription errors were noted.

5.8 Laboratory Duplicate Analysis

The laboratory duplicates a sample to assess method precision at the time of analysis. The laboratory did not analyze duplicate samples pairs; however, the laboratory analyzed a matrix spike and matrix spike duplicate sample pair to assess precision, as summarized in the following section.

5.9 Matrix Spike/ Matrix Spike Duplicate Samples (MS/MSD)

Matrix Spike/Matrix Spike Duplicate samples (MS/MSD) were analyzed to assess the effects of matrix interference and precision during analysis. The laboratory spiked and analyzed sample PBOW99-DP004-0002 in duplicate. All MS/MSD recoveries and relative percent differences (RPDs) were within the evaluation criteria with the exception of antimony, calcium, magnesium and manganese. PBOW99-DP004-0002 sample results for antimony, calcium, magnesium and manganese were qualified as estimated (**UJ/J**) based on outlying MS/MSD recoveries and RPDs. One hundred percent of the MS/MSD recoveries were recalculated and compared to the raw data; no transcription and calculation errors were noted.

5.10 ICP Serial Dilutions

Serial dilutions were analyzed to assess the potential significant physical or chemical interference due to sample matrix. The laboratory analyzed the serial dilution on a non-validated sample, PBOW99-DP005-0002. The serial dilution percent differences (%D) were within evaluation criteria with the exception of copper (19.8%D). Copper data for sample PBOW99-DP005-0002 was qualified estimated (**J**) based on the serial dilution data. One hundred percent of the serial dilution %Ds were recalculated and compared to the raw data; no transcription and calculation errors were noted.

5.11 ICP Interference Check Sample

Interference check samples (ICS) were analyzed to verify the contract laboratory's interelement and background correction factors for analysis of metals by ICP. The laboratory analyzed the ICS at the beginning and end of the analytical run (or a minimum or twice per eight hour analytical run) as required by the methodology. The ICS recoveries were within evaluation criteria; therefore, no qualification of the data was required. Twenty-five percent of the ICS recoveries were recalculated and compared to the raw data; no transcription and calculation errors were noted.

5.12 Sample Result Verification

One hundred percent of the validated sample results were recalculated to validate that analyte quantitation was derived accurately; no calculation errors were noted. Data summary forms were reviewed and compared to the raw data package; no transcription errors were noted.

5.13 Reporting Limits

The sample-reporting limit (RL) is the lowest concentration of an analyte that can be reported by the laboratory to be present in a sample result with a specified level of confidence. The RLs are a function of the sample characteristics, method quantitation, and laboratory performance. The raised RLs is this SDG were due to elevated metals concentrations.

5.14 Overall Data Assessment

Based on the criteria outlined, it is recommended that the results reported for these analyses be accepted for their intended use. Completeness, defined to be the percentage of analytical results that are judged to be valid, including estimated data (**J**), was 100 percent for this SDG.

Document: **Draft Final Report for the Limited Site Inspection for the Pentolite Area Waste Lagoons**
Name: **Susan P. Allemeier, CELRH-EC-CE**

1. Table of Contents: Appendices is misspelled.

Response: The text will be edited accordingly.

2. Table of Contents: It would be helpful to add the Appendix titles to the table of contents.

Response: A list of Appendices with titles is included immediately after the Table of Contents.

3. Page 2, section 2.4.1, first sentence "Ground Study should be Groundwater Study.

Response: The text will be edited accordingly.

4. Page 3, section 2.4.2, first sentence "indicated the a subsurface profile" does not make sense. Please revise.

Response: The word "the" will be removed from this sentence for clarity.

5. Page 4, section 2.5.2, the second sentence is written in the 1st person. Please revise.

Response: The sentence will be changed to "Groundwater encountered in the overburden soils beneath the PAWL site would likely be perched or trapped water."

6. Page 5, section 2.6.1, states that the "vast majority is cultivated." If known please indicate what is cultivated.

Response: Based on the USDA, 1971 Soil Survey for Erie County, Ohio the majority of the crops cultivated in Erie county are primarily fruits and vegetables of various types. The text will be edited to reflect this information.

7. Page 7, section 2.6.2.2, first paragraph, if known, please indicate which four VOCs were detected and at what levels.

Response: The four VOCs detected include: 1,2-Dichloroethene at 120 ug/kg, 1,1,1-Tricloroethane at 22 ug/kg, Trichloroethene 760 ug/kg, Tetrachloroethene at 19 ug/kg. This information will be added to the report.

8. Page 9, section 3.1 second paragraph, last sentence, sections should be section. Also, please state here which section is being referenced so that the reader can easily find this information.

Response: The text will be edited to read: " The results of the chemical analyses are presented in Appendix J. A summary of the chemical analysis results is presented in Tables 1 and 2."

9. Page 9 section 3.2, second sentence add "is" before the word accessible.

Response: The text will be edited accordingly.

10. Page 11, section 4.1, first sentence, please state which section of the report is being referenced here so that the reader can easily find this information.

Response: Section 2.5 will be referenced in the first sentence.

11. Page 12, section 5.1, this is written in the first 1st person. Please revise.

Response: This section has been modified based on technical input from NASA. It is no longer in the 1st person.

12. Page 12, section 5.2, see comment #9 above.

Response: The text will be edited accordingly.

13. Page 12, section 5.3, first sentence is written in the 1st person. Please revise.

Response: The word "our" will be replaced with the word "the" in the first sentence of this section.

14. Page 13, section 7.0, first section, re-word, suggest: The goal of the PAWL SI was to gather data necessary to evaluate the site for contamination due to past DOD activities.

Response: The text will be edited accordingly.

15. Page 13, section 7.0, 2nd bullet: does not make sense. Please revise.

Response: The information in the 2nd bullet will be added to the information in the first bullet and will read: "Wastewater from the pentolite manufacturing process was conveyed to two settling basins known as the PAWL in the early 1940s. This wastewater potentially contained metals, VOCs and explosives."

16. Page 13, section 7.0, 4th bullet: "from historical photographs to located test borings for soil..." this does not make sense as written. Please revise.

Response: The bullet will be edited to reflect the following: "The location of the PAWL was identified by using historical aerial photographs and geo-referencing."

17. Page 13, section 7.0, last paragraph is written in the 1st person. Please revise.

Response: The paragraph is being revised based on input from the OEPA. The new paragraph is not in the first person. The paragraph has been revised as follows: "Based on the results of this SI, it appears that the operation and decommissioning of the PAWL has not negatively impacted the environment. However, additional investigation is warranted to verify these findings. Therefore, a Remedial Investigation (RI) is recommended. The scope of the remedial investigation should be developed in to cooperation with OEPA and NASA personnel to help ensure successful closure of the site."

18. Appendix K - Where is the data validation information? If this report is indeed a final report as the cover says, then this information should be included at this time and not at a later date.

Response: This report was not intended to be a "Final Report". The document submitted for review should have been stamped "DRAFT". The data validation was not complete during the time the report was submitted. The data validation has been completed and will be placed in Appendix K.

Comment Responses

Document: **Final Report, Limited Site Inspection for the "Pentolite Area Waste Lagoons".**
Name: **Ronald E. Nabors, Ohio EPA**

1. Section 2.3, Hydrology, Page 2 and Section 5.1 Hydrology, Page 12: This section indicates that the surface water in the Pentolite Area Waste Lagoons flows northeast or northwest. This statement is incorrect. When the Plum Brook Reactor was constructed the entire reactor site, to include the PAWL, was engineered to capture surface water so that it could be tested. Please revise this section.

Response: The sections will be edited to reflect this information. Additional information has been obtained from NASA personnel.

2. Section 3.1 Sampling Activities, Page 8: This section does not provide discussion as to why sample locations were selected.

Response: The 1st paragraph of the section will be edited to read: "Based on historical data, the most likely location to encounter contaminated media associated with the operation of the PAWL is within and below the former lagoon features. Using historical aerial photographs and geo-referencing the former lagoon locations were identified for soil borings and sample collection. Five soil borings were advanced within the footprint of the former lagoons using direct push sampling methods. Boring DP02 was advanced in the vicinity of the former east inlet location. Boring DP03 was advanced at the parameter of the former lagoons, that is the wastewater ditch. The remainder of the borings were located to incorporate the entire footprint of the lagoons attempting to capture a significant release. The boring locations are illustrated on the Sample Location Plan (Figure 4). In addition, the boring locations are shown on a 1950 aerial photograph and 1995 aerial photograph (Figures 6 and 7, respectively)."

3. Section 3.1 Sampling Activities, Page 8: The table located on page 10 utilizes the soil type descriptions discussed in section 3.1. Howssssssssssssssssssssssssssssssssssssssssssssssssssss discussed. Please include this classification in this section.

Response: The "SM" classification is silty sands, sand silt mixtures. This definition will be included in section 3.1.

4. Section 3.1 Sampling Activities, Pages 8 & 9: Please provide a discussion as to why the crushed limestone layer was not sampled as part of this investigation. It is stated in the text that it is believed that this material remains from the former PAWL.

Response: The crushed limestone was assumed to be remnant sub-base material for the concrete slabs that made up the bottom of the former lagoons. It was assumed that contaminants, if released, would most likely be encountered in the fine-grained soils above and/or below the crushed limestone layer.

5. Section 3.1 Sampling Activities, Pages 8 & 9: Figure 5 provides plans and sections for the pentolite wastewater settling basins. Please explain why samples were not collected from the east and west inlet locations, as referenced on page 5? Please explain if any attempt was made to locate the inlet, outlet or vitreous sewer pipes. Were any samples collected in the general locations of these lines?

Response: Boring DP02 was advanced in the vicinity of the former east inlet location. Boring DP03 was advanced close to the perimeter of the former lagoons near the wastewater ditch. The remainder of the borings were located to incorporate the entire footprint of the lagoons. No attempt beyond the borings was made to locate remnants of the inlet, outlet or vitreous sewer pipes. This investigation was limited in nature and attempted to focus on the most likely locations to be contaminated. The author agrees additional samples will help further evaluate the potential for contamination and proposes to obtain input from OEPA and NASA personnel prior to future sampling activities.

6. Section 3.1 Sampling Activities, Pages 8 & 9: Please clarify if any samples were collected below the crushed limestone materials in the first clay layer. The table on page 10 indicates that only three (3) samples were collected at or below the depth of four (4) feet. If this area was excavated during construction of the NASA Nuclear Reactor, the majority of the PAWL samples collected, during this site investigation, were from fill material. This would not adequately characterize the PAWL.

Response: Based on evaluation of the geology encountered in the borings, the following chemical samples likely represent the native materials below the former PAWL: samples from Boring DP02, the 2–4 feet sample from Boring DP03 and the 4-6 feet sample from Boring DP05. The remainder of the chemical samples likely represents the fill materials associated with decommissioning of the former PAWL. This verbiage will be added to section 3.4 of the document.

The author agrees additional characterization is needed. The verbiage at the end of the report is not intended to request a NFA based on the existing data. However, the data obtained in this limited SI does <u>indicate</u> the PAWL were appropriately decommissioned. Therefore, we believe the approach to additional sampling should be to verify, with a more extensive sampling grid, that a NFA is appropriate. If the SI had indicated contamination, the approach to the future sampling would be to delineate the extent of contamination. Because of the confusion with the last paragraph of the report, the following verbiage will replace the last paragraph of the report text. "Based on the results of this SI, it appears that the operation and decommissioning of the PAWL has not negatively impacted the environment. However, additional investigation is warranted to verify these findings. Therefore, a Remedial Investigation (RI) is recommended. The scope of the remedial investigation should be developed in to cooperation with OEPA and NASA personnel to help ensure successful closure of the site."

Comment Responses

Document: **Draft Final Report for the Limited Site Inspection for the Pentolite Area Waste Lagoons**

Name: **Mr. Keith M Peecook, National Aeronautics and Space Administration**

1. Comment 1: Page 1, Section 2.1 First Paragraph, Second sentence (begins "The PBS facility...". This sentence is in error. PBS does not occupy a majority of Perkins Township, more like 25%. Also, there are two other townships that PBS overlaps. Recommended correction would be to replace the current sentence with "The PBS facility, formerly Plum Brook Ordnance Works (PBOW), occupies 6,400 acres of land belonging to Perkins, Huron, Milan, and Oxford Townships, and is located approximately four miles south of Sandusky, Ohio."

Response: Concur, the text will be edited as recommended.

2. Comment 2: Page 2, Section 2.3. This Paragraph is in error. The entire Plum Brook Reactor Facility was specifically graded so that all surface water would flow into a series of catch basins, all of which fed into the Water Effluent Monitoring System. This single outfall from the entire 27-acre site is located in the southeast corner of the fenced in area. Form here the water is discharged into Pentolite Ditch, which runs east to Plum Brook. The point at which Pentolite Ditch enters Plum Brook is just upstream of our NPDES monitoring station for Plum Brook, prior to it leaving the PBS boundary. Plum Brook flows north from here to end up in Sandusky Bay.

   Note that the following locations in the report are also in error:
   - Page 7, Section 2.6.2.2, Second paragraph
   - Page 12, Section 5.1

Response: The text in Section 2.3 and 5.1 will be edited to reflect the information presented in the comment. The second paragraph of Section 2.6.2.2 will be deleted.

3. Comment 3: Page 4, Section 2.6.1, last line on the page. Change "NASA Lewis Research Center" to "NASA Glenn Research Center". This change was official on March 1, 1999.

Response: The text will be edited as suggested

4. Comment 4: Page 5, Section 2.6.1, Second line on page. Change "westernmost" to "southernmost".

Response: Concur, the text will be edited as suggested.

5. Comment 5: Appendices, The following changes would make the appendices more useful:
   Appendix B- Label the figures so that it is clear which is 1959 and which is 1969.
   Appendix C, D and E- Provide the reader a better orientation to the maps given in these appendices by superimposing an outline of the PBS boundary, or at lease indicate the exact location on these figures of the PAWL.

Response: Concur, the appendix figures will be edited as suggested.

6. General comment

There are construction photos of the PBRF, circa 1958, that clearly show that the PAWL concrete liners are missing, leaving two irregularly shaped shallow excavations. Access to these photos was made available tot he ACE during their fieldwork in June, but they were not examined. After reviewing the existing report they would certainly seem to be a lot more relevant than some of the included illustration.

Response: Concur, this is great information and will certainly be integrated into the report.

Comment Responses

Document: **Draft Final Report for the Limited Site Inspection for the Pentolite Area Waste Lagoons**
Name: **Janet K. Wolfe, CELRH-EC-CE**

1. GENERAL COMMENT: Additional detail on the background for sampling of this area needs to be summarized and presented. Although this information may have been included in documents such as previous sampling/analysis and quality assurance plans, a summary of this information is helpful to the reviewer of this document who is not familiar with the site. Criteria for sampling locations, sampling parameters should be included. A discussion of action levels, PRGs, etc. should be included. A summary of data quality objectives should be presented. Some of the individual comments below pertain to this general comment.

Response: Specific details added to the report are addressed for each individual comment below. The introduction of the report explains that "The purpose of this limited (SI) was to evaluate the potential contamination of the PAWL site due to past Department of Defense (DOD) activities." And that "Historical information was reviewed to identify the environmental media and locations most likely to be affected." And that "results of the laboratory analyses were then compared to risk-based, media specific screening criteria. USEPA Region 9 Preliminary Remediation Goals (PRGs) have been used as the screening criteria."

Specific PRGs associated with contaminants encountered are listed in the "Soil Sample Analytical Results Detection Summary" tables "Tables 1 and 2".

2. Section 3.1, Sampling Activities. Since fill dirt has been added to this area, a discussion of sampling depths would be appropriate. This information should include whether the samples were taken from native soil. If the justification of sampling depth has been included in previous documents, it should be summarized and/or referenced in this report.

Response: The following verbiage will be added to section 3.4 of the document "Based on evaluation of the geology encountered in the borings, the following chemical samples likely represent the native materials below the former PAWL: samples from Boring DP02, the 2–4 feet sample from Boring DP03 and the 4-6 feet sample from Boring DP05. The remainder of the chemical samples likely represents the fill material associated with the decommissioning of the former PAWL."

3. Section 3.1, Sampling Activities, 5th paragraph. Specific information should be provided for the "organoleptic indications" used to determine the most likely contaminated locations/depths.

Response: The term "organoleptic indications" will be replaced with "visual staining".

4. Section 3.4, Analytical Results. The independent chemical data validation assessment has not been provided in Appendix K as referenced in this section. A discussion of the data validation results should be included in this section. Method detection limits, reporting limits, holding time and temperature excursions, field and laboratory quality control results, data usability, etc. should be addressed. A discussion of whether the detection/reporting limits were low enough to meet the data quality objectives (action levels, PRGs, etc.) should be included.

Response: The data validation was not complete during the time the report was submitted for review. The data validation has been completed and placed in Appendix K. A reference to Appendix K has been added to Section 3.4 and the appropriate QC elements are addressed within the validation report.

5. Section 3.4, Analytical Results, Inorganics. Table 1 appears to be included as a separate section. The term "attached" could be revised for clarity.

Response: The term (attached) will be removed.

6. Section 3.4, Conclusions. Additional information should be provided for the conclusion that the operation and decommissioning activities did not release significant contaminants into the environment. This information should include whether native soils were sampled, data quality objectives were met, etc.

Response: Section 3.4 will be changed to Section 3.5 and will be modified as follows: "The primary purpose of the this investigation was to evaluate the potential for contamination of the PAWL site due to past Department of Defense (DOD) activities. Sampling was directed to locations most likely to be contaminated. That is, soil samples were taken and analyzed within and below the former PAWL features and compared to Region 9 PRGs. Contamination was not revealed by the soil sampling, field screening and chemical laboratory analyses performed within the potential source area of the PAWL site. Independent data validation revealed the laboratory analytical data is acceptable."

7. Figure 3, Site Location Map. This map should identify streets and roads. It would be helpful to identify details from other areas of concern. For instance, there are Red Water Ponds that may be confused with this area. This would assist the reviewer not familiar with the Plum Brook Site.

Response: The name of major streets and roads will be added to Figure 3 and 4.

8. Table 1. The units of measure rather than the term "ppm" needs to be included in the table.

Response: The correct units of measure "mg/kg" and "ug/kg" will be added to Table 1 and Table 2.