U.S. Army Environmental Center

REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT

BARABOO, WISCONSIN

FINAL REMEDIAL INVESTIGATION REPORT APPENDIX DATA ITEM A009

8418

APPENDICES A THROUGH D
VOLUME 1 OF 7

CONTRACT DAAA15-91-D-0008

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UNITED STATES ARMY
TOXIC AND HAZARDOUS MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

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APPENDIX A

LOCATION-SPECIFIC AND CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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APPENDIX A1: SUMMARY OF FEDERAL ARARS AND GUIDANCE MATERIALS

Archeological and Historical Preservation Act, 40 CFR 6.301(c)

This law establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity or program. To comply with this law, a determination should be made that no historical or archeological data would be disturbed because of activity associated with remedial investigation or actions at a site.

Clean Air Act (CAA), National Ambient Air Quality Standards; 40 CFR Part 50 Part A

Site remediation activities must comply with the National Ambient Air Quality Standards (NAAQS). The most relevant pollutant standard is for particulate matter less than 10 microns in size (PM_{10}) outlined in 40 CFR Section 50.6. The PM_{10} standard for a 24-hour period is 150 micrograms per cubic meter ($\mu g/m^3$) of air, not to be exceeded more than once a year. The PM_{10} standard is based on the detrimental effects of particulate matter to the lungs. Remedial construction activities such as excavation will need to ensure compliance with the PM_{10} standard. NAAQS for the six criteria pollutants are listed below:

National Ambient Air Quality Standards	
Criteria Pollutant	Standards
Carbon Monoxide	Maximum 1-hr concentration not to be exceeded more than once per year - 35 ppm Maximum 8-hr concentration not to be exceeded more than once per year - 9 ppm
Lead	Maximum quarterly arithmetic mean - 1.5 $\mu g/m^3$
Nitrogen Dioxide	Annual arithmetic mean - 53 $\mu g/m^3$

National Ambient Air Quality Standards	
Criteria Pollutant	Standards
PM_{10}	24-hr average concentration not to be exceeded more than once per year - 150 $\mu g/m^3$ Expected annual arithmetic mean concentration - 50 $\mu g/m^3$
Ozone	Daily maximum 1-hr concentration, not to be exceeded more than one day per year - 0.12 ppm
Sulfur	Annual Arithmetic Mean - 0.03 ppm Maximum 24-hr concentration not to be exceeded more than once per year - 0.14 ppm Secondary standard: Maximum 3-hr concentration not to be exceeded more than once per year - 0.5 ppm

The attainment and maintenance of primary and secondary standards are required to protect public health and welfare (wildlife, climate, recreation, transportation, and economic values). The principal application of these standards is during remedial activities resulting in exposures through dust and vapors. NAAQSs do not apply directly to source-specific emissions limitations. Instead, the State translates the emission limitations into source-specific limitations through State Implementation Plans (SIPs), discussed in 40 CFR Part 52, Subpart YY - Wisconsin.

CAA, Prevention of Significant Deterioration Requirements; 40 CFR Part 52.21

This regulation established requirements for "major sources" of emissions in air control attainment areas (as opposed to non-attainment areas). Major sources for attainment are defined as a source which either emits 250 tons/year (tpy) of any regulated pollutant, or if the site has facility, such as an incinerator or chemical processing plant, which emits 100 or more tpy of a regulated pollutant. Attainment areas are those regions of the country that are designated as being in compliance with the NAAQS priority pollutants. Air emission requirements may vary depending upon whether the area in which the source is located is an attainment or a non-

attainment area. Non-attainment areas are those parts of the country where compliance has not been attained for one or several criteria pollutants. Sauk county, in which Badger Army Ammunition Plant (BAAP) is located, is designated as an attainment area for all regulated air pollutants.

Because of the location of the facility within an attainment area, Prevention of Significant Deterioration (PSD) regulations apply. The PSD regulations classify PSD areas as either Class I, Class II, or Class III. The classification of a particular area within a state is established within the SIP. Significant deterioration is said to occur when the amount of the new pollution exceeds the maximum allowable increment for the applicable class. The allowable increments are listed in the table below.

ALLOWABLE PSD INCREMENTS
(micrograms per cubic meter)

	Class I	Class II	Class III
Sulfur Dioxide			
annual	2	20	40
24-hour	5	91	182
3-hour	25	512	700
Total Suspended Particulate Matter (TSP)			
annual	5	19	37
24-hour	10	37	75

The PSD requirements are implemented through a pre-construction review process. The review process requires that affected sources comply with NAAQS and that an emission limit that reflects the installation and operation of Best Available Control Technology (BACT) is established. PSD permit regulations also require an ambient impact analysis to demonstrate the impact of the new source or modification on compliance with the NAAQS. It may be possible to demonstrate compliance by showing that impacts on air quality of the proposed source are below the significant ambient concentrations established by USEPA and shown in the following table, adapted from 40 CFR Part 52.21(i)(8)(i).

SIGNIFICANT AMBIENT CONCENTRATIONS	
Pollutant	Concentration (micrograms per cubic meter)
Carbon Monoxide	575 (8-hour average)
Nitrogen Dioxide	14 (annual average)
Particulate Matter	10 TSP (24-hour average) 10 PM_{10} (24-hour average)
Sulfur Dioxide	13 (24-hour average)
Lead	0.1 (3-month average)
Mercury	0.25 (24-month average)
Beryllium	0.001 (24-hour average)
Fluorides	0.25 (24-month average)
Vinyl Chloride	15 (24-hour average)
Total Reduced Sulfur	10 (1-hour average)
Hydrogen Sulfide	0.2 (1-hour average)
Reduced Sulfur Compounds	10 (1-hour average)

CAA, State Implementation Plans; 40 CFR Part 52, Subpart YY - Wisconsin

The SIP for Wisconsin implements requirements established by the CAA. The Wisconsin SIP is composed of citations of the State air regulations, which are at least as stringent as the CAA requirements. The SIP also divides the state into Air Quality Control Regions and assigns PSD classifications for each region. The SIP is both Federally enforceable and a potential Federal Applicable or Relevant and Appropriate Requirement (ARAR).

CAA, New Source Performance Standards; 40 CFR Part 60

This regulation establishes new source performance standards (NSPS) as follows:

New Source	Standards
Incineration	Particulate emissions shall be less than 0.08 grains per dry standard cubic foot corrected to 12% carbon dioxide.
Statutory Gas Turbines	Standard for NO_x emission. SO_2 emissions shall be less than 0.015% by volume at 15% oxygen and on a dry basis.
Storage of Petroleum Liquids	Floating roof, vapor recovery system, or equivalent are required

The NSPSs limit the emissions of a number of different pollutants, including the six criteria pollutants as well as fluorides, sulfuric acid mist, and total reduced sulfur (including H_2S).

Because NSPS are source-specific requirements, they are not generally considered applicable to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup actions. However, an NSPS may be applicable if the facility at a CERCLA site is a new source subject to an NSPS, such as an incinerator; or a relevant and appropriate ARAR if the pollutant emitted and the technology employed during the cleanup action are sufficiently similar to the pollutant and source category regulated by an NSPS.

CAA, National Emission Standards for Hazardous Air Pollutants (NESHAP); 40 CFR Part 61

This regulation establishes emission levels for certain hazardous air pollutants. NESHAPs are not generally applicable to Superfund remedial activities because CERCLA sites do not usually contain any of the specific source categories regulated. NESHAPs are also not generally relevant and appropriate because the standards of control are intended for the specific type of source regulated. Part of a NESHAP

may be relevant and appropriate if a component of a particular alternative falls into a regulated category (i.e., the NESHAP for an manufacturing air stripper for a particular contaminant may be relevant and appropriate for an air stripper as a component of a cleanup alternative.

Clean Air Act Amendments (CAAAs) of 1990: The CAA Amendments of 1990 established the requirement to promulgate new emissions standards for sources of 189 listed hazardous air pollutants (HAPs). These standards must reflect the maximum achievable control technology (MACT) considering cost, energy requirements and other impacts. MACT standards for each of the listed categories will be issued progressively within 10 years. The categories to be regulated will include a category referred to as "Waste Treatment and Disposal". Standards for the waste treatment and disposal category are scheduled for November 15, 1994.

The CAAAs establish a threshold for sources to be regulated under the air toxics program. For this purpose, a major source is defined as a source with the potential to emit greater than 10 tpy of any one of the listed HAPs, or greater than 25 tpy of any combination of listed HAPS, assuming operation of the facility at maximum capacity for 24 hours per day, 365 days per year. Major sources are then subject to the permitting requirements established in the CAAAs.

Clean Water Act (CWA)

The Clean Water Act was enacted to restore and maintain the quality of surface waters. The CWA regulations that are most likely to be ARARs for Superfund actions are the requirements for:

- Surface water quality, (Quality Criteria for Water)
- Direct discharges to surface waters, (National Pollutant Discharge Elimination System);
- Indirect discharges to publicly-owned treatment works, (National Pretreatment Program);
- Discharges of dredge-and-fill materials to surface waters, (Guidelines for Specification of Disposal Sites for Dredged or Fill Material).

Each of these regulations, in addition to the regulations governing discharge of radioactive pollutants to surface waters and oil pollution control are discussed in the following paragraphs. There are three categories of pollutants regulated under the various parts of the CWA listed below:

- Toxic pollutants identified in CWA Section 307(a)(1);
- Conventional pollutants including biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH (CWA Section 304(a)(4); and
- Nonconventional pollutants which are defined as any pollutant not identified as either conventional or toxic in accordance with 40 CFR 122.21(1)(2).

CWA, Ambient Water Quality Criteria; 40 CFR Part 131

Federal Ambient Water Quality Criteria (AWQC) under the Clean Water Act are non-enforceable guidance established by the U.S. Environmental Protection Agency (USEPA) for evaluating toxic effects on human health and aquatic organisms. AWQC are used or considered by the States in setting their water quality standards.

AWQC may be potential relevant and appropriate ARARs for groundwater in instances where Maximum Contaminant Levels (MCLs) or Maximum Contaminant Level Goals (MCLGs) are not sufficiently stringent to be protective of the environment. In instances where the contaminants present an environmental concern, the MCLs and MCLGs should be compared, and the more stringent should be considered as the potential relevant and appropriate requirement for the site. However, while it is possible to derive cleanup levels for drinking water from AWQC, these values are not intended to be used as drinking-water cleanup standards, since no criteria are provided human exposure from ingestion of water alone. Carcinogens, which have a AWQC of zero, are not considered relevant and appropriate because they cannot be measured. This policy is consistent with the zero value for MCLGs under the Safe Drinking Water Act (SDWA). AWQC for non-carcinogens are generally set above zero, and address chronic and toxic effects. Table A-1 lists the AWQC published for two human exposure scenarios as well as acute and chronic toxicity for fresh water aquatic life.

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

CHEMICAL		SAFE DRINKING WATER ACT (SDWA) (d)		CWA WATER QUALITY CRITERIA (c)				WI PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)			
				FOR PROTECTION OF HUMAN HEALTH		FOR PROTECTION OF AQUATIC LIFE		CURRENT STANDARDS		PROPOSED STANDARDS	
CHEMICAL CODE	CHEMICAL NAME	MCL (µg/l) (a)	MCLG (µg/l)	WATER AND FISH CONSUMPTION (µg/l)	FISH CONSUMPTION ONLY (µg/l)	FRESHWATER ACUTE/CHRONIC (µg/l)	MARINE ACUTE/CHRONIC (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)
ACRYLO	acrylonitrile	-	-	0.058	0.65	7,500/2,600 (10)	-/-	-	-	-	-
AL	aluminum	50-200 (1)	-	(2)	(2)	(2)	(2)	-	-	-	-
ALK	alkalinity	-	-	-	-	- /20 ppm	-/-	-	-	-	-
AS	arsenic	50 (3)	-	0.0022	0.0175	-/-	-/-	50	5	-	
B2EHP	bis(2-ethylhexyl) phthalate	4 (4)	0	15,000	50,000	400/300 (4)	400/360 (4)	3	0.3	-	-
BA	barium	2,000	2,000	1,000	-	-/-	-/-	1,000	200	2,000	400
C2H3CL	vinyl chloride	2	0	2	525	-/-	-/-	0.2	0.0015	-	0.02
C6H6	benzene	5	0	0.66	40	5,300/- (5)	5,100/700 (5)	5	0.067	-	0.5
CA	calcium	-	-	-	-	-/-	-/-	-	-	-	-
CCL4	carbon tetrachloride	5	0	0.4	6.94	35,200/- (5)	50,000/- (5)	5	0.5	-	-
CD	cadmium	5	5	10	-	3.9/1.1 (4)	43/9.3	10	1	5	0.5
CHCL3	chloroform	100 (6)	-	0.19	15.7	28,900/1,240(5)	-/-	6	0.6	-	-
CL	chloride	250,000 (7)	-	-	-	860,000/230,000	-/-	250,000 (7)	125,000 (7)	-	-
CO	cobalt	-	-	-	-	-/-	-/-	-	-	-	-
CR	chromium (total)	100	100	-	-	-/-	-/-	50	5	100	10
CS2	carbon disulfide	-	-	-	-	-/-	-/-	-	-	-	
12DCLE	1,2-dichloroethane	5	0	0.94	243	118,000/20,000 (5)	11,300/- (5)	5	0.05	-	0.5
DEP	diethylphthalate	-	-	350,000	1,800,000	-/-	-/-	-	-	-	-
DNBP	di-n-butyl phthalate	-	-	34,000	154,000	-/-	-/-	-		-	

continued

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

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				FOR PROTECTION OF HUMAN HEALTH		FOR PROTECTION OF AQUATIC LIFE		CURRENT STANDARDS		PROPOSED STANDARDS	
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DNOP	di-n-octyl phthalate	-	-	-	-	-/-	-/-	-	-	-	
24DNT	2,4-dinitrotoluene	-	-	0.11	9.1	330/230 (5)	-/-	0.05	0.005	-	-
26DNT	2,6-dinitrotoluene	-	-	-	-	-/-	-/-	0.05	0.005	-	
FANT	fluoroanthene	-	-	42	54	3,980/- (5)	40/16 (5)	-	-	-	
FE	iron	300 (1)	-	300	-	- / 1	-/-	300 (7)	150 (7)	-	
HARD	hardness	-	-	-	-	-/-	-/-	-	-	-	
HG	mercury	2	2	0.144	0.146	2.4/0.012	2.1/0.025	2	0.2	-	
MEC6H5	toluene	1,000	1,000	14,300	424,000	17,500/- (5)	6,300/5000 (5)	343	68.6	40 (8)	20 (8)
MEK	2-butanone	-	-	-	-	-/-	-/-	460	90	-	-
MN	manganese	50 (1)	200 (4)	50	100	-/-	-/-	50 (7)	25 (7)	-	
2MNAP	2-methylnaphthalene	-	-	-	-	-/-	-/-	-	-	-	-
NA	sodium	(9)	-	-	-	-/-	-/-	-	-	-	
2NANIL	2-nitroaniline	-	-	-	-	-/-	-/-	-	-	-	-
3NANIL	3-nitroaniline	-	-	-	-	-/-	-/-	-	-	-	-
4NANIL	4-nitroaniline	-	-	-	-	-/-	-/-	-	-	-	-
NAP	naphthalene	-	-	-	-	2,300/620 (5)	2,350/-	40	8	-	
NB	nitrobenzene	-	-	19,800	-	27,000/- (5)	6,680/- (5)	-	-	-	
NG	nitroglycerine	-	-	-	-	-/-	-/-	-	-	-	-

continued

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

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CHEMICAL CODE	CHEMICAL NAME	MCL (µg/l) (a)	MCLG (µg/l)	WATER AND FISH CONSUMPTION (µg/l)	FISH CONSUMPTION ONLY (µg/l)	FRESHWATER ACUTE/CHRONIC (µg/l)	MARINE ACUTE/CHRONIC (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)
NI	nickel	100	100	13.4	100	1,400/160 (10)	75/8.3	-	-	-	-
NIT	nitrite/nitrate-nonspecific	10,000 (11)	10,000 (11)	-	-	-/-	-/-	10,000	2,000	-	-
NNDPA	n-nitros diphenylamine	-	-	(12)	(12)	-/-	-/-	-	-	-	-
NO2	nitrite	1,000	1,000	-	-	-/-	-/-	-	-	1000	200
NO3	nitrate	10,000	10,000	10,000	-	-/-	-/-	-	-	10,000	2,000
PB	lead	TT (3)	0	50	-	83/3.2 (10)	220/8.5	50	5	15	1.5
SE	selenium	50	50	10	-	0.02/0.005	0.3/0.071	10	1	50	10
SO4	sulfate	250,000 (1) 400/500 (4)	400/500 (4)	-	-	-/-	-/-	250,000 (7)	125,000 (7)	-	-
111TCE	1,1,1-trichloroethane	200	200	18400	1,030,000	-/-	31,200/- (5)	200	40	-	-
112TCE	1,1,2-trichloroethane	5	3	0.6	41.8	-/9,400 (5)	-/-	0.6	0.06	-	-
TDS	total dissolved solids	500,000 (14)	-	-	-	-/-	-/-	-	-	-	-
236TMN	2,3,6-trimethylnapthalene	-	-	-	-	-/-	-/-	-	-	-	-
TRCLE	trichloroethylene	5	0	2.7	80.7	45,000/21,000 (5)	2,000/- (5)	5	0.18	-	0.5

continued

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CHEMICAL SPECIFIC STANDARDS AND GUIDANCE

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ZN	Zinc	5000 (1)	-	-	-	102/110 (10)	95/86 (10)	5,000 (7)	2,500 (7)	-	-

Sources:

(a) U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards". Office of Water, Washington, D.C. August, 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards", Office of Water, Washington, D.C., September, 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule", 57FR31776, July 17, 1992.

(b) Wisconsin Administrative Code, Chapter NR 140.10, Table 1.

(c) EPA, 1991. "Water Quality Criteria Summary"; Office of Science and Technology, Health and Ecological Criteria Division, Ecological Risk Assessment Branch, Human Risk Assessment Branch; Washington, D.C. May 1, 1991.

(d) EPA SDWA National Primary Drinking Water Regulations per 40 CFR 141: MCLs and MCLGs.

Notes:

(1) Secondary drinking water standards, suggested level
(2) Criteria are pH dependent. Refer to 53FR33178.
(3) MCL for arsenic currently under review.
(4) Proposed value.
(5) Insufficient data to develop criteria. Value presented is the lowest observed effect level.
(6) Standard indicated is propose value for total trihalomethanes (i.e., chloroform, dibromomethane, bromodichloromethane, and bromoform).
(7) Values are for protection of public welfare (usually aesthetic concerns) rather than for protection of public health. Public welfare standards may not be enforced as rigorously as public health standards.
(8) WDNR proposes to delete toluene from regulation as a public health water quality standard and to promulgate a public welfare water quality standard.
(9) No MCL has been set for sodium. However, a reporting level of 20,000 µg/l has been established as the reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet.
(10) Hardness dependent criteria (100 mg/l $CaCO_3$ used).
(11) Standard indicated is for total nitrite/nitrate.
(12) Although no published criteria exist, values for NNDPA have been calculated using IRIS. Refer to Source (c).
(13) Treatment technique requirement in effect.
(14) The Preventative Action Limit for total dissolved solids (TDS) is 200,000 µg/l above an established background concentration; there is no Enforcement Standard for TDS.

Acronyms:

CWA	Clean Water Act
EPA	United States Environmental Protection Agency
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
µg/l	micrograms per liter, equivalent to parts per billion
mg/l	milligrams per liter, equivalent to parts per million
PAL	Preventative Action Limit
SDWA	Safe Water Drinking Act
TDS	Total Dissolved Solids
WDNR	Wisconsin Department of Natural Resources

In the absence of any Wisconsin Surface Water Quality Standard (FWQS) specific to the pollutant and water body of concern, AWQC may be ARARs for surface-water bodies when protection of aquatic life is a concern or if human exposure from consumption of contaminated fish is a concern.

CWA, 40 CFR Part 122, 125 - National Pollutant Discharge Elimination System (NPDES)

The CWA controls the direct discharge of pollutants to surface water thro[illegible]e NPDES program. NPDES requires permits for direct discharges to surface [illegible]rs. The permits contain limits based on either effluent standards or AWQC if they are more stringent. An on-site discharge from a CERCLA site to surface waters must meet the substantive NPDES requirements, but need not obtain an NPDES permit to comply with the administrative requirements of the permitting process, consistent with CERCLA section 121(e)(1). On the other hand, an off-site discharge from a CERCLA site to surface waters is required to obtain an NPDES permit and to meet both the substantive and administrative NPDES requirements. Examples of direct discharges include:

- <u>On-site waste treatment</u> whereby wastewater (which may include contaminated groundwater which is pumped, treated, and discharged to surface water), is discharged into or very close to a surface-water body through a discernable conveyance such as a pipe, ditch, channel, tunnel, or well.

- <u>Off-site treatment</u> whereby wastewater is discharged by a discernable conveyance to an off-site surface water body.

- <u>Any remedial action</u> where site runoff is channeled directly to a surface-water body through a ditch, culvert, storm sewer, or other means.

- <u>Unchanneled runoff</u> from a site into surface water.

CWA, 40 CFR Part 403, Section 307 (b) - National Pretreatment Program

If a groundwater treatment system is installed at the site and the discharge is to be sent to a publicly owned treatment works (POTW), then pretreatment standards

under the federal CWA apply. CWA Section 307(b) authorized the National Pretreatment Program to regulate the introduction of pollutants from nondomestic sources into POTWs. The goal of the program is to prevent discharges into POTWs that (1) will interfere with the operation of a POTW, including interferences with sludge use or disposal; (2) will pass through the POTW; or (3) will be otherwise incompatible with the POTW. The National Pretreatment Program consists of the following interacting elements:

- national categorical standards
- prohibited discharge standards
- local limitations

Because the national categorical standards provide limits on discharges from particular industries, they are not applicable to the site. The prohibited discharge standards consist of general prohibitions, specific prohibitions, and local limitations, and are discussed in the following subsections.

General Prohibitions

General prohibitions of pretreatment regulations (40 CFR Section 403.5(a)) are intended to control the introduction of certain contaminants into POTWs to (1) prevent interference with POTW operation, (2) prevent passage of contaminants through the POTW, and (3) improve opportunities to recycle and reclaim municipal and industrial wastewater and sludge.

Specific Prohibitions

Specific prohibitions of the National Pretreatment Program (40 CFR Section 403.5(6)) are intended to protect against discharges that cause (1) fire or explosion hazards, (2) corrosive structural damage to a POTW, (3) obstruction of flow into a sewer system, (4) interference due to a pollutant's high concentration, or (5) a temperature increase that would inhibit biological activity at a POTW.

Local Limitations

Local limitations are specific requirements developed and enforced by POTWs. POTWs develop limitations to meet state and local regulations in conjunction with general and specific prohibitions. These limitations should be periodically reviewed

and revised to respond to changes in federal or state regulations or criteria, or plant operations at the POTW. For POTWs to develop local limitations, the statutory and regulatory requirements of the CWA and General Pretreatment Regulations and state and local requirements must be addressed.

Quality Criteria for Water; 40 CFR Part 131

AWQC are non-enforceable, health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds. AWQC were developed under CWA Section 304 and are used by the state, in conjunction with a designated use for the surface water body, to establish water quality standards under CWA Section 303. AWQC provide levels of exposure from drinking the water and consuming aquatic life which are protective of public health. AWQC also provide acute and chronic concentrations for protection of freshwater and marine organisms. AWQC for non-carcinogens are generally set above zero, and address chronic and toxic effects. AWQC for carcinogens are recommended at zero. Table A-1 lists the AWQC published for two human exposure scenarios as well as acute and chronic toxicity for fresh water aquatic life.

Remedial actions involving contaminated surface water or groundwater must consider water uses and the circumstances of the release or threatened release. If a groundwater treatment system is installed at the site and the discharge from this system is sent to an on-site surface water body, the federal AWQC must be attained when relevant and appropriate under the circumstances of the release or the threatened release. Because compliance with AWQC is not legally required at non-Superfund site, and they are not legally applicable requirements under CERCLA.

In the absence of any FWQS specific to the pollutant and water body of concern, AWQC may be ARARs for surface-water bodies when protection of aquatic life is a concern or if human exposure from consumption of contaminated fish is a concern. When protection of aquatic life is a concern, the AWQC for fresh or saltwater aquatic life may be ARARs. When human exposure from consumption of contaminated fish is a concern, the AWQC for human exposure from consumption of fish may be ARARs for the site. AWQC are rarely determined to be ARARs for surface water or groundwater determined to be a potential current or future source of potable water. However, if contamination of a potential potable water source also presents an environmental concern, the stringency of AWQC may be compared to non-zero MCLs or MCLGs, and the more stringent of the two may be the relevant and appropriate requirement for the site.

Again, AWQC may be potential relevant and appropriate ARARs for groundwater in instances where MCLs or MCLGs are not sufficiently stringent to be protective of the environment. In instances where the contaminants present an environmental concern, the MCLs and MCLGs should be compared, and the more stringent should be considered as the potential relevant and appropriate requirement for the site. However, while it is possible to derive cleanup levels for drinking water from AWQC, these values are not intended to be used as drinking-water cleanup standards, because no criteria are provided for human exposure from ingestion of water alone. Carcinogens, which have a AWQC of zero, are not considered relevant and appropriate because they cannot be measured. This policy is consistent with the zero value for MCLGs under the SDWA.

CWA, 40 CFR Part 230 - Guidelines for Specification of Disposal Sites for Dredged or Fill Materials

The CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The U.S. Army Corps of Engineers (USACE) defines wetlands as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and, that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem. The act of excavation and/or dredging is not regulated under Section 404; however, the deposition of dredged or excavated materials in U.S. waters, including wetlands, is. Discharge of fill material generally includes, without limitation, placement of fill necessary for construction and site development (e.g., dams, dikes, and levees), fill associated with the creation of ponds, and any other work involving fill material discharge. If a remedial alternative involves a dredged or fill material being discharged to a wetland, the USACE permit requirements must be attained. No procedures are set forth in the regulations for the jurisdictional determination.

No procedures are set forth in the regulations for jurisdictional determination. Therefore, to determine if an area is subject to wetlands jurisdiction and permitting requirements, the closest USACE district office should be consulted. However, USACE, in conjunction with the U.S. Fish and Wildlife Service (USFWS), USEPA, and U.S. Department of Agriculture Soil Conservation Service, developed the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, which presents a multi-parameter approach to field identification of federally regulated

wetlands (Department of the Army et al., 1989). For an area to meet the USACE definition of a wetland, it must contain hydrophytic vegetation and hydric soils, and have a hydrology indicative of a wetland. The size of the wetland is not a factor.

In addition, Section 404(b)(1), Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230), maintains that no dredged or fill material discharge will be permitted if there is a practicable alternative with less impact on the aquatic ecosystem. Discharge also will not be permitted unless steps are taken to minimize potential adverse impacts, or if the discharge will cause or contribute to significant degradation of U.S. waters. If a remedial alternative involves discharging dredged or fill material to a wetland, potential short- and long-term effects must be determined, based on various physical, chemical, and biological parameters. Impacts to the following areas need to be addressed: substrate, suspended particulates, turbidity, water, current patterns and water circulations, normal water fluctuations, salinity, threatened and endangered species, fish or other aquatic organisms in the food web, and other wildlife. Effects on human use characteristics (e.g., aesthetics and recreation) also need to be addressed.

CWA, 40 CFR Part 112 - Oil Pollution Control

Under these regulations, on shore and offshore oil storage facilities that could potentially spill oil into navigable U.S. waters or onto adjoining shorelines are required to prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) plan. Specifications for secondary containment and/or diversion structures, discharge systems, and leak detection systems are outlined. Facilities that have an aggregate storage of 1,320 gallons of oil or less, provided no single container has a capacity exceeding 660 gallons, are exempt from these regulations. These requirements may be potential relevant and appropriate ARARs for sites which include underground storage tanks.

Endangered Species Act (ESA), 40 CFR Part 302 (h)

With the vast acreage of undeveloped land available, many Army installations serve as habitat for native and migratory species including threatened and endangered flora and fauna. The ESA of 1973 as amended in 1988, governs the management of these resources and requires that proposed federal action do not jeopardize the continued existence of endangered or threatened species or result in the destruction of critical

habitat. For example, if under the ESA a baseline survey identifies listed species or areas of critical concern, a biological assessment may be required to evaluate potential adverse impacts caused by a proposed action or project.

Fish and Wildlife Coordination Act, 40 CFR 302 (g)

The Fish and Wildlife Coordination Act requires that the USFWS, National Marine Fisheries Service, and other related state agencies be consulted before a body of water, including wetlands, is modified (i.e., dredged, filled, or dammed). During the development of the site Feasibility Study (FS), alternatives proposing excavation or fill in or adjacent to a wetland will be evaluated with respect to potential impacts on wetlands.

In addition, under the Sikes Act, each military department must provide for proper fish and wildlife management. Furthermore, the Act requires resource management be carried out according to a cooperative plan mutually agreed upon by the installation commander, the regional office of the U.S. Fish and Wildlife Service, and the appropriate state agency. This Act also provides for collection of hunting and fishing fees to provide habitat improvements.

Floodplain Management Exec. Order (EO) No. 11988; (40 CFR 6.302(b) and Appendix A

This executive order requires Federal agencies to evaluate the potential effects of adverse impacts to floodplains associated with direct and indirect development of a floodplain. Alternatives that involve the alteration of a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.

Hazardous Materials Transportation Act, 49 CFR Parts 171, 173, 178, 179; Hazardous Materials Transportation Regulations

This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials. Contaminated materials would need to be

packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.

Historic Sites, Buildings and Antiquities Act; 40 CFR 6.301
Hazardous Materials Transportation Act, 49 CFR Parts 171, 173, 178, 179; Hazardous Materials Transportation Regulations

This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials. Contaminated materials would need to be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.

National Environmental Policy Act Regulations (NEPA), 40 CFR Part 6

Appendix A of NEPA sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order (EO 11990). Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve and enhance natural and beneficial values of wetlands. Appendix A requires that no remedial alternative adversely affect a wetland if another practicable alternative is available. If no alternative is available, impacts from implementing the chosen alternative must be mitigated. During the site FS process, identification and evaluation of alternatives involving excavation, excavation transport, or fill in or adjacent to a wetland will address the alternative's impact on the wetland as it relates to NEPA.

Occupational Health and Safety Act (OSHA), General Industry Standards; 29 CFR Part 1910

This regulation establishes requirements for programs to assure worker health and safety at hazardous waste sites, including employee training requirements and permissible exposure limits for workplace exposure to a specific listing of chemicals. Under 40 CFR 300.38, requirements apply to all response activities under the National Contingency Plan (NCP).

Occupational Health and Safety Act, Occupational Health and Safety Regulations; 29 CFR Part 1910, Subpart Z

This subpart of 29 CFR Part 1910 establishes permissible exposure limits for workplace exposure to a specific listing of chemicals. These standards are applicable for worker exposure to OSHA hazardous chemicals during remediation activities.

OSHA, Recordkeeping, Reporting, and Related Regulations; 29 CFR Part 1904

This regulation establishes recordkeeping and reporting requirements applicable to remediation activities. These requirements apply to all site contractors and subcontractors and must be followed during all site work.

OSHA, Health and Safety Standards; 29 CFR Part 1926

This rule specifies the type of safety training, equipment, and procedures to be used during site investigation and remediation. All phases of the remedial response project should be executed in compliance with this regulation.

Protection of Wetlands EO No. 11990; 40 CFR 6.302(a) and Appendix A

This executive order requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists. Alternatives that involve the alteration of a wetland may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the wetland.

Resource Conservation and Recovery Act (RCRA), Hazardous Waste Management System; (40 CFR Part 260)

This rule sets forth procedures that USEPA will use to make information available to the public, and sets forth rules that transfer storage and disposal facilities (TSDF) must follow to assert claims of business confidentiality with respect to information

submitted to USEPA pursuant 40 CFR Parts 261-265. This rule creates no substantive clean-up requirements.

RCRA, 40 CFR Part 261, 261.1-261.33 - Identification and Listing of Hazardous Waste

This rule defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265. The applicability of RCRA regulations to wastes found at the site is dependent on the solid waste meeting one of the following criteria:

- The wastes are generated through a RCRA listed source process;
- The wastes are RCRA listed waste from non-specific source; or
- The waste is characteristically hazardous due to ignitability, corrositivity, reactivity or toxicity.

RCRA, 40 CFR Part 262, Subparts A - D, 262.10-262.44 - Standards Applicable to Generators of Hazardous Waste

These rules establish standards for generators of hazardous wastes that address: accumulating waste, preparing hazardous waste for shipment, and, preparing the uniform hazardous waste manifest. These requirements are integrated with Department of Transportation (DOT) regulations. If an alternative involves the off-site transportation of hazardous wastes, the material must be shipped in proper containers that are accurately marked and labeled, and the transporter must display proper placards. These rules specify that all hazardous waste shipments must be accompanied by an appropriate manifest.

RCRA, 40 CFR Part 263 Subparts A - C, 263.10-263.31 - Standards Applicable to Transporters of Hazardous Waste

This rule establishes procedures for transporters of hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR Part 262. If an alternative involves off-site transportation of hazardous waste for treatment and/or disposal, transporters must meet these requirements.

RCRA, 40 CFR - Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

This rule establishes minimum national standards which define the acceptable management of hazardous wastes for owners and operators of facilities which treat, store or dispose of hazardous wastes. Should remedial actions involve management of RCRA wastes at an off-site TSDF or if a treatment facility is constructed on-site, these requirements would by applicable.

RCRA, 40 CFR Subpart B, 264.10-264.18 - General Facility Standards

These general facility requirements outline general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a hazardous waste facility located in a 100-year floodplain be designed, constructed, operated, and maintained to prevent washout of hazardous wastes during a 100-year flood. An exception is if it can be demonstrated that current procedures can facilitate the safe removal of waste (before floodwaters would reach the facility) to a location where waste is not vulnerable to floodwaters. Should remedial actions involve management of RCRA wastes at an off-site TSDF, if a treatment facility is constructed on-site, or if the 100-year floodplain may be impacted, these requirements may be potential relevant and appropriate ARARs.

RCRA, 40 CFR Subpart C, 264.30-264.37 - Preparedness and Prevention

This regulation outlines requirements for safety equipment and spill-control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment. Safety and communication equipment should be incorporated into all aspects of the remedial process and local authorities should be familiarized with site operations.

RCRA, 40 CFR Subpart D, 264.30-264.37 - Contingency Plan and Emergency Procedures

This regulation outlines the requirements for emergency procedures to be used following explosions, fires, and other emergency events. These requirements are

relevant and appropriate for remedial actions involving the management of hazardous waste.

RCRA, 40 CFR Subpart E, 264.70,72-77 - Manifest System, Recordkeeping, and Reporting

This rule outlines procedures for manifesting hazardous waste for owners and operators of on-site and off-site facilities that treat, store, or dispose of hazardous waste. These regulations apply if a remedial alternative involves the treatment, storage, or disposal of hazardous waste off-site. For on-site treatment/disposal, these regulations are applicable in order to properly document disposition of RCRA wastes.

RCRA, 40 CFR Sections 264.90-264.101, Subpart F - Releases from Solid Waste Management Units

The RCRA concentration limits (40 CFR Section 264.94) are potentially applicable and establish three categories of groundwater protection standards: background concentrations, RCRA MCLs, and Alternate Concentration Limits (ACLs). RCRA MCLs consist of a subset of SDWA MCLs; therefore, in complying with SDWA MCLs, clean-up will be consistent with RCRA MCLs. If no MCL exists, a background level or a health-based (i.e., assuming human exposure) ACL may be developed on a case-by-case basis as a groundwater protection standard. ACLs are based on the contaminant level's potential adverse effects on groundwater quality and on hydraulically connected surface waters, considering factors such as (1) physical and chemical characteristics of the waste, (2) hydrogeological characteristics of the setting, (3) groundwater flow quantity and direction, (4) current and future groundwater uses, (5) existing quality of area groundwater, and (6) persistence and permanence of adverse effects. Additional factors are listed in 40 CFR Section 264.94. This rule is relevant and appropriate for cleanup of groundwater contamination at facilities holding a RCRA Part B permit for the treatment, storage, and disposal of hazardous waste.

RCRA, 40 CFR Subpart G, 264.110-264.120 - Closure and Post-Closure

This regulation details general requirements for closure and post-closure of hazardous waste facilities, including installation of a groundwater monitoring program. This rule is a potential relevant and appropriate ARAR for remedial alternatives that involve the closure of a hazardous waste site. If a RCRA Part B permitted site is in the process of closure and post-closure of SWMUs, this regulation would be applicable.

RCRA, 40 CFR Subpart I, 264.170-264.178 - Use and Management of Containers

This requirement defines standards for the containerized storage of hazardous waste. This requirement would apply if a remedial alternative involves the storage of containers filled with hazardous waste. Additionally, the staging of study-generated RCRA-wastes should meet the intent of the regulation.

RCRA, 40 CFR Part 264.190-264.199, Subpart J - Tank Systems

These regulations outline design standards and leak detection measures for aboveground an underground storage tanks used for storing or treating hazardous waste. These regulations include requirements for assessing existing tank systems, design and installation of new tank systems, containment and detection of release, general operations, inspections, response to leaks or spills, and closure and post-closure care. These requirements must be considered underground storage tanks, and, if applicable, complied with during implementation of remedial activities

RCRA, 40 CFR Subpart K, 264.220-264.231 - Surface Impoundments

There are three basic closure options for surface impoundments. The clean-closure option requires removal or decontamination for all hazardous constituents; it includes very stringent groundwater standards for clean-up levels. If all hazardous constituents will not be removed or decontaminated, the landfill closure option may be used. Landfill closure is a containment option and requires a final cover or cap and a post-closure plan that protects human health and the environment.

Should a remedial action involve the placement of hazardous wastes in surface impoundments (e.g., lagoons for the treatment and/or storage of extracted water/groundwater), this regulation would be relevant and appropriate.

RCRA, 40 CFR Part 264, Subpart L, Waste Piles

This rule establishes procedures and operating requirements for both closure and post-closure of waste piles. If removal or decontamination of all contaminated subsoils is not possible, closure and post-closure requirements for landfills must be attained. Should a remedial action involve the placement of hazardous wastes in surface impoundments (e.g. lagoons for the treatment and/or storage of extracted water/groundwater), this regulation would be relevant and appropriate. According to RCRA, waste piles used for treatment or storage of non-containerized accumulation of solid, non-flowing hazardous waste may comply with either the waste pile or landfill requirements. The temporary storage or treatment of hazardous waste on-site, therefore, should meet the substantive requirements of one or the other subpart.

RCRA, 40 CFR Part 264, Subpart M - Land Treatment

This rule details procedures, design, and operating requirements, monitoring requirements, recordkeeping, and closure and post closure requirements for land treatment units. Any facility employed in the treatment of hazardous waste should meet the substantive construction, monitoring, operational, and closure standards established within this regulation.

RCRA, 40 CFR Sections 264.300-264.317, Subpart N - Landfills

This regulation covers design and operating requirements, and closure and post-closure options for hazardous waste landfills. These requirements must be considered and complied with during the development and implementation of remedial alternatives for the site landfills to contain hazardous waste. If closure is implemented as a remedial action, a final cover must be designed and constructed that prevents migration of liquids, requires minimum maintenance, promotes drainage, minimizes erosion, accommodates settling, and has a permeability less than or equal to that of any bottom liner or natural subsoils present.

RCRA, 40 CFR Subpart O, 264.340-264.599 - Incinerators

This regulation specifies the performance standards, operating requirements and monitoring, inspection, and closure guidelines of any incinerator burning hazardous waste. These requirements are applicable for the off-site incineration of RCRA-regulated wastes. For alternatives employing on-site thermal treatment (i.e., incineration) of RCRA wastes should comply with the requirements specified in this subpart of RCRA.

RCRA, 40 CFR Subpart X, 264.600-264.999 - Miscellaneous Units

These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, and wetlands that may have adverse effects on human health and the environment. The design of proposed treatment alternatives, not specifically regulated under other subparts of RCRA, must prevent the release of hazardous constituents and must prevent future impacts on the environment.

RCRA, 40 CFR Part 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

Part 266 deals with both recycling/reuse activities and types of wastes being recycled or reused. Five types of recycling/reuse are included:

Subpart C - Applies to materials that in the process of being recycled are applied. These materials can be referred to as "use constituting disposal". The regulatory requirements for these actions are very similar to the requirements for land disposal.

Subpart E - Applies to used oil burned for energy recovery. The substantive requirements apply only to used oil that exceeds specified limits for heavy metals, flash point, and total halogens.

Subpart F - Applies to precious metal wastes that are processed for metal recovery. These requirements are administrative only.

Subpart G - Applies to spent lead-acid batteries that are being reclaimed. Only storage facilities for spent lead-acid batteries are regulated under this subpart.

Subpart H - Applies to hazardous wastes that are burned in boilers and industrial furnaces. Permitting requirements, emission standards, minimum storage requirements, record keeping, and operating requirements are established for this activity.

RCRA, 40 CFR Part 268 - Land Disposal Regulations (LDRs)

This regulation details procedures, design and operating requirements, monitoring requirements, recordkeeping, and closure and post-closure for land treatment units. Any land treatment facility employed in the treatment of hazardous waste should meet the construction, monitoring, operational, and closure standards established within this regulation.

Land disposal of RCRA hazardous wastes without prior treatment is prohibited. Waste at specific sites must be evaluated as to whether it meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility. Under the LDRs, treatment standards have been established for all listed wastes. If it is determined that hazardous wastes at the site are considered subject to LDRs, the material must be handled and treated in compliance with these regulations. To date, treatment standards for hazardous soil and debris (CSD) have been proposed, but not promulgated; however, if CSD fails the Toxicity Characteristic Leaching Procedure (TCLP) test, and are thus characteristically hazardous, disposal of treated wastes in a RCRA-permitted unit would be required

RCRA, Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris, 40 CFR Parts 148, 260, 261, 262, 265, 270 and 271

Contaminated debris can now be managed so that treated, cleaned debris may be disposed as non-hazardous waste. The treatment residual of the original contaminant remains a hazardous waste and must be disposed as such. Under this new rule,

debris must be treated to the performance or design and operating standards by a specified extraction or destruction technology identified in the rule, and it cannot exhibit a characteristic of hazardous waste. Residuals generated by the treatment of hazardous debris are subject to the numerical treatment standards for the waste which contaminated the debris.

A new waste management unit, a containment building, is established as part of this rule. This new unit allows wastes to be stored for up to 90 days without meeting treatment standards. Containment buildings granted 90-day status must meet the same substantive standards as permitted and interim status units.

Containment buildings are authorized for storage of dry wastes or wastes containing "very small quantities" of free liquids. Acceptable activities within the unit include storage of hazardous waste for treatment (including recovery and recycling) or transport off-site. Design and operating standards are promulgated in the rule to ensure containment of waste that is equivalent to the containment achieved by tanks.

RCRA, 40 CFR Part 270, Hazardous Waste Permit Program

This rule establishes provisions covering basic USEPA permitting requirements. RCRA permitting requirements need to be determined on a case-by-case basis, working with all involved regulatory agencies. However, any activity involving the treatment or containment of hazardous waste is subject to these permitting requirements.

RCRA, 40 CFR Part 280 - Underground Storage Tanks (USTs)

These regulations apply to USTs used to store "regulated substances," which are substances defined in Section 101(14) of CERCLA. The regulations do not apply to hazardous waste USTs.

Each UST must be properly designated and constructed. Any portion underground and any piping that routinely contains regulated substances must be protected from corrosion, in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory, as specified in the regulation. To prevent spilling and overfilling associated with product transfer to the UST, required spill and overfill prevention equipment must be used. All existing USTs must comply

with the new UST system performance standards, be upgraded, or undergo closure no later than December 22, 1998.

Additional requirements pertain to general operations (Subpart C), release detection (Subpart D), and release reporting investigation and confirmation (Subpart E). Of particular importance are the requirements under Subpart F (i.e., Release Response and Corrective Action for UST Systems Containing Petroleum of Hazardous Substances). Upon confirmation of a release, certain activities must take place, including an initial response, initial abatement measures and site check, initial site characterization, free-product removal, investigations for soil and groundwater clean-up, and a corrective action plan. To permanently close a UST, the requirements of Subpart G are applicable. The UST must be emptied and cleaned, and either removed or filled with an inert solid material. The site must be assessed for contamination at closure.

If it is determined that an UST at the site is the source of contamination and must be closed, these regulations must be attained when developing and implementing remedial alternatives.

RCRA, Hazardous and Solid Waste Amendment, 1984 (HSWA) Section 3004 (u) and (v) - Corrective Action Requirements

RCRA requirements which apply to alternatives involving off site treatment or disposal and are relevant and appropriate to on site treatment approaches include: standards for owners and operators of permitted hazardous waste facilities (i.e. preparedness and prevention, contingency plan and emergency procedures, recordkeeping and reporting, and groundwater monitoring). In addition, these alternatives should meet the intent of RCRA closure and post-closure requirements. Releases of RCRA hazardous constituents into all media, on- or off-site, are subject to the HSWA. Because the corrective action requirements are only now being developed by USEPA, CERCLA remedial actions must continue to operate within the RCRA requirements.

Rivers and Harbors Act, Section 10

Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This law would be applicable

during any remedial activity which involved dredge-and-fill activities which could potentially affect navigable waters.

SDWA, 40 CFR Part 141 - National Drinking Water Regulations; Maximum Contaminant Level Goals

The SDWA MCLGs are ARARs for aquifers and related groundwater used as a potable water supply source. MCLGs are nonenforceable health goals established by USEPA, however, the 1990 NCP recognizes MCLGs as potential ARARs. MCLGs are used in cases in which multiple contaminants or pathways of exposure present extraordinary risks to public health. In such cases, USEPA makes a site-specific determination of the more stringent standards. Non-zero MCLGs are considered potential relevant and appropriate ARARs for groundwater used as a current or potential source of drinking water. The NCP established that MCLGs equal to zero are not appropriate for setting cleanup levels. In those circumstances the corresponding MCL will be the potentially relevant and appropriate requirement. An example of this approach is found in determining potential ARARs for copper and lead. The MCLG for copper is set at 1300 µg/l, which is therefore the potential relevant and appropriate ARAR for copper. The MCLG for lead, on the other hand, was set at zero, which is not considered to be an "appropriate" standard for CERCLA cleanups. MCLGs are never applicable requirements at CERCLA sites because they are not enforceable. As discussed under MCLs, MCLGs could also be considered potential ARARs for surface water if the water bodies under consideration are not current or potential sources of drinking water.

SDWA, 40 CFR Part 141 - National Drinking Water Regulations, Maximum Contaminant Levels

The SDWA MCLs are legally enforceable federal drinking water standards. MCLs are commonly identified as ARARs for existing or potential future drinking water sources. However, MCLs would only be applicable where water at a CERCLA site is delivered through a public water supply system; they would be relevant and appropriate ARARs for existing or potential drinking water sources where it is not part of a public water system. MCLs could also be potential ARARs for surface waters if the surface water bodies on or potentially affected by the site not current or potential sources of drinking water.

SDWA, 40 CFR Part 143 - National Secondary Drinking Water Standards (SMCLs)

This regulation establishes SMCLs, which are non-enforceable limits intended as guidelines for use by States in regulating water supplies. These values are listed in Table A-1 under the Federal MCL column. Secondary drinking water criteria are identified with a "(2)" following the number.

SDWA, 40 CFR Parts 144, 146, 147, 1000 - Underground Injection Control Regulations

These regulations outline minimum program and performance standards for underground injection programs. Technical criteria and standards for siting, operation and maintenance, and reporting and recordkeeping as required for permitting are set forth in Part 146. This rule also provides for protection of underground sources of drinking water. Discharge of treated groundwater, by well injection, must be in accordance with all criteria and standards in these federal regulations, as well as meet all state Underground Injection Control Program requirements. Treated groundwater must meet all SDWA standards prior to well injection.

Solid Waste Disposal Act, Criteria for Classification of Solid Waste Disposal Facilities and Practices; (42 U.S.C. 6901-6987, 40 CFR Part 257)

This rule establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on human health or the environment and thereby constitute prohibited open dumps. If a remedial alternative involves on-site disposal, all limitations of this regulation must be met.

FEDERAL GUIDELINES TO BE CONSIDERED

USEPA Health Assessment Documents, Acceptable Intake, Chronic (AIC) and Subchronic (AIS)

The Acceptable Intake - Chronic and Acceptable Intake - Subchronic health assessment documents provide values developed for the Reference Doses (RfDs) and Health Effects Assessments (HEAs) for noncarcinogenic compounds. AIC and AIS values characterize the risks from these contaminants. This material provides guidance for assessing chronic and subchronic risks for noncarcinogenic compounds.

USEPA Human Health Assessment Cancer Slope Factors (CSFs)

Cancer Slope Factors are developed by the USEPA from HEA, or evaluation by the Human Health Assessment Group (HHAG). These values present the most up-to-date cancer risk potency information. HHAGs compute the individual cancer risk resulting from exposure to contaminants.

USEPA Office of Drinking Water, Health Advisories (HAs)

USEPA HAs are chemical concentrations based on estimates of risks due to consumption of contaminated drinking water. The HAs consider noncarcinogenic effects only, and should be considered for contaminants in groundwater used for drinking water.

Health advisories are estimates of risk due to consumption of contaminated drinking water. These advisories should be considered for contaminants in surface and groundwater which is or could potentially be used as a potable water source.

USEPA Reference Concentrations (RfCs)

RfCs are concentration levels developed by the USEPA for non-carcinogenic effects for lifetime exposure. RfCs values represent levels that, most likely, do not cause adverse effects to humans via inhalation of chemicals. RfCs are used to characterize

risks of soil and groundwater contaminant exposure (for the inhalation exposure scenario).

USEPA Reference Doses

USEPA RfDs are dose levels also developed for noncarcinogenic effects. RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure. RfDs are typically employed to characterize risks of soil and groundwater contaminant exposure for the dermal contact and ingestion pathways.

USEPA Office of Water Guidance, Water Related Fate of 129 Priority Pollutants (1979)

Presents chemical-specific fate and transport information for 129 priority pollutants. This document provides guidance to support the determination of contaminant fate and transport and is relevant to the site characterization, risk assessment, and fate and transport modelling components of the RI.

Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites; [OSWER Directive #9355.4-02]

Sets forth interim soil cleanup levels for lead in lieu of any USEPA verified toxicological values. Interim guidance recommends a cleanup level for total lead of 500 to 1,000 mg/kg. Site-specific conditions may warrant levels lower than 500 mg/kg, based on the exposure assessment.

APPENDIX A.2: SUMMARY OF WISCONSIN ARARS AND ADMINISTRATIVE CODE

Chapter NR 100: Environmental Protection

Chapter 100 outlines the discharge limits for both organic and inorganic mercury into State waters.

Chapter NR 102: Water Quality Standards for Wisconsin Waters

In conjunction with NR 103 to NR 105, this chapter establishes water quality standards for surface waters in the State of Wisconsin. This chapter describes the designated use categories for waters of the State and water quality criteria necessary to support these uses. The waters of the state are classified into fish and aquatic life categories described below:

- Great Lakes Communities; these waters include Lake Superior, Lake Michigan, and Green Bay and all associated bays, inlets, and spawning areas for anadromous fish species.
- Cold Water Communities; waters other than the Great Lakes communities which include surface waters capable of supporting cold water fish and other aquatic life or serving as a spawning area for such fish.
- Warm Water Sport Fish Communities; surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for such fish.
- Warm Water Forage Fish Communities; surface waters capable of supporting abundant forage fish and other aquatic life.
- Limited Forage Fish Communities; surface waters of limited capacity and naturally poor water quality or habitat, capable of supporting only a limited community of forage fish and other aquatic life.

- Limited Aquatic Life; surface waters of severely limited capacity and naturally poor water quality or habitat which are capable of supporting only a limited community of aquatic life.

NR 102 states that all waters must meet the following conditions at all times and for all flow conditions:

- Substances which cause objectionable deposits on the shore or in the bed of a body of water must not be present;
- floating or submerged debris, oil, scum, or other material must not be present; and
- materials which produce color, odor, taste, or unsightliness may not be present in amounts which interfere with public rs in state waters.
- Substances which are toxic or harmful to humans may not be present in amounts which are a significant public health threat or which are acutely harmful to animal, plant or aquatic life.

Section NR 102.04(4) establishes the following criteria for all waters classified for fish and aquatic life:

- Dissolved oxygen content in the surface waters may not be lowered to less than 5 mg/L unless a variance in granted in accordance with Section NR 104.02(3).
- Temperature changes may not be so extreme that they adversely affect aquatic life. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature may not exceed 5°F for streams and 3°F for lakes. The maximum allowable water temperature for warm water fish is 89°F.
- The range of pH must be within 6.0 to 9.0 with no change greater than 0.5 units outside seasonal minimum or maximum.
- Unauthorized concentrations of substances which are toxic to fish or aquatic life are not permitted.

- Streams classified as trout waters or as great lakes or cold water communities may not be altered so as to affect background temperature and dissolved oxygen levels.

Section 102.14 sets threshold concentrations for several substances causing taste and odor in water.

Chapter NR 103: Water Quality Standards for Wetlands

These regulations establish water quality standards for wetlands. The rule outlines the conditions necessary to protect water quality related functions and values of wetlands. To this end, the rule specifies that water quality values which must be protected include:

- storm and flood water storage and retention of water level fluctuation extremes;
- hydrologic function including the maintenance of dry season stream flow, discharge of groundwater to a wetland, recharge of groundwater from a wetland to another area, and the flow of groundwater through a wetland;
- filtration or storage of sediments, nutrients, or toxic substances that would have an adverse impact on other the quality of other state waters;
- shoreline protection against erosion through the dissipation of wave energy and water velocity and anchoring of sediments;
- habitat for aquatic organisms in the food web;
- habitat for resident and transient wildlife species; and
- recreational, cultural, educational, scientific, and natural aesthetic values and uses;

Wetland functional values and the impact of a proposed activity upon those values is determined using standardized wetland ecological methods such as:

- Wetland Evaluation Techniques (FHWA/COE);
- Wisconsin Wetland Evaluation Methodology;
- Hollands-Magee (IEP/Normandeau);
- Minnesota Wetland Evaluation Methodology for North Central United States; and the
- Wisconsin Department of Natural Resources Rapid Assessment Method.

Chapter NR 104; Uses and Designated Standards (formerly Intrastate Waters - Uses and Designated Standards)

Surface water classifications and effluent limitations are established in this rule. Classification by hydrologic characteristics includes the hydrologic description of lakes, diffused surface waters, wetlands, wastewater effluent channels, noncontinuous streams, and continuous streams. Effluent limitations for surface waters significant to the environmental integrity of the state or classified for fish and aquatic life, and wastewater treatment lagoons are also defined.

Chapter NR 106; Wisconsin Water Quality Standards; Procedures for Calculating Water-quality-based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Water

Wisconsin procedures for calculating effluent limitations are applicable to point sources that discharge wastewater containing toxic or organoleptic substances to surface waters. These regulations outline the calculations and data requirements necessary to calculate effluent limitations. If an alternative proposes to discharge treated groundwater at surface water body at BAAP, these requirements may apply.

Chapter NR 108: Wisconsin Water Quality Standards; Requirements for Plans and Specifications Submittal for Renewable Projects and Operations of Community Water Systems, Sewerage Systems, and Industrial Wastewater Facilities

This rule establishes protocols for plan reviews and standards for treatment facilities in order to meet effluent standards.

Chapter NR 109: Wisconsin Water Quality Standards; Safe Drinking Water

This rule establishes water quality standards for potable water. These standards apply to all new and existing public water systems. Public water system, under the definition provided in this rules, means any system that has at least 15 service connections. Because BAAP waters are not used as a drinking water source, this rule will not be considered during the FS and remedial actions.

Chapter NR 115: Wisconsin's Shoreland Management Program

Chapter NR 115 requires counties to establish shoreland ordinances for all unincorporated shoreland areas. Shorelands are defined as the areas within 1,000 feet of a lake, pond, or flowage, or within 300 feet of rivers or streams or the floodplain. Each county must adopt regulations that meet or exceed minimum state standards to protect water resource values: natural beauty, water quality, recreation and navigation, and fish and wildlife. At a minimum, the ordinances must include (1) minimum lot sizes; (2) building setbacks from property lines and waterways; (3) controls on cutting trees and shrubbery; (4) standards for filling, grading, lagooning, dredging, ditching, and excavating; and (5) restrictions on improvements to older structures or uses that do not meet shoreland standards.

As specified in Chapter NR 115, Sauk County has adopted the Sauk County Shoreland Protection Ordinance (Sauk County Code of Ordinances, Chapter 8). This ordinance defines minimum lot sizes, building setbacks, restrictions to existing structure modification, controls on tree cutting, standards for fill, grading, lagooning, dredging, ditching, and excavating. This regulation may be applicable if any site-specific FS actions involved any of these activities at defined shorelands or wetlands. The shorelands/wetlands district includes all shorelands within the jurisdiction of this ordinance which are wetlands of 5 acres or more, (excluding point symbols) and which are shown on the Wisconsin Wetland Inventory Maps that are adopted and

made a part of this ordinance. A portion of a wetland which is less than 5 acres in size, and which is located in the unincorporated shoreland area within the county, shall be included in the shoreland/wetland district where the wetland as a whole is 5 acres or larger, but extends across the corporate limits of a municipality, across the county boundary or across the shoreland limits, so that the wetland is not regulated in its entirety by the county.

If an existing town shorelands ordinance is more restrictive than the County ordinance, the town ordinance prevails in respect to the greater restrictions but not otherwise.

Specifically, regarding setbacks, "Unless an existing development pattern exists, a setback of 75 feet from the ordinary high-water mark of an adjacent body of water to the nearest part of a building or structure shall be required for all building and structures, except piers, boat hoists, and boathouses."

Chapter NR 116: Wisconsin's Floodplain Management Program

This chapter regulates all construction activities in the floodplain. Any construction activity must be evaluated for impact on upstream flooding. Generally, no activities are allowed in the "floodway" including solid or hazardous waste disposal.

Chapter NR 117: Wisconsin's City and Village Shoreland-Wetland Protection Program

Chapter NR 117 requires cities and towns to establish shoreland-wetland zoning ordinances that create shoreland-wetland zoning districts for all wetlands of 5 acres or more, located in shorelands within the incorporated area of the city or village. The state, with input from cities and villages, developed inventory maps showing the location and type of all wetlands. Cities and villages have the option of zoning any wetland within their incorporated area, including wetlands that are smaller than 5 acres in size.

The State of Wisconsin defines a wetland as an area in which water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions. The

shoreland zone is defined as the area within 1,000 feet of a lake, pond, or flowage, or within 300 feet of a stream or the floodplain, whichever is greater.

Although local governments may enact more restrictive standards, the state permits the following uses in wetlands:

- recreation, such as hunting, fishing, trapping, and hiking
- forestry, including limited water level manipulation and some road construction
- harvesting of wild crops
- pasturing of livestock, including fence construction
- agricultural cultivation, including maintenance of existing drainage systems
- some limited construction of small buildings needed to support open space or wetland preservation uses
- pier, dock, and walkway construction
- development of parks, recreation areas, and fish and wildlife habitat improvement projects
- limited utility construction
- limited road construction for farming and forestry
- limited railroad construction

Some additional uses are allowed in cities and villages. Every shoreland-wetland zoning ordinance or zoning code must provide a system to issue land use or building permits.

Potential wetlands have been identified at five BAAP sites. Shoreland-wetland requirements will be addressed for those remedial alternatives evaluated during the FS process involving land use or construction within a wetland zoning district.

Chapter NR 140: Wisconsin Groundwater Quality Standards

Wisconsin groundwater quality standards apply to virtually all facilities, activities, and practices regulated by the state which may affect groundwater quality. Chapter NR 140 encompasses the following relevant areas:

(1) it establishes two separate numerical standards for a wide group of pollutants. These are enforcement standards and preventative action limits (PALs) (Chapter NR 140.10 and Chapter NR 140.12).

(2) it specifies scientifically valid procedures for determining if a numerical standards has been attained or exceeded (Chapter NR 140.14);

(3) it specifies procedures for establishing points of standards compliance [Wisconsin Administrative Code (WAC), Chapter NR 140.22]; and,

(4) it establishes sets of ranges of responses required if a groundwater standard (PAL or enforcement standard is attained or exceeded [Chapters NR 140.24, NR 140.26, and NR 140.27]).

Under Chapter NR 140, two separate standards, an enforcement standard and a PAL, were developed for public health (NR 140.10) and public welfare (NR 140.12). Enforcement standards are set at concentrations greater than PALs.

PALs are developed by using a percentage of enforcement standards (i.e., 10 percent for carcinogenic compounds and 20 percent for noncarcinogenic compounds), and must be achieved if technically and economically feasible. The feasibility of complying with a PAL is determined on a case-by-case basis.

According to NR 140.22, when designing a facility, enforcement standards and PALs can be applied at the following locations:

- any point of current groundwater use
- any point beyond the boundary of the property on which the facility, practice, or activity is located
- any point within the property boundaries beyond the three-dimensional design management zone if one is established by Wisconsin

Department of Natural Resources (WDNR) at each facility, practice, or activity

For spills, discharges, and other remedial response actions, the point of standards application is every point at which groundwater is monitored to determine if a PAL or enforcement standard has been attained or exceeded.

Sections NR 140.24 and NR 140.26 delineate the range of remedial responses required after verification that PALs and enforcement standards are exceeded, respectively. In both sections, notification and evaluation criteria are presented. The difference in response requirements between NR 140.24 and NR 140.26 mainly are that WDNR, under NR 140.24, has the latitude to require no action, additional sampling, or further testing/study actions if a PAL is exceeded or attained. Under NR 140.24 the WDNR may also require the following responses:

- Revise the operational procedures at the facility, practice, or activity.
- Change the design or construction of the facility, practice, or activity.
- Develop an alternate method of waste treatment or disposal.
- Prohibit or close and abandon a facility, practice, or activity.
- Conduct a remedial action to renovate or restore groundwater quality.
- Revise rules or criteria on facility design, location, or management practices.

Under Chapter NR 140.26, if a determination is made that an enforcement standard is violated at a point of compliance WDNR requires one of the above actions with no exceptions (i.e., no provision for a no-action response).

Section NR 140.27 states that attainment or exceedance of an enforcement standard at a point other than a point of compliance requires a response the same as for NR 140.24.

Chapter NR 200: Wisconsin Water Pollution Control Regulations; Applications for Discharge Permits

Permits are required for discharges of pollutants from point sources to surface waters and to land areas where pollutants may percolate, seep to, or be leached to groundwaters. Definitions are provided for in the Water Pollution Control Regulations (Parts 200-239) and describes the requirements for discharge permits.

Chapter NR 205; Wisconsin Water Pollution Regulations; General Provisions

Wisconsin Pollutant Discharge Elimination System (WPDES) permit program is similar to the federal NPDES program under the CWA. Discharge of pollutants to waters of the state is prohibited without a valid WPDES permit. WDNR may impose monitoring, recordkeeping, and reporting requirements on the WPDES permit. Discharge standards are generally determined by the state on a case-by-case basis.

Chapter NR 215; Wisconsin Water Pollution Control Regulations; List of Toxic Pollutants

A list of toxic pollutants is provided in this chapter. According to the requirements of Chapter 147, Stats., all discharges containing these pollutants must not contain quantities of these pollutants which are greater than the amount which would remain after the discharge had received treatment by the best available technology economically achievable. Also, the quantities may also not exceed any lesser quantity necessary to provide an ample margin of safety, as determined by WDNR. Nearly all of the listed contaminants of concern for BAAP are included in this list of toxic pollutants.

Chapter NR 218; Wisconsin Water Pollution Control Regulations; Method and Manner of Sampling

This chapter provides the methods and manner for collection of effluent samples to comply with the monitoring requirements established in chapter 147, Stats., and WPDES permits. Methods for measuring flow rate, calibration of flow measuring devices, location of sampling points, and size and storage of samples is addressed.

Chapter NR 219: Wisconsin Water Pollution Control Regulations; Analytical Test Methods and Sampling Procedure

Analytical test methods, preservation procedures, requirements for laboratories, and procedures applicable to effluent limitations for discharges point sources are established in this chapter.

Chapter NR 220: Wisconsin Water Pollution Control Regulations; Categories and Classes of Point Sources and Effluent Limitations

Categories and classes of point sources and effluent limitations are established in this rule. This chapter also lists industries for which standards have been established. Explosives manufacturing is included in this list.

Chapter NR 400: Wisconsin General and Portable Sources Air Pollution Control Rules; Air Pollution Control Definitions

Definitions for Chapters NR 400 to 499 are included in this chapter.

Chapter NR 404: Wisconsin General and Portable Sources Air Pollution Control Rules; Ambient Air Quality Standards

Under WAC, Chapter NR 404, Wisconsin established primary and secondary ambient air quality standards for sulfur oxides, suspended particulates, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter with an aerodynamic diameter less than or equal to a nominal PM_{10}. The primary air standard is the level of air quality that provides protection for public health with an adequate margin of safety. The secondary air standard is the level of air quality that may be necessary to protect public welfare from unknown or anticipated adverse effects.

The secondary standard for total suspended particulates is 150 $\mu g/m^3$, maximum 24-hour average concentration, not to be exceeded more than once a year. The primary and secondary standards for lead and its compounds, measured as elemental lead, are 1.5 $\mu g/m^3$, maximum arithmetic mean average over a calendar quarter, as a constituent of suspended particulate matter. The primary and secondary standards

for PM_{10} are (1) 50 $\mu g/m^3$, annual arithmetic mean concentration, and (2) 150 $\mu g/m^3$, maximum 24-hour average concentration. Sulfur dioxide and nitrogen dioxide releases to the atmosphere may be of concern if soils contaminated with nitrates or sulfates are incinerated. The primary standards for sulfur oxides, measured as sulfur dioxide, are 80 $\mu g/m^3$, annual arithmetic mean, and 365 $\mu g/m^3$ maximum 24-hour average not to be exceeded more than once per year. The secondary standard is 1,300 $\mu g/m^3$, maximum 3-hour average concentration, not to be exceeded more than once per year. The primary and secondary standards for nitrogen dioxide are 100 $\mu g/m^3$, annual arithmetic mean. The standards may be applicable during excavation, incineration of soils, and construction-related activities at BAAP.

Chapter NR 406 and NR 409: Wisconsin General and Portable Sources Air Pollution Control Rules: Construction or Modification and New Operation Permits

Chapter NR 406 requires permits for construction or modification of stationary sources of air pollution and operation of new stationary sources. Section NR 406.04 identifies specific and general categories of sources exempt from the permit requirements. Specific categories of exempt sources include but are not limited to (1) certain fuel-burning equipment that does not burn hazardous waste; (2) equipment designed to burn solid wastes, which are not pathological wastes or hazardous wastes, at a rate of not more than 500 pounds per hour; (3) storage tanks containing petroleum liquid or organic compounds that are not volatile organic compounds (VOCs), with a maximum capacity of not more than 40,000 gallons; and (4) VOC storage tanks with a maximum capacity of not more than 10,000 pounds.

The regulations also include a general category of exempt sources, and identify certain pollutants and standards that may not be exceeded without considering pollution control equipment in order for the source to be exempt from the permit requirements. The exemptions apply when the following conditions exist:

- The source will not emit sulfur dioxide, carbon monoxide, or nitrogen oxides at a rate of more than 9 pounds per hour for each pollutant emitted, without considering pollution control equipment.

- The source will not emit particulate matter or organic compounds at a rate of more than 5.7 pounds per hour for each pollutant emitted, without considering pollution control equipment.

- The source will not emit PM_{10} at a rate of more than 3.4 pounds per hour, without considering pollution control equipment.

- The source will not emit any of the following air contaminants at a rate greater than the applicable emission rate listed:

  - fluorides, 3 tons per year
  - hydrogen sulfide, 10 tons per year
  - reduced sulfur compounds, 10 tons per year
  - total reduced sulfur, 10 tons per year
  - vinyl chloride, 1 ton per year

- The source's potential emissions at full capacity, without considering pollution control equipment, of any hazardous air contaminant listed in Chapter NR 445.04 are not greater than the emission rate listed.

- The source will not emit any air contaminant at a rate of more than 6 pounds per hour for each pollutant emitted, without considering pollution control equipment.

Under WAC, Chapter NR 409, a new permit must be obtained when a portable source is relocated to a new site. Portable sources are subject to the same exemptions for new stationary sources listed under Chapter NR 406.

Chapter NR 415; Wisconsin Particulate and Sulfur Emissions Rules; Control of Particulate Emissions

Chapter NR 415 applies to all air contaminant sources and requires precautions to be taken to prevent particulate matter from becoming airborne. Examples of precautions include but are not limited to use of water or chemicals for control of dust, application of plastic covering on material stockpiles and surfaces which can create airborne dust, or covering or securing of materials likely to become airborne while being moved on public roads. WAC, Chapter NR 415.05 specifies particulate emission limits for certain processes. In addition, particulate emissions limits were developed for fuel-burning equipment and incinerators (Chapters NR 415.06 and NR 415.07, respectively), depending on unit specifications. In particular, the limit for incinerators on which construction commenced after April 1, 1972, and which are rated at 4,000 pounds of waste per hour or more, is 0.15 pounds of particulate per

1,000 pounds of exhaust gas. The limit for incinerators rated at over 500 pounds and less than 4,000 pounds of waste per hour is 0.21 pounds of particulate per 1,000 pounds of exhaust gas. For incinerators rated at 500 pounds of waste per hour or less, other than prefabricated domestic incinerators below a 5-cubic-foot capacity, the limit is 0.30 pounds of particulate matter per 1,000 pounds of exhaust gas. Prefabricated domestic incinerators below a 5-cubic-foot capacity must not exceed the performance emission requirements prescribed by the United States of America Standards Institute for domestic incinerators (Standard Z21.6).

Chapter NR 419; Wisconsin Organic Compound Emissions Rules

Chapter NR 419 requires that reasonable precautions be taken when handling organic compounds to prevent spillage or escape or emission of organic compounds, solvents, or mixtures. In addition, no person may dispose of more than 5.7 liters of any liquid VOC waste, or any liquid, semisolid, or solid waste materials containing more than 5.7 liters (1.5 gallons) of any VOC, in any one day from a facility in a manner that would permit evaporation into the ambient air during the ozone season. This includes but is not limited to the disposal of VOCs that must be removed from VOC control devices so as to maintain the devices at the required operating efficiency.

The quantity of VOCs that evaporates into the ambient air during the ozone season must not exceed 15 percent (by weight) or 5.7 liters in any one day, whichever is larger. If remedial actions could result in the release of VOCs to the atmosphere, such as could occur during air stripping, this regulation will be considered.

Chapter NR 422; Control of Organic Compound Emissions from Surface Coating, Printing, and Asphalt Surfacing

This chapter establishes requirements for the control of emissions resulting from surface coating and printing processes and for the use of cutback asphalts for surfaces intended for use by motor vehicles, bicycles, and pedestrians. May be applicable if hot mix asphalt is selected as a remedial alternative.

Chapter NR 426; Wisconsin Carbon, Lead, and Nitrogen Emission Rules; Control of Carbon Monoxide Emissions

Chapter NR 426 states that carbon monoxide may not be emitted into the ambient air in concentrations which contribute substantially to exceeding of an air standard or which cause air pollution. New direct sources may not release significant emissions of carbon monoxide unless these emissions are subjected to incineration at 1,300°F for 0.3 seconds. The concentration of carbon monoxide can also be reduced by some other means to an equivalent amount.

Chapter NR 427; Wisconsin Carbon, Lead, and Nitrogen Emission Rules; Control of Lead Emissions

This chapter states that lead or lead compounds cannot be emitted to the ambient air in quantities that exceed an air standard or air increment, or which creates air pollution.

Chapter NR 428; Wisconsin Carbon, Lead, and Nitrogen Emission Rules; Control of Nitrogen Emissions

Chapter NR 428 states that nitrogen oxides or nitrogen compounds may not be emitted to the ambient air which substantially contributes to exceeding of a air standard or cause air pollution.

Chapter NR 429; Wisconsin Malodorous and Visible Emissions Rules; Control of Malodorous Emissions and of Open Burning

This chapter establishes emission limitation, odor tests, and abatement or control requirements for malodorous air contaminant sources and to limit the conditions under which open burning is permitted in order to protect air quality. Section 429.04 addresses exceptions for open burning of explosive or dangerous materials for which there is no other safe means of disposal.

Chapter NR 445; Wisconsin Hazardous Air Pollutants Emissions Standards

Chapter NR 445 applies to all air contaminant sources and to all owners or operators of an air contaminant source, unless it is a specifically regulated source under Chapters NR 446 through NR 449 or the NESHAPS. (NOTE: Chapters NR 446 through NR 449 and NESHAPS are not generally applicable to hazardous waste remedial activities because the activities do not usually use one of the specific source categories regulated. Chapters NR 446 through NR 449 and NESHAPS are intended for a specific type of source and not all sources of that pollutant.)

A hazardous air contaminant is defined as any air contaminant for which no ambient air quality standard is set in Chapter NR 404 of the WAC and which the department determines may cause or significantly contribute to mortality, or in a serious irreversible or incapacitating reversible illness, or may pose a significant threat to public health or the environment. Hazardous air contaminant emission concentrations are percentages of threshold limit values established by the American Conference of Governmental Industrial Hygienists. These percentages are specified in Chapter NR 445. Specific application of these standards will be determined on a site-specific basis during the FS process. Emission standards are listed for each contaminant for 24- and 1-hour averaging periods. The standards may be applicable to remedial activities that involve treatment by a process which generates hazardous air contaminant emissions. Some emission rates which may be considered at BAAP are listed in the following table.

Hazardous Air Contaminants with Acceptable Ambient Concentrations		
contaminants	*emission rate in lbs/hr w/emission points <25 ft*	*emission rate in lbs/hr w/emission points ≥25 ft*
P-Nitroaniline	0.249600	1.032000
Nitrobenzene	0.417600	1.752000
Diethyl phthalate	0.417600	1.75200
Trichloroethylene	22.485600	94.416000
Hazardous Air Contaminants with Acceptable Ambient Concentrations (compliance to be achieved by April 1, 1993)		
Dinitrotoluene	0.124800	0.504000
Aluminum - pyro powders	0.417600	1.752000
- soluble salts	0.165600	0.672000
Chromium (metal, compounds)	0.040800	0.170400
Cobalt (metal, dust)	0.004080	0.017040

Hazardous Air Contaminants Without Acceptable Ambient Concentrations Requiring Application of Best Available Control Technology	
contaminant	*lbs/years*[2]
Acrylonitrile	25.0
Carbon Tetrachloride	25.0
N-Nitrosodi-n-propylamine (total nitrosoamines)	250.0
Nickel Compounds	250.0

Chapters NR 500-520; Wisconsin Solid Waste Management Regulations

These regulations outline requirements for solid waste landfill construction, operation, and closure. The requirements include performance and location standards, and design, operation, and closure criteria.

A solid waste landfill may not be located within 1,000 feet of any navigable lake, pond, or flowage; 300 feet of any navigable river or stream; a floodplain; 1,000 feet of the nearest edge of any state trunk highway, interstate, or federal aid primary highway, or the boundary of any public park unless the landfill is not visible; or 1,200 feet of any public or private water supply well. The location of a solid waste landfill also must not cause significant adverse impacts to wetlands critical habitat areas, surface water, or groundwater.

Remedial actions that involve closure of a landfill that contains nonhazardous solid waste must comply with the design requirements outlined in WAC, Chapter NR 504.07. In general, all final cover systems must be designed to minimize leachate generation, reduce facility maintenance by stabilizing the final surface through design of compatible slopes and vegetation, minimize climatic effects, and provide removal of leachate and venting of gas.

When closing a facility, the owner or operator must notify the WDNR in writing at least 120 days prior to closing and restrict access within 10 days of ceasing to accept waste. Closure should be accomplished in the following manner unless a different closure plan or plan of operation has been approved:

1. The entire area previously used for disposal purposes must be covered with at least 2 feet of compacted earth sloped adequately to allow surface water runoff.

2. Surface water run-on must be diverted around all areas used for waste disposal to limit the potential for erosion and increased infiltration. Drainage swales conveying surface water runoff over previous waste disposal areas must be lined with a minimum thickness of 2 feet of clay.

3. The final slopes of the facility must be greater than 2 percent, but must not exceed 3 horizontal to 1 vertical.

4. The finished surface of the disposal area must be covered with a minimum of 6 inches of topsoil.

5. The area must be vegetated within 90 days after ceasing to accept wastes or, if waste termination is after September 15, within 90 days after March 15 of the following year.

The WDNR may require the facility to have a gas venting system if necessary. Under Section NR 508.04, WDNR may require monitoring at existing facilities, regardless of whether the facility remains in operation. Specifications for monitoring are outlined. Sampling frequency for groundwater is based on the size of the facility. Leachate head wells must be measured at least monthly for leachate level elevations. Sampling parameters must be specified in writing by the WDNR.

Chapter NR 600: Hazardous Waste Management Rules; General

This chapter provides definitions for Wisconsin's Hazardous Waste Management Rules (Chapters NR 600-699) and general permit application information. Section NR 600.04 also specifies four prohibited activities:

- underground treatment of any hazardous waste through a well;
- land treatment of any hazardous waste;
- the use of solid waste, used oil, or other material which is contaminated or mixed with a hazardous waste for dust suppression or road treatment; or
- the placement of any noncontainerized or bulk hazardous waste in a salt dome formation salt bed formation, underground mine, or cave.

This chapter also incorporates reference citations and general information concerning the hazardous waste management program.

Chapter NR 605: Wisconsin Hazardous Waste Management Rules; Identification and Listing of Hazardous Waste Rules

These rules establish criteria for identifying the characteristics of hazardous waste and establishes a list of hazardous wastes based on these criteria. These rules are used to determine if waste handled by a solid waste generator, transporter, or owner/operator of a solid waste facilities is a hazardous waste subject to regulation.

Chapter NR 610: Wisconsin Hazardous Waste Management Rules; Small Quantity Generator Standards

This chapter specifies requirements that apply to small and very small quantity generators of hazardous waste. This rule defines very small generators as producing less than 100 kilograms of hazardous waste in a calendar month; and does not accumulate at any time quantities of hazardous waste greater than 1000 kilograms. Very small generators are exempt from full regulation if the requirements listed in NR 610.07 are met. BAAP is most likely a very small generator of hazardous waste. That waste is the result of burning of propellants in a steel burning dish, which generates a very small quantity of ash.

Chapter NR 620: Wisconsin Hazardous Waste Management Rules; Hazardous Waste Transporter Standards

The requirements which apply to the transportation of hazardous waste, as well as the licensing requirements for transporters of hazardous waste, are established in this chapter. Requirements for the implementation of a manifest system are described in NR 620.07 The rules also outlines the packaging, labeling, marking and placarding requirements in NR 620.11 which must be met for a transporter to move a transport vehicle containing hazardous waste. The rule states that packing must be conducted in accordance with 49 CFR Part 173, November 1, 1985 and labeled, marked, and placarded in accordance with 49 CFR Part 172, November 1, 1985

Chapter NR 625; Wisconsin Hazardous Waste Management Rules; Hazardous Waste Recycling Standards

This regulation provides exemptions from the requirements of NR 600.04 and Chapters NR 630 through 680 for legitimate recovery or reclamation of hazardous waste.

Chapter NR 630; Wisconsin Hazardous Waste Management Rules; Storage, Treatment and Disposal Facility General Standards

This chapter specifies the general requirements that apply to the storage, treatment, and disposal of hazardous waste. Chapter NR 630.12 describes the requirement for general waste analysis for hazardous waste. This rule requires that an owner or operator of a hazardous waste facility conduct a detailed chemical and physical analysis of a representative sample of waste before treatment or disposal of any hazardous waste. Chapter NR 630.13 describes the waste analysis plan which must be prepared and followed by the owners and operators of a hazardous waste facility. This rule further specifies locations where a hazardous waste facility may not be located, including:

- Floodplains
- Wetlands
- Endangered species habitats
- Within 200 feet from facility property line without locking (subject to WDNR ruling)
- Within 200 feet of a fault which has had displacement during the Holocene time.

The rule also establishes standards for open burning and detonation of explosives in NR 630.20. Table VII, in Section 623.20, establishes the minimum distance, from open burning or detonation of waste explosives or propellants, to the property owned by other persons.

Section NR 630.21 establishes preparedness and prevention measures required in the design, construction, maintenance, and operation of a hazardous waste facility. Requirements for a contingency plan are detailed in Section NR 630.22.

Chapter NR 635: Wisconsin Groundwater Standards for Hazardous Waste; Groundwater and Leachate Monitoring Standards and Corrective Action Requirements.

This rule specifies groundwater and leachate monitoring requirements, as well as corrective action requirements resulting from a monitoring program. Existing landfills or impoundments are defined as facilities having accepted hazardous waste after November 19, 1980 but not after July 26, 1982. The monitoring requirement for existing landfills is contained in Section 635.17. The requirements of Section NR 635.05 and 635.16 apply to all landfills, surface impoundments, and waste piles that accepted wastes after July 26, 1982.

Solid waste disposal facilities which are approved under NR 506.15 to accept hazardous waste only from very small quantity generators are exempted from this rule.

Chapter NR 640: Wisconsin Hazardous Waste Container Standards

This rule provides environmentally acceptable hazardous waste treatment and storage operations for hazardous waste facilities that store or treat hazardous waste in containers. Small quantity generators accumulating waste on-site in containers which are in compliance with Chapter NR 610 and large quantity generators who are in compliance with Chapter NR 615. This rule may apply if hazardous wastes are held in containers on site prior to or during on-site treatment. A totally enclosed treatment facility, however, would be exempted from this rule.

Chapter NR 645: Wisconsin Hazardous Waste Tank System Standards

This rule provides environmentally acceptable hazardous waste treatment and storage operations for hazardous waste facilities that store or treat hazardous waste in tank systems. Small quantity generators accumulating waste on-site in tanks which are in compliance with Chapter NR 610 and large quantity generators who are in compliance with Chapter NR 615. This rule may apply if hazardous wastes are held in containers on site prior to or during on-site treatment. A totally enclosed treatment facility, however, would be exempted from this rule.

Chapter NR 655: Wisconsin Hazardous Waste Pile Standards

This chapter specifies the requirements which apply to hazardous waste piles. The rule states that an interim license, operating license, variance, or waiver from the department must be obtained to store or treat hazardous waste in a waste pile. Section 655.05 establishes that the design, construction and operational requirements specified in sections NR 655.07, 655.10, 660.11, 660.12, and 660.13 and the monitoring requirements in NR 635 be met. This rule may be considered during the FS process if hazardous materials are stored in a waste pile prior to or during treatment.

Chapter NR 635: Wisconsin Groundwater Standards for Hazardous Waste: Groundwater and Leachate Monitoring Standards and Corrective Action Requirements.

This rule specifies groundwater and leachate monitoring requirements, as well as corrective action requirements resulting from a monitoring program. Existing landfills or impoundments are defined as facilities having accepted hazardous waste after November 19, 1980 but not after July 26, 1982. The monitoring requirement for existing landfills is contained in Section 635.17. The requirements of Section NR 635.05 and 635.16 apply to all landfills, surface impoundments, and waste piles that accepted wastes after July 26, 1982.

Solid waste disposal facilities which are approved under NR 506.15 to accept hazardous waste only from very small quantity generators are exempted from this rule.

Chapter NR 660: Wisconsin Hazardous Waste Landfill Standards: Landfill and Surface Impoundment Standards.

This chapter applies to owners and operators of facilities that treat, store, or dispose of hazardous waste in landfills or surface impoundments. Specific location restrictions are given in Section NR 660.06. The chapter also discusses the requirements for initial site inspection and report, feasibility report, plan of operation, and minimum design requirements in Sections NR 660.07, 08, 09, 10, and 13, respectively.

Exemptions to this rule include surface impoundments which have discharges regulated under Chapter 147, a solid waste disposal licensed under Chapters 500 to 522, and facilities operating under interim licenses.

Chapter NR 665: Wisconsin Hazardous Waste Incinerator Standards

Requirements and standards that apply to incinerators that burn hazardous waste are addressed in this chapter. This rule requires that an interim license, operating license, variance, or waiver be obtained to incinerate hazardous wastes in accordance with NR 600.9 and NR 680.

Prior to constructing a hazardous waste incinerator an initial operating license under NR 680 must be obtained. This requires an approved feasibility study and plan or operation report. The requirements for these reports in provided in NR 665.06. Operation requirements for incinerators include:

- operation of the incinerator should minimize interference with other activities.
- A sign must be posted to show the name, license number, and hour of operation.
- All hazardous waste must be confined to a designated storage area.
- Hazardous waste may only be stored in tanks or containers in accordance with NR 640 and NR 645.
- The incinerator must be brought to steady state, normal conditions, including steady state temperature and air flow, using auxiliary fuel or other means, before adding hazardous waste.
- Records must be maintained for a minimum of 3 years, including records of weights of materials incinerated, the quantity of resulting residue, and hours of plant operation.
- Records must detail all training required and completed.
- Adequate cleaning equipment must be available.

- Charging openings and other equipment must be provided with adequate safety equipment.
- WDNR must be allowed to inspect new incinerators after completion and at least 10 days prior to operation.
- Monitoring and inspections must be conducted in accordance with section NR 665.09(11)(a-g).
- An automatic cut off device must be operational which will cut off waste feed when a deviation from or exceedance of the limits.
- Required removal efficiencies for a variety of wastes is provided in section NR 665.09(13).
- Operations must conform to the requirements specified in the license.
- The department will specify acceptable operating limits based on the results of the analysis and trial burns.
- Hazardous waste may not be fed into the incinerator during start-up or shut-down unless the incinerator is operating within the conditions of operation.
- Fugitive emissions must be controlled by either: (1) keeping the combustion zone sealed; (2) maintaining a combustion zone pressure of lower the atmosphere; or (3) an alternate means equivalent to (2).
- The incinerator must cease operations if waste feed, incinerator design, or operating conditions exceed limits designated in license.
- The incinerator must be designed to meet the requirements in NR 640.06.

The rule further states that throughout the operating period, unless the owner or operator can demonstrate that the residue removed from the incinerator is not a hazardous waste, the owner or operator becomes a generator of hazardous waste.

Chapter NR 670: Miscellaneous Hazardous Waste Standards; Miscellaneous Unit Standards

This chapter specifies requirements that apply to facilities that are not specified otherwise. Prior to establishing or constructing a miscellaneous unit, an operating license must first be issued following approval of a feasibility study and plan or operation report.

Standards for miscellaneous units are based on protection of human health and the environment that may be due to migration of waste constituents: in the groundwater or subsurface environment; in surface water, wetlands, or on the soil surface; and in the air. Parameters which must be considered are described in section NR 670.08.

Requirements for thermal treatment facilities other than incinerators is addressed in section NR 670.11.

Chapter NR 675: Wisconsin Hazardous Waste Land Disposal Restrictions

This chapter identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be disposed of on land. An exemption from this rule may be obtained if certain conditions are met. This exemption would allow wastes which are otherwise prohibited from land disposal to be treated in a surface impoundment. Evaporation of hazardous constituents as the principal means of treatment is not included in this exemption. Treatment standards are expressed as concentrations of waste extract for contaminants of concern.

Chapter NR 680: Hazardous Waste Facility Licensing Regulations

Minimum standards for reports, plan submittals, and the issuance of licenses and variances for facilities which recycle, treat, store, or dispose of hazardous waste are established in this chapter. The fee schedule for facilities other than landfills and surface impoundments is provided in Table XII of the rule. The fee schedule for landfill and surface impoundments is provided in Table XIII.

Chapter NR 685: Hazardous Waste Facility Closure Regulations

This chapter establishes requirements for closure, long-term care, and financial responsibility of hazardous waste facilities.

Closure performance standards require that a hazardous waste facility must be closed in a manner that: minimizes further maintenance; manages post closure escape of wastes, hazardous leachate, contaminated runoff or waste decomposition products to ground or surface waters or the atmosphere; and meets other closure requirements established with the Wisconsin Hazardous Waste Management Rules.

The rule further establishes that the owner must provide long-term care for the closed hazardous waste facility for 30 years after closure.

Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements

This statute outlines permit requirements for structures and deposits in Wisconsin navigable waters and for enlargement of waterways. These requirements will be considered and complied with when developing and implementing remedial actions at BAAP that involve navigable waters. Under Section 30.12, it is unlawful to deposit any material or to place any structure on the bed of any navigable water without a permit where no bulkhead line has been established or beyond a lawfully established bulkhead line. A structure must not materially obstruct navigation or reduce the effective flood flow capacity of a stream, and must not be detrimental to the public interest.

Under Section 30.19, unless a permit has been granted, it is unlawful to construct, dredge, or enlarge any artificial or natural waterway, canal, channel, ditch, lagoon, pond, lake, or similar waterway where the purpose is ultimate connection with an existing navigable stream, lake, or other navigable waters, or where any part of the artificial waterway is located within 500 feet of the ordinary high-water mark of an existing navigable stream, lake, or other navigable waters. A permit is also required for grading or removing topsoil from the bank of any navigable stream, lake, or other body of navigable water where the area is exposed by the grading and where removal will exceed 10,000 square feet. Exceptions are granted for public highways, agricultural uses, lakes and streams located in certain counties with a population of 750,000 or more, and any work required to maintain the dimensions of an enlarged waterway.

Chapter 30 also addresses bridge construction and maintenance, waterfowl habitat management, cutting weeds in navigable waters, wharves, piers, swimming rafts, diversions of water from lakes and streams, and removal of material from beds of navigable waters.

If the response action is conducted entirely on-site, a permit would not be required.

City of Baraboo Floodplain Zoning Code (Subchapter II)

The Baraboo Floodplain Zoning Code divides floodplain areas into three districts: the Floodway District, the Flood Fringe District, and the General Floodplain District. The Floodway District is the channel of a stream and those portions of the floodplain adjoining the channel that are required to carry and discharge the floodwater or flood flows of any river or stream associated with the regional flood. The Flood Fringe District is the area between the regional flood limits and the floodway area. The General Floodplain District is the land that has been or may be hereafter covered by floodwater during the regional flood and encompasses both the Floodway and Flood Fringe districts.

Certain activities are prohibited or subject to specific restrictions in floodplain areas. Within the Floodway District, only open space having low flood damage potential and not obstructing flood flows is permitted, including agricultural uses, nonstructural industrial or commercial uses (e.g., parking lots), public and private recreational uses, extraction of sand or gravel, marina- and boat-related structures, railroads, pipes, streets, and culverts. Specific standards for developments in floodway areas are listed.

In the Flood Fringe District, any structures, land use, or development may be permitted, provided a land use permit has been issued by the Building Inspector. Manufacturing and industrial buildings, structures, and accessory uses must be elevated or flood-proofed to 2 feet above the regional flood elevation. The storage or processing of materials that are buoyant, flammable, or explosive, or which in times of flooding could be injurious to human, animal, or plant life, must be at or above the flood protection elevation or flood-proofed. All solid waste disposal sites, whether public or private, are prohibited in flood fringe areas.

A building permit must be obtained for construction in a floodplain. Flood-proofing measures must be designed consistent with the flood protection elevation for the particular area associated with it. The applicant must submit a plan or document

certified by a registered professional engineer or architect that the flood-proofing measures are adequately designed for protection to the flood protection elevation for the particular area. All flood-proofing must provide anchorage to resist flotation and lateral movement.

All zoning and permit requirements associated with activities within a floodplain will be considered if remedial or construction activities at BAAP involve work in a floodplain.

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ACLs	Alternate Concentration Limits
AIC	Acceptable Intake - Chronic
AIS	Acceptable Intake - Subchronic
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
BAAP	Badger Army Ammunition Plant
BACT	Best Available Control Technology
BOD	biochemical oxygen demand
CAA	Clean Air Act
CAAAs	Clean Air Act Amendments
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSD	Treatment standards for hazardous soil and debris
CSFs	Cancer Slope Factors
CWA	Clean Water Act
DOT	Department of Transportation
EO	Executive Order
ESA	Endangered Species Act
FS	Feasibility Study
FWQS	Surface Water Quality Standard
HA	Health Advisories
HAPs	Hazardous Air Pollutants
HEAs	Health Effects Assessment
HHAG	Human Health Assessment Group
HSWA	Hazardous and Solid Waste Amendment
LDRs	Land Disposal Regulations
MACT	Maximum Achievable Control Technology
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
mg/L	milligrams per liter

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
OSHA	Occupational Health and Safety Act
PAL	preventative action limits
POTW	publicly owned treatment works
PSD	Prevention of Significant Deterioration
RfC	Reference Concentration
RfD	Reference Dose
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SIPs	State Implementation Plans
SMCLs	National Secondary Drinking Water Standards
SPCC	Spill Prevention, Control, and Countermeasure
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
tpy	tons/year
TSDF	transfer storage and disposal facility
TSP	total suspended particulate matter
TSS	total suspended solids
$\mu g/m^3$	micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
VOCs	volatile organic compounds
WAC	Wisconsin Administrative Code

WDNR	Wisconsin Department Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System

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APPENDIX B

SOIL VAPOR SURVEY

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APPENDIX B: SOIL VAPOR SURVEY

B.1 STANDARD OPERATING PROCEDURES

This section contains the standard operating procedures followed by Northeast Research Institute Inc. (NERI) of Farmington, Connecticut, while performing the Petrex soil vapor survey at BAAP during the RI.

B.1.1 Sample Production and Preparation

Charcoal Sieving. The static volatile organic compound (VOC) collector is prepared by applying presieved activated charcoal to the end of a ferromagnetic wire.

Charcoal Bonding. The procedure for preparing the activated charcoal is proprietary information. The procedure results in the production of a collector consisting of size-sorted activated charcoal bonded to the area within 1 cm of the end of a ferromagnetic wire with a Curie point of 358°C.

Collector Containers. Culture tubes, measuring 25 mm by 125 mm and having a screw cap closure, are washed in a biodegradable detergent, rinsed in methanol, and baked at 180°C for 1 hour.

Wire Cleaning. The previously constructed wires are cleaned by heating in a special apparatus at 358°C a total of 35 times. The wires are cleaned in lots of 32 wires. From each lot, two wires are removed for immediate analysis to verify the cleanliness of the lot. The remaining 30 wires are then sealed in one clean culture tube under an inert atmosphere and placed in inventory.

Packaging for Client. Immediately prior to shipping the wires to the field, the tubes containing 30 wires are removed from inventory and the wires are repackaged under an inert atmosphere in individual tubes. Ten percent of the repackaged tubes contain two wires and are called "duplicates." The collectors are packaged by double bagging in Ziploc bags in an inert atmosphere. These bags are then placed in inventory in a temperature-controlled room.

Quality Control and Quality Assurance. Prior to releasing stocked wires for a field survey, two single wires from each lot are checked for cleanliness and collecting potential. This QA/QC phase measures and documents collector preparedness when leaving the laboratory. One of these wires is analyzed without exposure in order to demonstrate that the lot is clean, and the other wire is exposed to hexane vapor for 2 seconds and then analyzed in order to verify that the charcoal is highly adsorptive. The duplicates are used when the wires return from the field. These wires help determine the required machine sensitivity and act as a measure of reproducibility.

Custody Document. A "custody document" accompanies each group of collectors leaving the laboratory and remains with the group until the collectors have been exposed, analyzed, and are disposed of.

B.1.2 Field Operations

Locating Sample Sites. Sample placement sites, usually predetermined on an accepted survey proposal, are located from a nearby, surveyable landmark using a compass and pacing or some other measuring device (e.g., pacing wheel, hip chain, or tape measure). A transit may be used for more accurate placement, but such accuracy is seldom required.

Soil Coring. Once a sample site has been established, a hole is cored to a depth of 1 to 3 feet, depending on the soil nature (sample placement depth is held constant for a given survey). This is accomplished using a variety of tools depending on the nature of the material to be cored. The holes should be vertical and as free from debris as possible. When the sampling is performed in areas covered by asphalt or concrete, a generator-powered rotary hammer drill with a carbide-tipped bit is used to drill a 1½-inch-diameter hole in the cover. A hand auger is used to remove the cuttings and road base from the hole, and then to extend and deepen the hole for collector placement.

Collector Placement. Immediately after the hole is cored, a collector tube is removed from the Ziploc bag and the bag is resealed. The cap is then removed from the tube, and the tube is placed vertically, open end down, into the hole. The hole is then backfilled with the soil core which was removed. The cap is placed in a clean Ziploc bag and stored until collector retrieval. Collectors placed under asphalt or concrete are treated the same as those in uncovered soil, except for modifications to permit easy retrieval and to avoid potential downhole contamination from surface cuttings. To allow retrieval of these collectors, a piece of galvanized wire is twisted

around the neck of the tube and run to the surface so that the sample may be recovered by pulling the wire. Once the collector is placed in the hole, sterile sand is used to backfill the hole to a point well over the top of the sample. An aluminum plug is then placed near the top of the hole, and the remainder of the hole is filled with the sterile sand.

Site Identification. Each site is flagged using pin flags or ribbon flagging, and the site location is marked and numbered on a base map. A field notebook is used to record the date, collector number, site location description, soil type, and general observations.

Exposure Time. Time calibration collectors are included as part of every survey. These are QA collectors used to monitor sample loading during the survey. These collectors are placed in an area of known or suspected contamination, and sets are retrieved and analyzed at intervals to indicate the appropriate residence time for survey samples. Separate "travel blank" collectors are also included as a QC measure in every survey. These collectors are buried along with the survey collectors, but the tubes are never opened. These control collectors monitor for contamination during transport or placement.

Collector Retrieval. The collectors are retrieved when the time calibration collectors reveal that there has been sufficient loading of gases on the charcoal absorbent. In the field, the soil is removed until the tube is exposed. A cap is taken from the sealed Ziploc bag. The Teflon seal is checked to make sure it is seated inside the cap. The culture tube is removed from the hole and any dirt that is on the threads of the tube is wiped off with a clean cloth. In the event the tube is broken or cracked, the collector wire is transferred to a new tube using forceps. The tube is capped and sealed. All flagging material is retrieved.

Collector Numbering. Each tube is immediately numbered according to the scheme established in the field notes and on the base map. The collector number is written on adhesive labels which are applied to the tube cap. No two sites may have the same number.

Collector Shipment. Once the collectors have been retrieved, they are sealed in double Ziploc bags, wrapped, and then padded with bubble packing. Material such as Styrofoam peanuts or newsprint can introduce possible contaminants to the collectors and should not be used for packaging. The collectors, field notes, base map, and chain-of-custody document are either hand-carried back to NERI's

analytical laboratories in Lakewood, Colorado, or are shipped by overnight carrier service.

B.1.3 Collector Analysis

Numbering Check. Upon receipt of the collectors, the number on each tube is recorded and any missing or duplicated numbers are noted. A missing number generally indicates that the collector could not be retrieved. Samples with identical numbers generally cannot be used unless their true site location can be established.

Instrumentation. Thermal desorption is accomplished using a Fisher radio frequency power supply and a Curie point pyrolyzer designed by NERI and Extrel. The mass spectrometer used is an Extrel SpectrEL quadruple mass spectrometer. A few Petrex wire samples contained several compounds. NERI desorbed some of the duplicate backup wires by another technique using pyrolysis/GC/MS. This technique enabled detection of many more compounds at very low detection limits. Using this method on a number of wires, the presence of carbon tetrachloride was confirmed. In addition, several other compounds were identified as present in certain areas, including dichlorobenzene, hexachloroethane, nitrobenzene, nitrotoluene, dinitrotoluenes, dinitrophenol, dinitrobenzene, trinitrotoluene, and hexachlorobenzene. The analysis is controlled and recorded by DEC PDP 11/23 microcomputer. Following the analysis, all data are collected and archived on a PDP 11/73 microcomputer. Data for all active jobs are stored on both of the PDP 11 computers, as well as on magnetic tape. Data for all completed jobs are stored on magnetic tape in perpetuity.

Calibration. Mass assignment, sensitivity, and resolution are manually adjusted using a Perfluorotributylamine (PFTBA) standard. Following tuning, the spectrum of PFTBA is collected under computer control and the digital spectrum is compared to the known spectrum of PFTBA with respect to sensitivity, response linearity, and mass assignment. If more than three of the measured peaks deviate from the published values by greater than 0.1 amu, or if any single peak deviates by greater than 0.2 amu, the instrument is tuned again.

Instrument Parameters. The instrument is operated with the following parameters.

Vacuum	$< 3x10^{-6}$ torr
Ionization Energy	70.0 eV
Ionization Current	12.0 mA
Desorption Time	5.0 sec
Desorption Temperature	358°C
Number of Scans/Sample	30
Scan Rate	1,250 amu/sec

Mass Spectrometer Analysis and QA/QC. Each collector wire is analyzed in random order. The entire group of survey collectors are analyzed as one run without interruption from other surveys.

The organic gases adsorbed on the carbon are thermally desorbed from the carbon, separated according to ion mass, counted, and a mass spectrum of masses from 15 to 240 is obtained.

Periodic (approximately every 20 samples) machine background analyses are performed as a QC measure to assure minimal influence from internal communication. If there are peaks that are not related to atmospheric gases, the supervisor is notified and the mass spectrometer is shut down and cleaned as necessary.

A written sample number record is kept during the analysis to prevent accidental cross-numbering. The mass spectrometer control program prompts the operator with a warning if a sample number is entered that has already been used. The operator then checks the current number, along with the disk storage location of the previously entered number, to identify the true numbering situation.

Data Filing. The raw data file generated by the sample analysis is labeled for storage under a unique file name.

Detection Limits. The sensitivity of the Petrex method can be estimated by making the assumption that there is free soil gas to be sampled continuously in the vadose zone. We have determined by the spiking of Petrex wires that we have the following mass spectrometric system detection limits.

TYPICAL CHLORINATED SOLVENTS	PETREX WIRE	APPROXIMATE FIELD (25 DAYS)
Tetrachloroethylene	10 ng	15 ppt
Trichloroethylene	10 ng	15 ppt
trans-1,2-Dichlorethylene	50 ng	60 ppt
Dichloromethane	25 ng	60 ppt
Trichloromethane	10 ng	30 ppt
Tetrachloromethane	20 ng	30 ppt
Vinyl Chloride	50 ng	200 ppt

ng = nanograms; ppt = parts per trillion

Because we put the entire wire into the mass spectrometer, 99 percent of the passively adsorbed compounds end up in the quadrapole for detection. If we assume a sampling rate of the Petrex collector to be approximately 10 cubic centimeters per minute, we can calculate the approximate field (25 days) sensitivity.

The working range of the methodology relates somewhat to the performance of the mass spectrometer and the linear range of the detector system. When dealing with individual ions, we have a 10^5 ion count working range and a saturation value of approximately 2.4×10^5. We can correct target ions for saturation in clusters by using adjacent ratios to extend the target ion above the 2.4×10^5 saturation range. Generally, uncertainties in these mass spectrometric measurement and detection issues are not a major contributor to the mapping of ion flux or our interpretation of compound anomalies. The typical flux or ion count range for soil gas concentration is 10 to 5,000 ng on wire adsorption or 10 ppt to 2.4 parts per billion (ppb) for an average 25-day survey.

If you review our calibration procedure, you will see that much emphasis is put on FC43 tuning ratios. We assure reference tuning ratios which are equivalent to what is recommended for USEPA work. Representative duplicate wires are used to establish an initial working range for a set of target compounds. Then, those conditions are held constant throughout the run.

B.1.4 Data Interpretation and Presentation

Map Generation. The sample location maps are created by placing the field base map on a digitizing board and entering each site as an X-Y coordinate relative to some surveyable feature at the site. The relative ion counts for each compound can then be plotted at the sample locations. Cultural and topographic features can also be digitized onto the map as reference points.

Compound Identification. The mass spectrum that is drawn for each sample is compared to a library of mass spectra derived from known VOCs. Several thousand pure compound spectra have been developed by the Bureau of Standards and are available for spectra comparison. NERI has also developed its own library of spectra through headspace analysis of pure compounds using the Petrex wires. Once a compound has been identified in this manner, the ion current or "flux" for this compound is defined as the total ion current for the "parent peak" of that compound.

Relative Flux Determination. The process of determining ion currents (relative intensities) of indicator peaks is computerized. All ion current data are extracted from the original data file and are processed for identification.

The relative ion current intensity (relative intensities) of the gases that are desorbed from the collectors are matched with sample locations on a map of the survey area. These relative intensities are useful for inferring the areal extent of contamination and relative differences in the concentrations of the compounds in the soil or groundwater. This can aid in determining the direction of source areas or direction of movement of contamination.

These surface collections and analyses cannot be used to determine the depth to the source contaminants or the precise concentration at depth. Because compounds can be differentiated by their spectra, analyses from the carbon collectors can be used to help differentiate multiple compounds and multiple source areas within a single survey.

Data Interpretation. Once the relative intensities for the compound in question are mapped, the data can be contoured to reveal those areas with "hot spots" and the orientation of plume migration. All other available data, such as geologic setting, soil types, groundwater conditions, type of contaminant, site history, and other factors are taken into account as the interpreter draws conclusions. One conclusion may be

that not enough data are available, and a follow-up survey may be recommended to further clarify the interpretation.

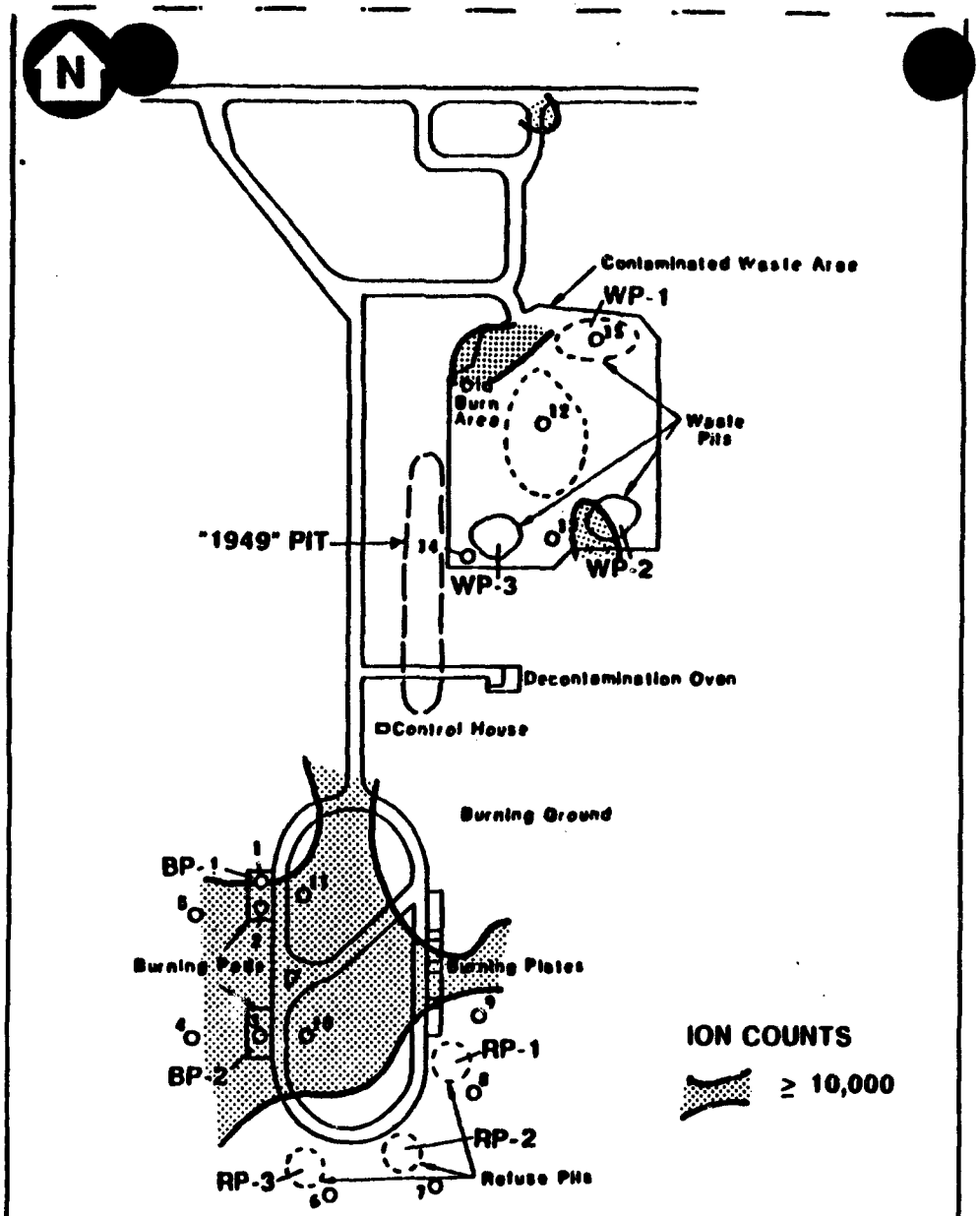
Data Presentation. Once the data has been compiled, interpreted, and mapped, a report describing the Petrex technology, the survey design and results, interpretations, conclusions, and recommendations is produced for the client's use. Also, the maps are printed which display compounds of the client's specifications. These reports and maps are for the client's use only, and no report or map is released to anyone else without prior written consent of the client. This confidentiality policy is never breached.

B.1.5 Interpretation of Petrex Maps

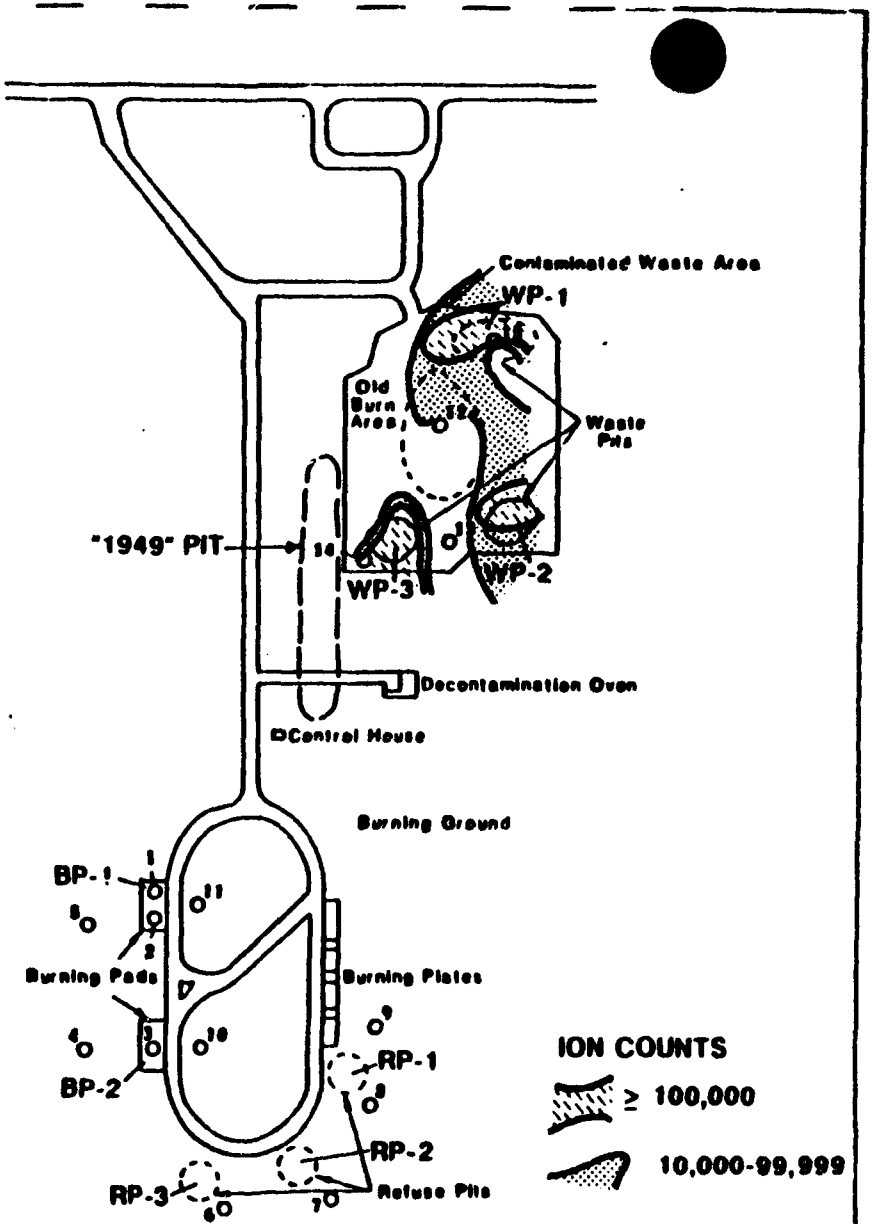
As previously stated, the relative intensities for any compound at one sample location can only be compared to another location within the same survey for the same compound. Relative intensities of different compounds cannot be compared to each other. Also, the relative intensities of one survey cannot be compared to the relative intensities of any other survey, even between two surveys at different times of the year over the same site. Since the data are non-quantitative, only the flux patterns of a survey or the relative difference between flux values of two samples from the same survey should be considered during interpretation. However, the same "hot spots" and plumes should contour in the same place over multiple surveys at a given site, allowing for migration.

B.2 RESULTS

The results of the soil vapor survey are presented in the following figures. Figures B-1 through B-4 illustrate areas of elevated relative flux concentrations for various hydrocarbons and chlorinated hydrocarbons in the Propellant and Deterrent Burning Grounds. Figures B-5 through B-12 present the relative ion counts at each sample location for the specific compound being evaluated. The ion counts were generated through analyses of mass spectra data generated for each sample.



RELATIVE FLUX - CCL4



RELATIVE FLUX - TRCLE

SCALE IN FEET

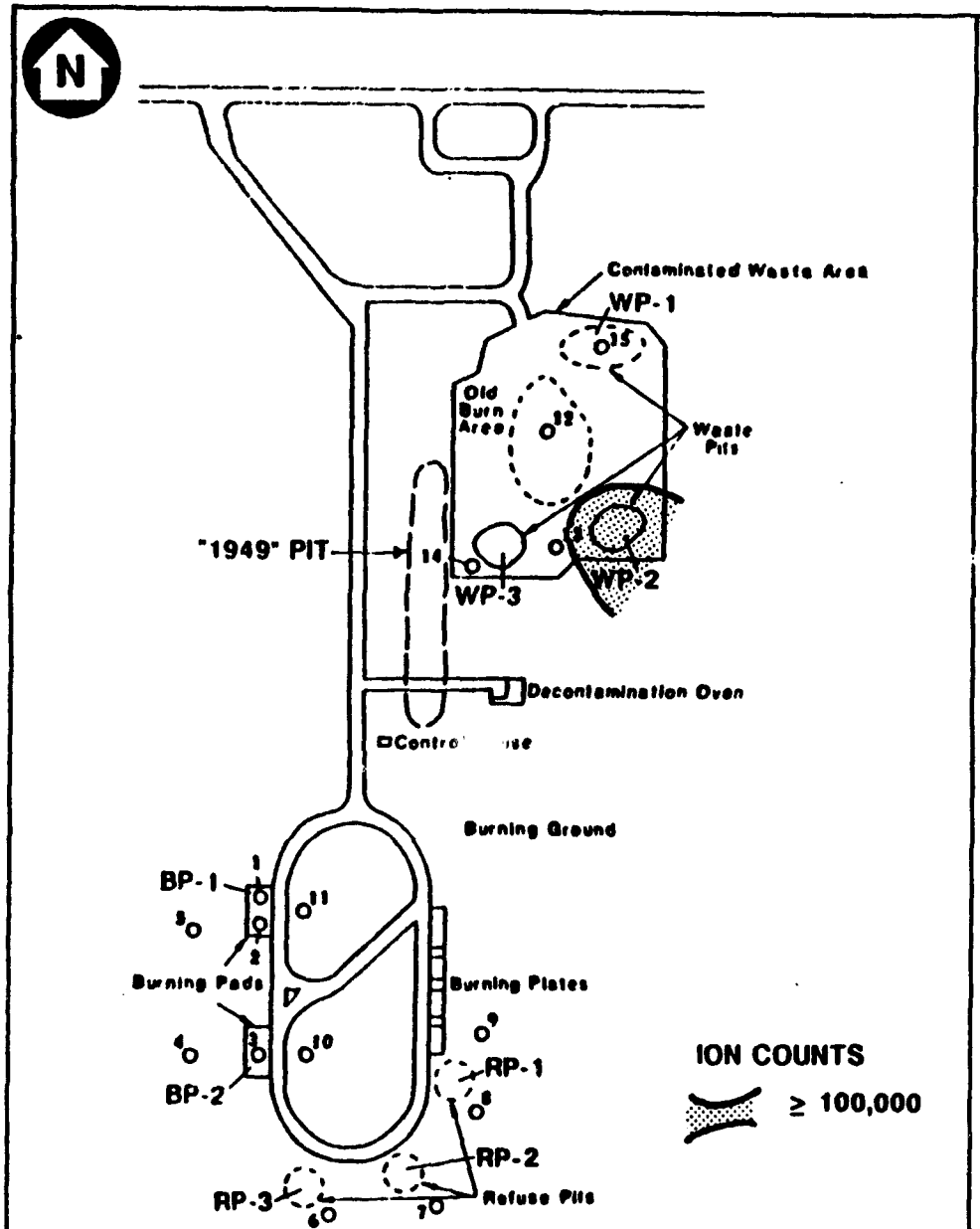
0 150 300

NOTE: SEE FIGURE 2-4 FOR EXPLANATION OF OTHER SYMBOLS.

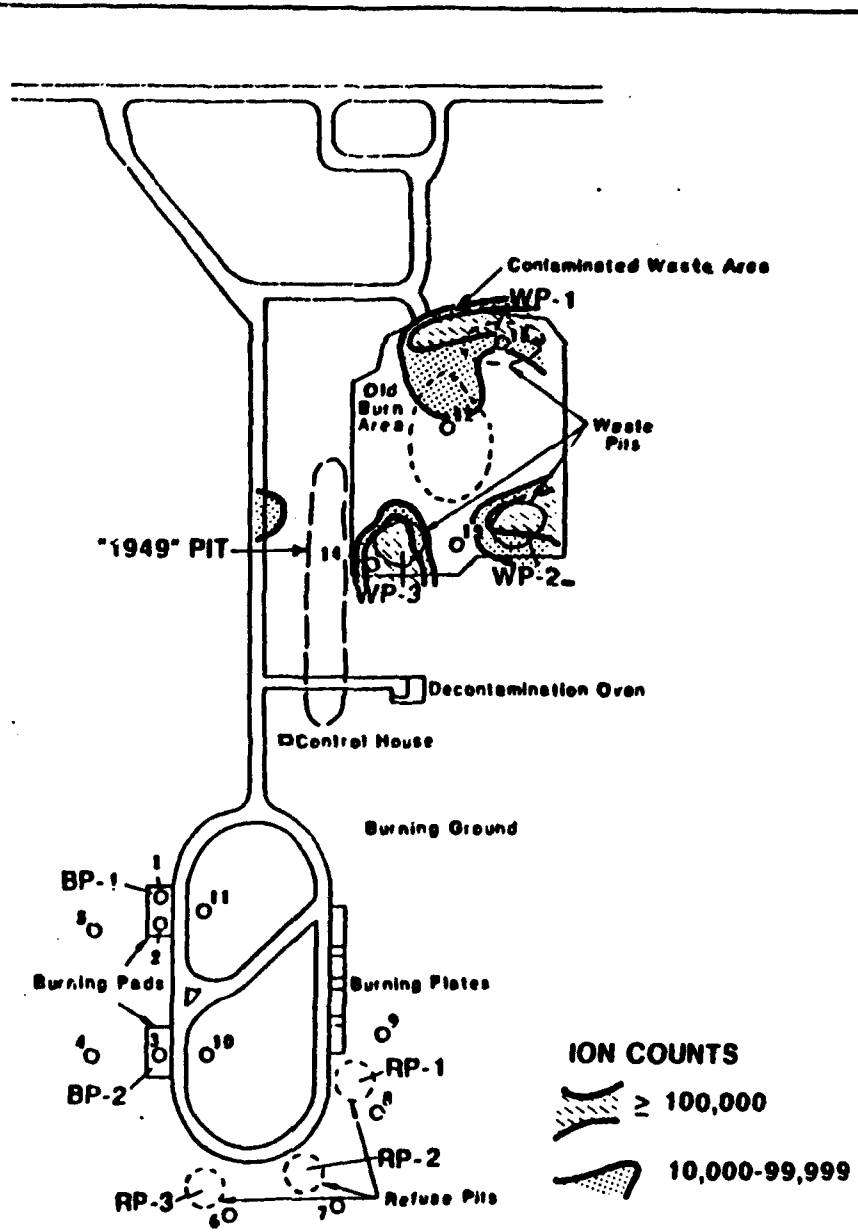
FIGURE B-1
SOIL VAPOR SURVEY RESULTS FOR CCL4 AND TRCLE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

E.C.JORDAN CO.

5753-15



RELATIVE FLUX - TCLEE



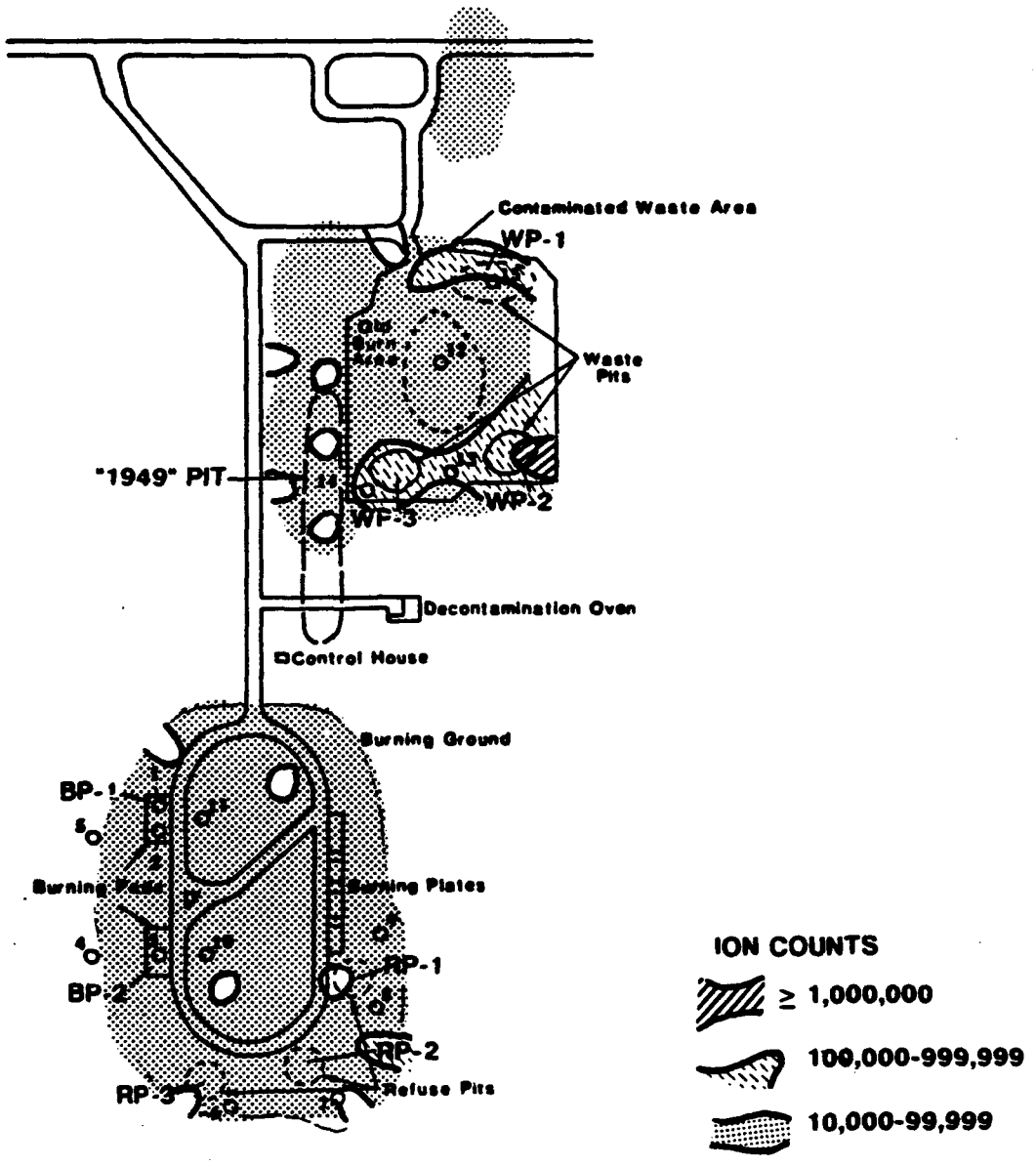
RELATIVE FLUX - SIMPLE AROMATICS

SCALE IN FEET

0 150 300

NOTE: SEE FIGURE 2-4 FOR EXPLANATION OF OTHER SYMBOLS.

FIGURE B-2
SOIL VAPOR SURVEY RESULTS FOR TCLEE AND SIMPLE AROMATICS PROPELLANT BURNING GROUND BADGER ARMY AMMUNITION PLANT



RELATIVE FLUX - COMBINED HYDROCARBONS

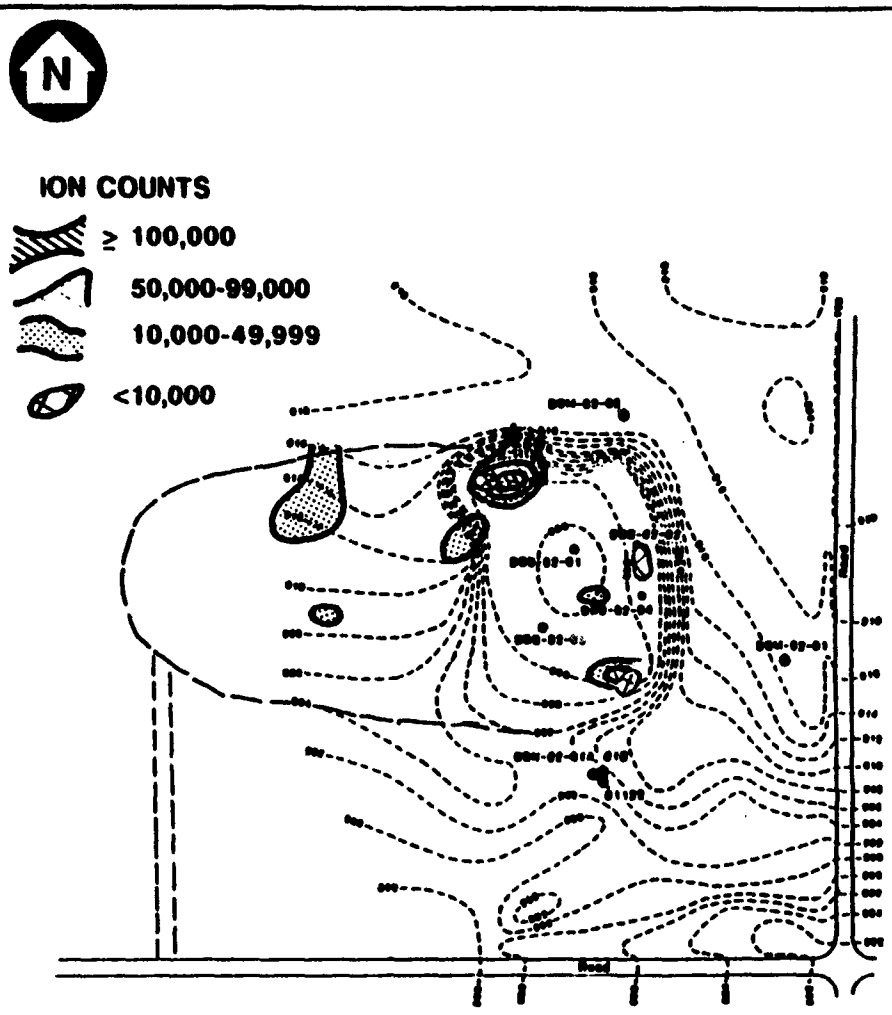
NOTE: SEE FIGURE 2-4 FOR EXPLANATION OF OTHER SYMBOLS.

SCALE IN FEET

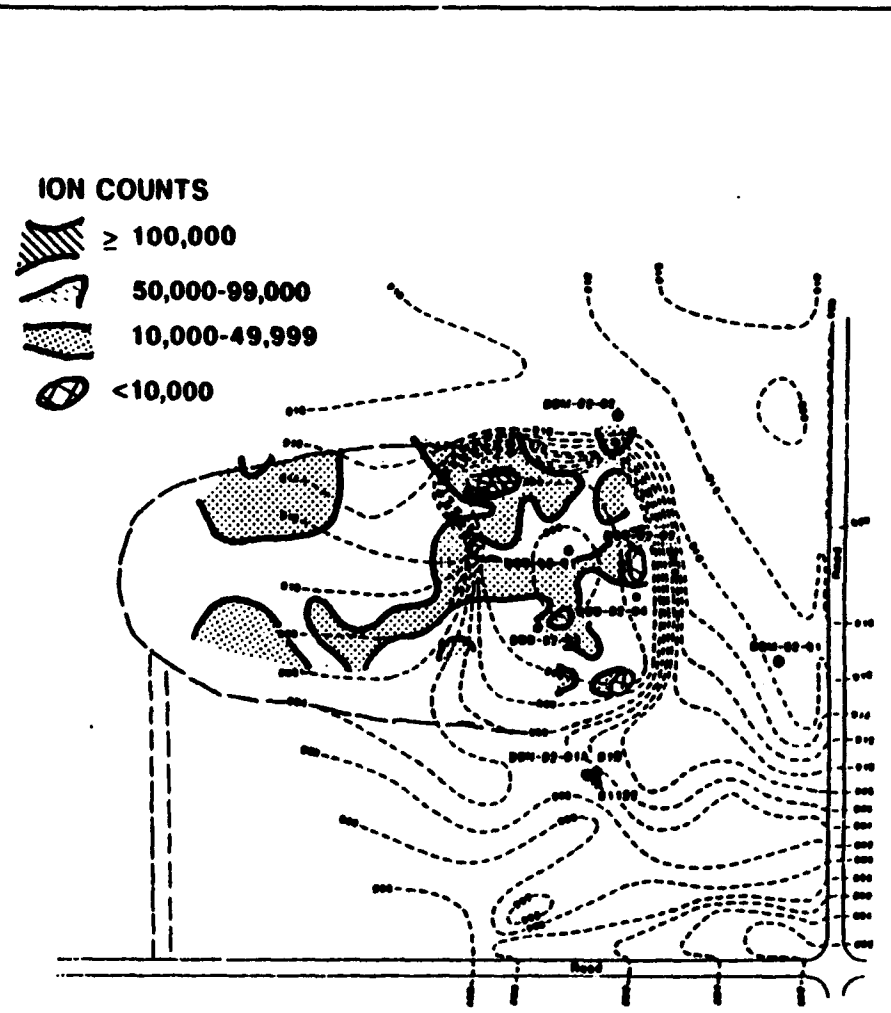
150 300

FIGURE B-3
SOIL VAPOR SURVEY RESULTS FOR COMBINED HYDROCARBONS PROPELLANT BURNING GROUND BADGER ARMY AMMUNITION PLANT

ECJORDANCO



RELATIVE FLUX - SIMPLE AROMATICS



RELATIVE FLUX - ALKANES

SCALE IN FEET

0 100 200 300

NOTE: SEE FIGURE 2-5 FOR EXPLANATION OF OTHER SYMBOLS.

FIGURE B-4
SOIL VAPOR SURVEY RESULTS FOR SIMPLE AROMATICS AND ALKANES
DETERRENT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

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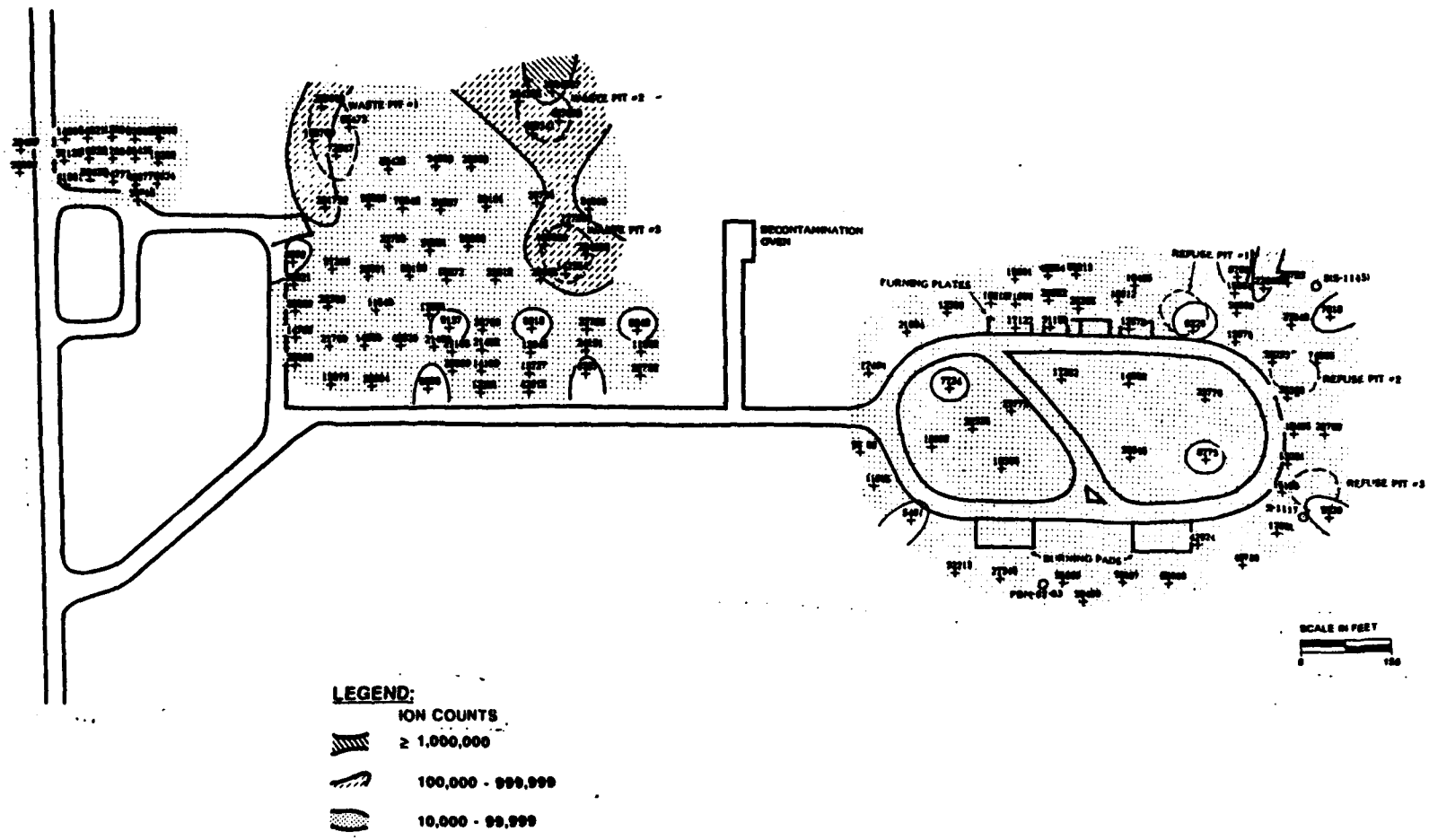

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-5
RELATIVE FLUX COMBINED HYDROCARBONS
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

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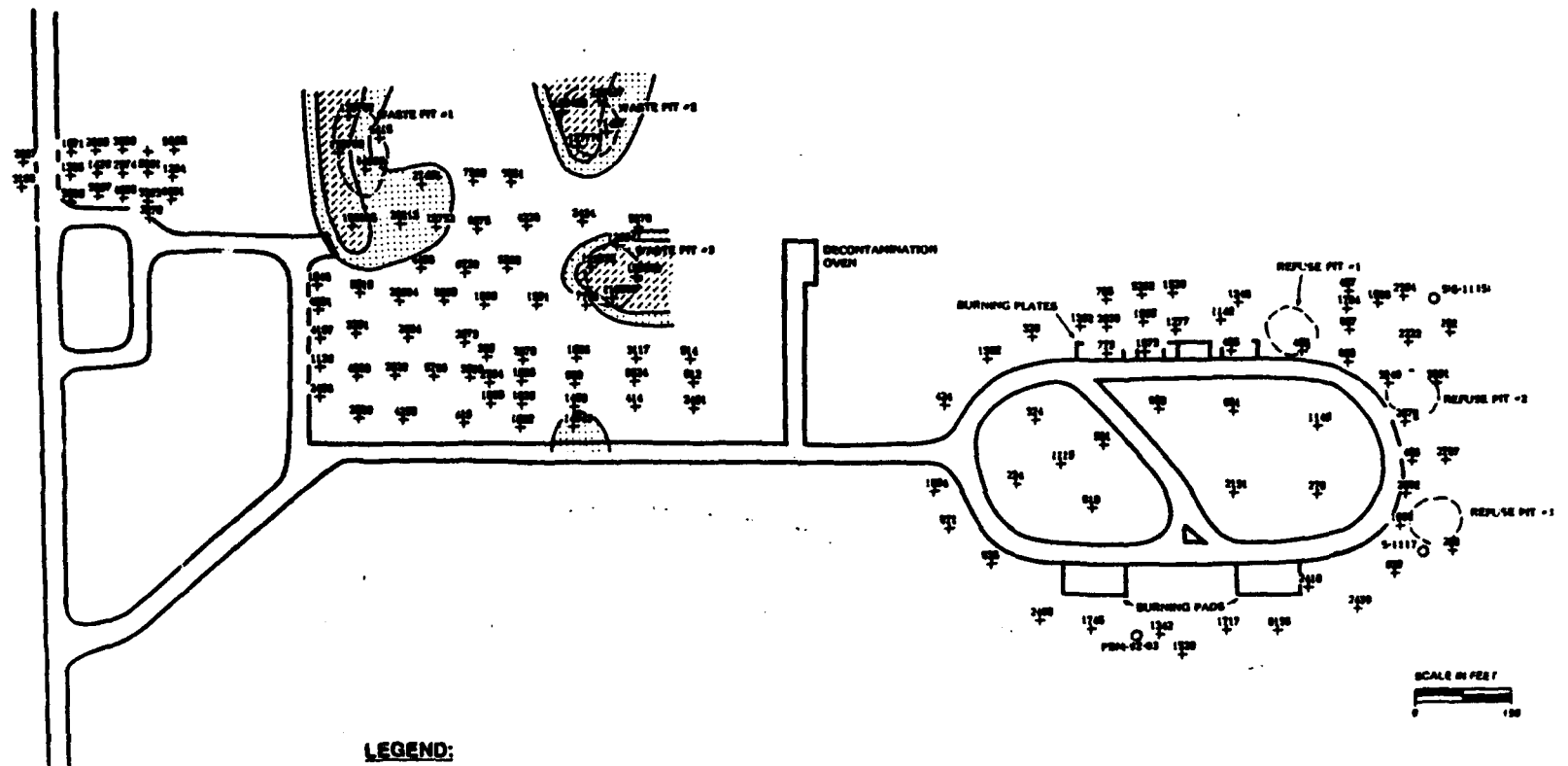

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-6
RELATIVE FLUX SIMPLE AROMATICS
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

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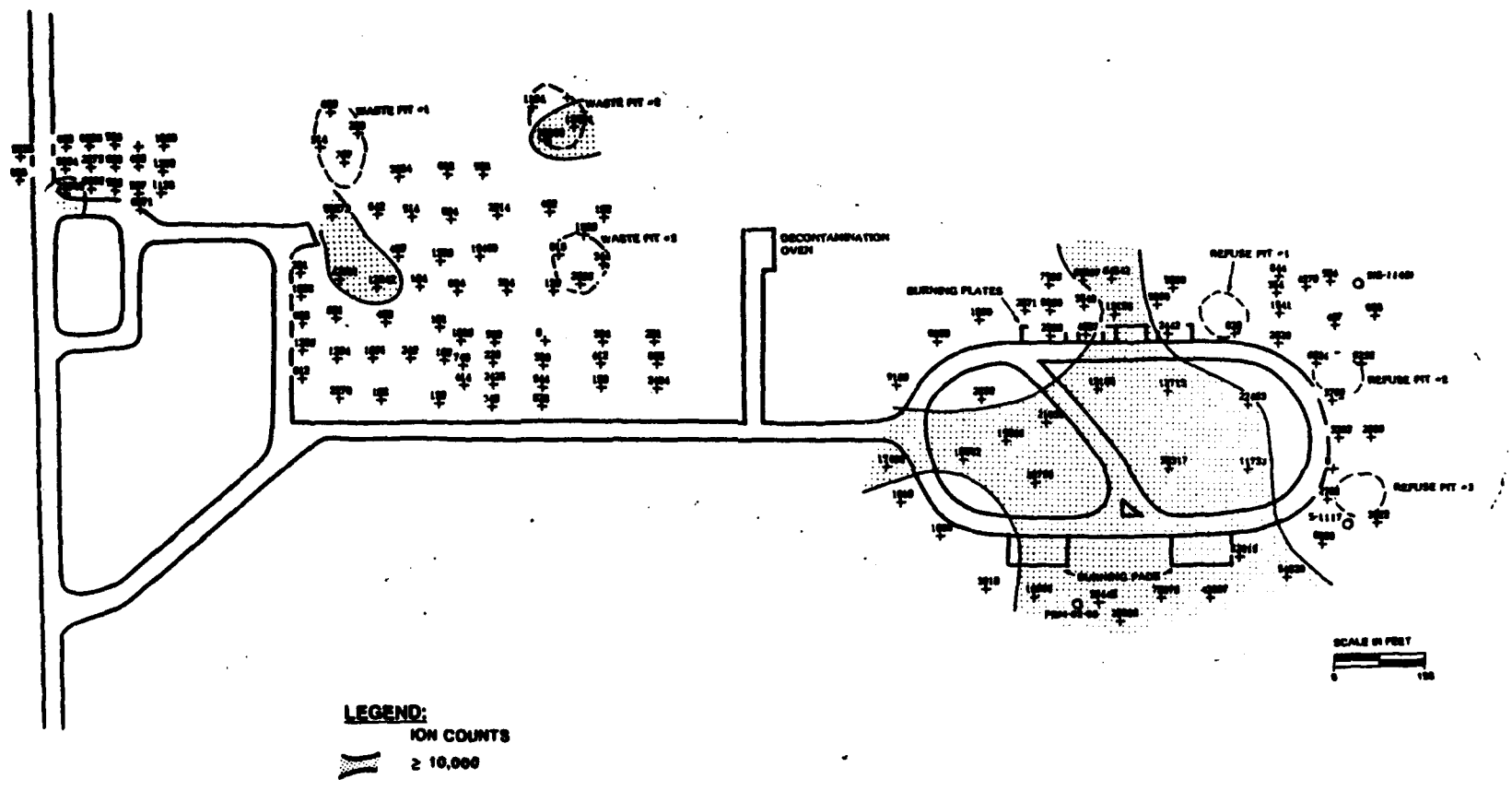

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-7
RELATIVE FLUX CARBON TETRACHLORIDE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

E.C.JORDAN CO

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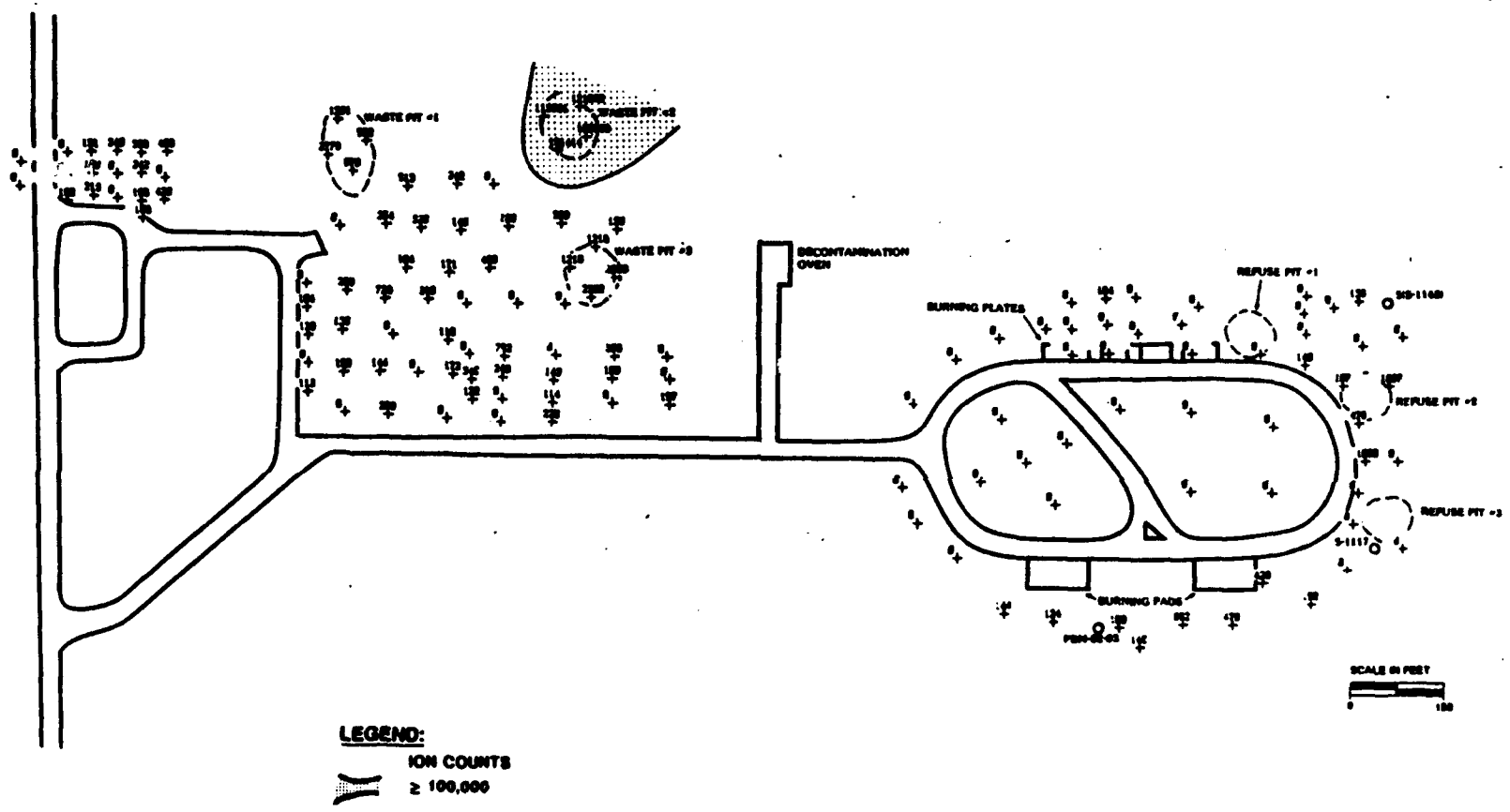

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-8
RELATIVE FLUX TETRACHLOROETHYLENE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

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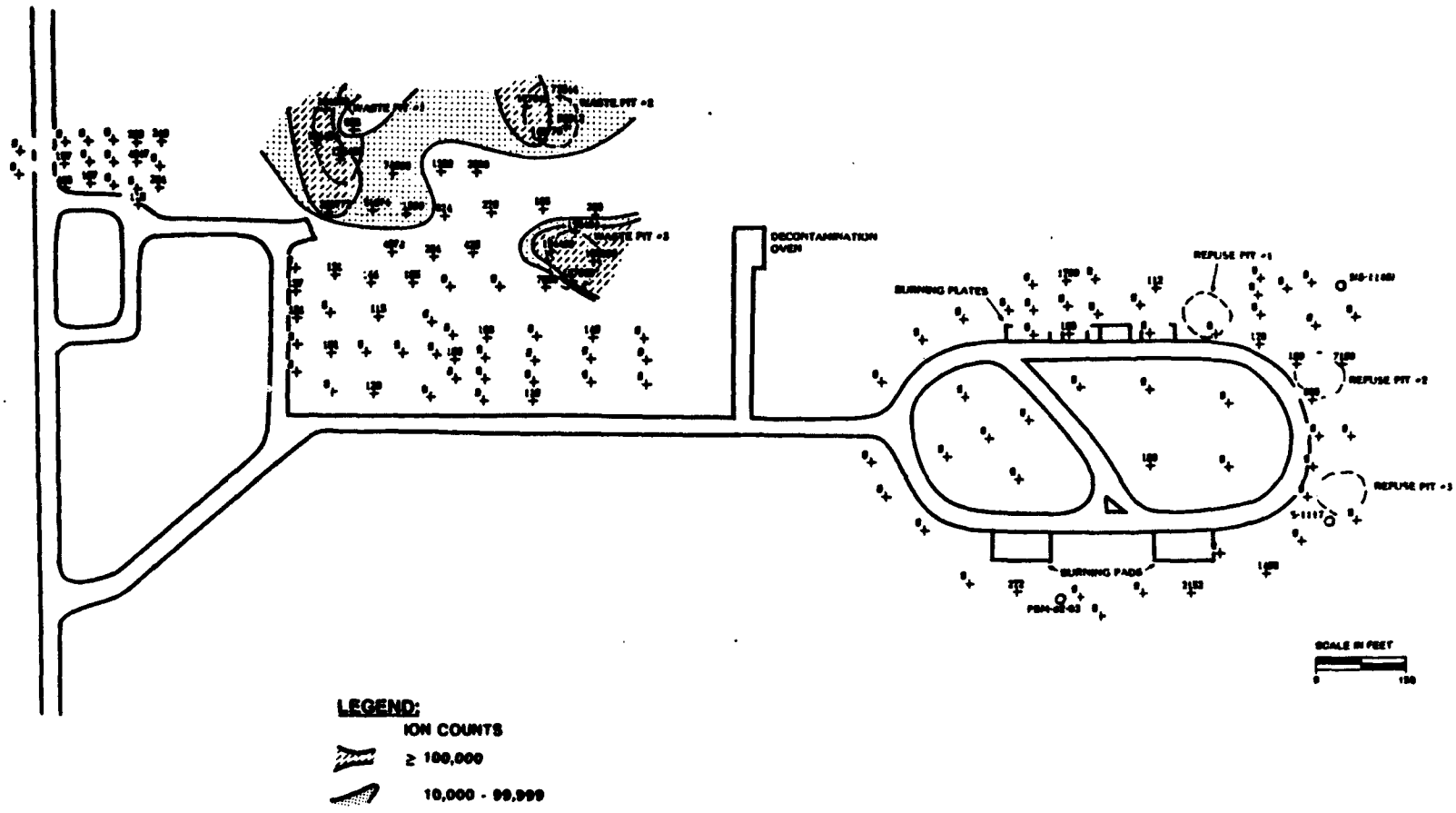

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-9
RELATIVE FLUX TRICHLOROETHYLENE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

E.C.JORDAN CO.

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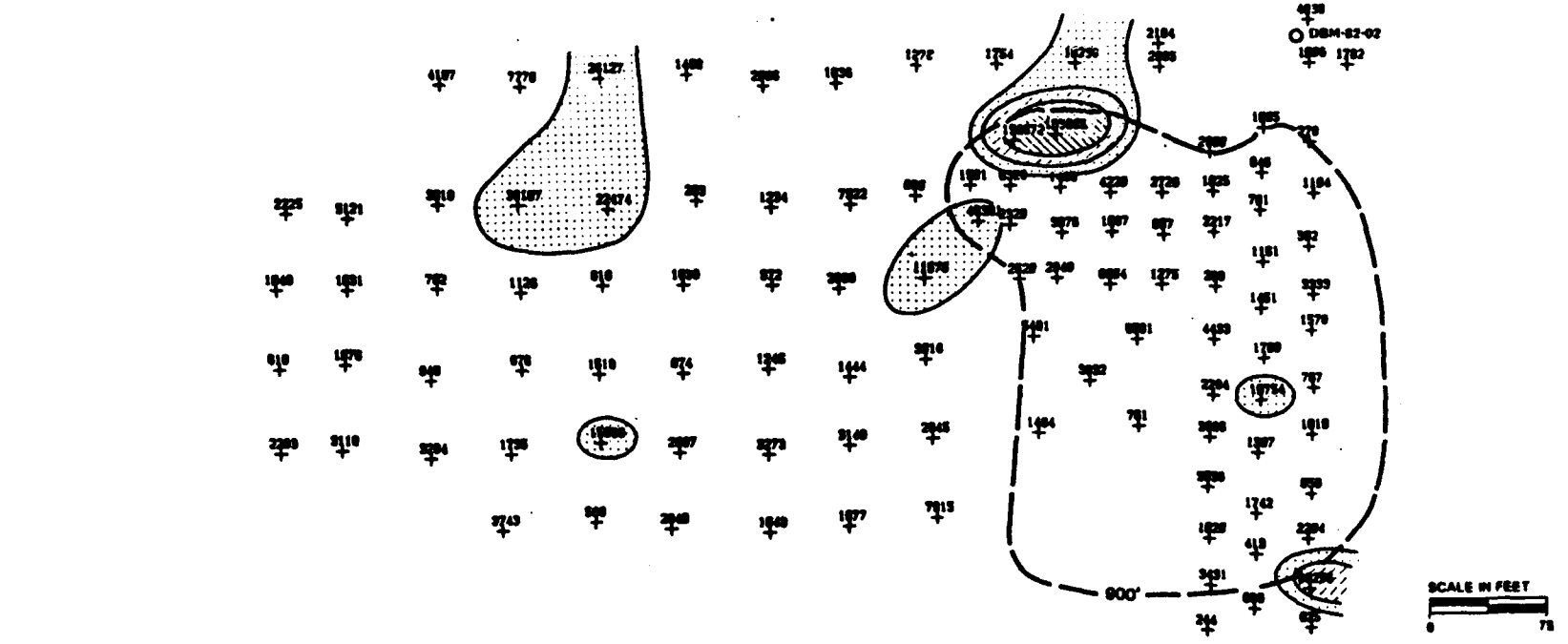

LEGEND:

ION COUNTS

- ≥ 100,000
- 50,000 - 99,999
- 10,000 - 49,000

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-10
RELATIVE FLUX SIMPLE AROMATICS
DETERRENT BURNING GROUND
BADGER army AMMUNITION PLANT

E.C. JORDAN CO.

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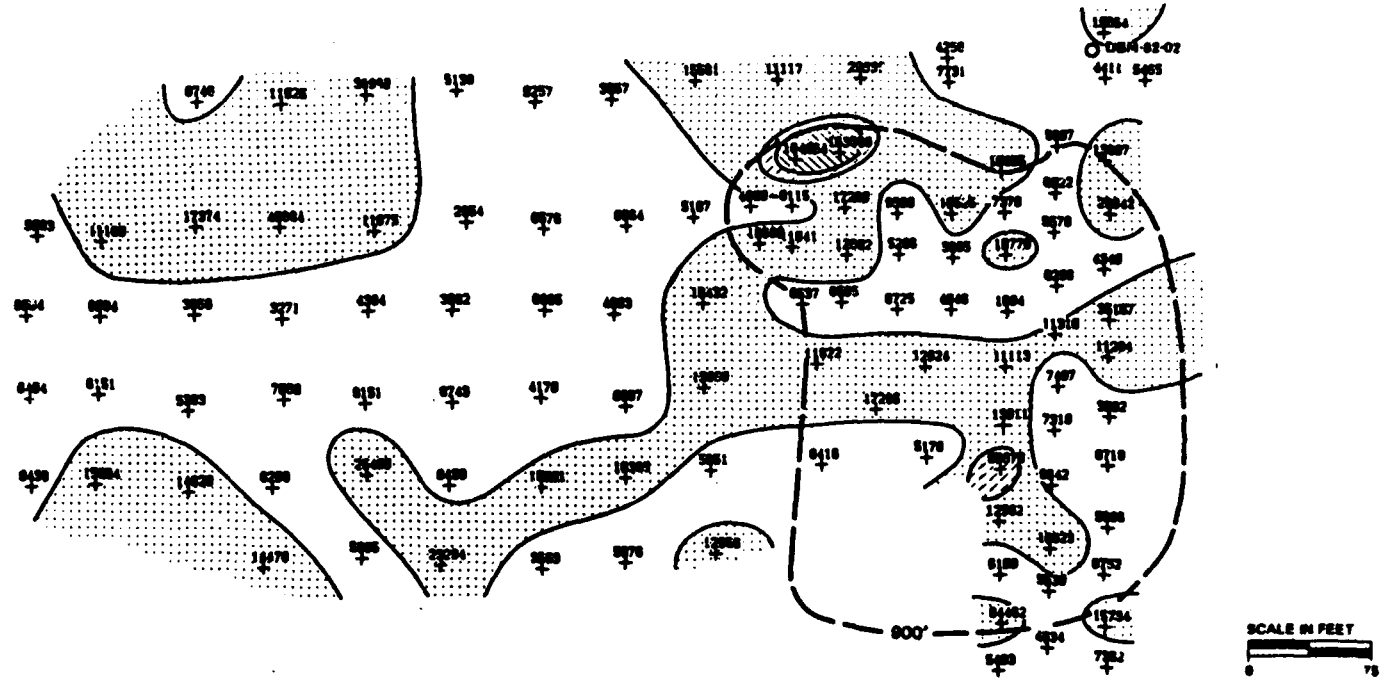

LEGEND:

ION COUNTS

- ≥ 100,000
- 50,000 - 99,999
- 10,000 - 49,999

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-11
RELATIVE FLUX ALKANES
DETERRENT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

ECJORDANCO

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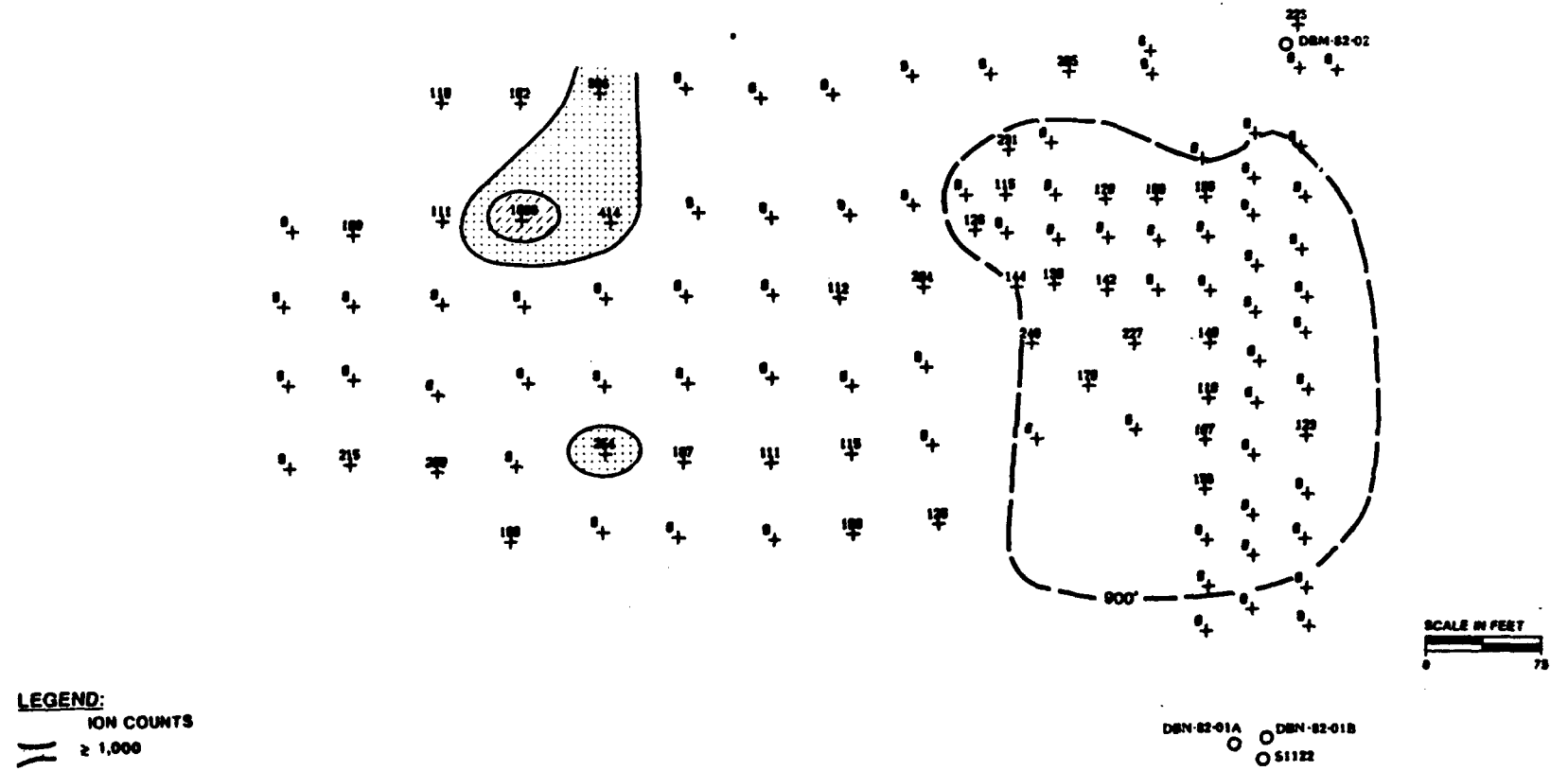

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-12
RELATIVE FLUX TRICHLOROETHYLENE
DETERRENT BURNING GROUND
BADGER army AMMUNITION PLANT

EC JORDAN CO

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APPENDIX C

SURFACE GEOPHYSICAL SURVEY

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APPENDIX C: SURFACE GEOPHYSICAL SURVEY

C.1 TECHNIQUES

Terrain conductivity (TC) measurements, ground-penetrating radar (GPR), and magnetometer profiling were performed at Badger Army Ammunition Plant. These techniques are described in the following subsections.

C.1.1 Terrain Conductivity Measurements

C.1.1.1 General. TC surveys, also referred to as electro-magnetic induction (EMI) surveys, have traditionally been used in mineral exploration for tracing conductive ore bodies (i.e., massive sulfides). More recently, conductivity surveys have been widely used for tracing conductive contaminant plumes in groundwater. Leachate from municipal landfills tends to be much more conductive than naturally occurring groundwater. Accordingly, the shape, extent, and relative impact of a plume can be studied with TC surveys. Such surveys have also been successfully used in studying some organic contamination in soil and groundwater since the conductivity of most organic chemicals is much lower than naturally-occurring soils and groundwater.

C.1.1.2 Data Acquisition. Data generated during field surveys were stored in a numerical data logger and were recorded on log books in the field. Since the instrument never comes in contact with the ground, data acquisition is more rapid than conventional, galvanic, earth resistivity surveys. However, quantification of conductivity data to yield a layered-earth solution is more difficult than with conventional earth resistivity.

The EM-31 DL utilized at BAAP is a widely used TC meter manufactured by Geonics, Ltd., in Mississauga, Ontario. This instrument, which has proven to be rapid-reconnaissance exploration tool, is used to assess the conductivity values for soil and rock materials.

C.1.1.3 Principles. The instrumentation for TC surveys consists of a transmitter and receiver which operates in the following manner. The transmitter is energized by an alternating current producing a magnetic field, designated as the primary field, Hp. This artificial magnetic field induces small electric currents to flow in the earth which, in turn, produce a secondary magnetic field, Hs. This secondary magnetic field is complexly related to the transmitter/receiver separation distance and to the operating frequency of the transmitter, both of which are selected by the operator. The ratio of the secondary magnetic field to the primary magnetic field (Hs/Hp), under conditions fulfilled in the field, is linearly

proportional to the TC. This ratio is measured by the receiver and converted into conductivity values in units of millimhos per meter.

C.1.1.4 Interpretation. Although it is difficult to define the thicknesses and "true" conductivity of individual subsurface layers, the instrument precisely measures the "apparent" conductivity of a volume of underlying earth materials. The apparent conductivity is comprised of the sum of the contributions from each layer that is "sampled" by the transmitter-receiver array. The volume (and therefore the depth) of earth materials sampled increases with increasing separation between the transmitter and receiver. This separation is fixed at 3 meters with the EM-31.

The instrument can be used in either the horizontal dipole or vertical dipole mode. Selection of the operational dipole mode depends on the depth of sampling desired, and the desired sensitivity of the instrument to materials at various depths, relative to the transmitter-receiver coil separation. Table C-1 shows the relationship of the vertical and horizontal dipole modes and coil separation to the effective depth of exploration.

The relative response of the instrument to materials at various depths can be estimated by examining Figure C-1, which shows a comparison of the relative responses for vertical and horizontal dipoles. The vertical axis describes the relative contribution to the secondary magnetic field, arising from a thin layer at a given depth, z. The horizontal axis shows how this response varies as a function of the ratio (z/s), where z is the depth of the thin layer described previously and s is the transmitter/receiver separation.

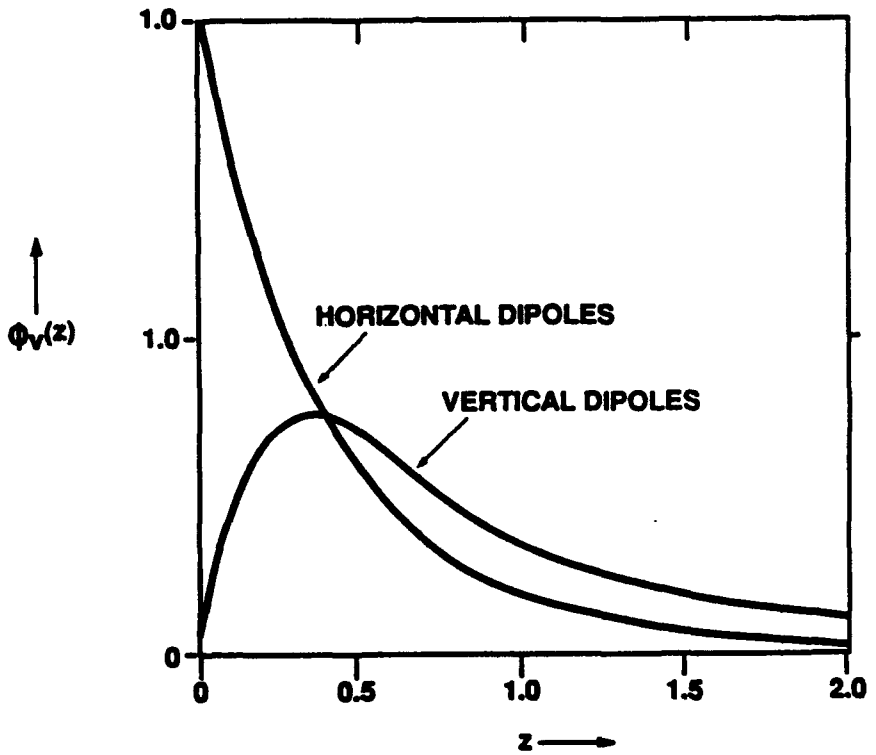
Figure C-1 demonstrates that in the vertical dipole mode, the contribution to the secondary magnetic field from near-surface materials is very small but reaches a maximum at a depth z of approximately 40 percent of s. The contribution is significant, although diminished, at a depth of 150 percent of s. This depth represents the effective depth of exploration in the vertical dipole mode (see Table C-1).

In the horizontal dipole mode, the contribution to the secondary magnetic field arising from near-surface materials, is a maximum and decreases with increased depth. The contribution is also significant at a depth of about 75 percent of s. This depth represents the effective depth of exploration in the horizontal dipole mode (see Table C-1). The location and results of TC surveys at the Deterrent Burning Ground and Landfill 1 are discussed in Section 6.1.

TABLE C-1
TERRAIN CONDUCTIVITY MEASUREMENTS
EFFECTIVE DEPTH OF EXPLORATION

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

INSTRUMENT	COIL SEPARATION	VERTICAL DIPOLE	HORIZONTAL DIPOLE
EM 31	3m	4.5m	2.25m
EM 34-3	10m	15m	7.5m
	20m	30m	15m
	40m	60m	30m



NOTE: "Øv(z)" is the relative contribution to the secondary magnetic field intensity from material in a thin layer (dz) located at (normalized) depth "z."

"z" is the depth of the thin layer (dz) divided by the intercoil spacing between transmitter and receiver.

FIGURE C-1
TERRAIN CONDUCTIVITY SURVEY
COMPARISON OF RELATIVE RESPONSES FOR VERTICAL AND HORIZONTAL DIPOLES
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

C.1.2 Ground Penetrating Radar Profiling

C.1.2.1 Introduction. The GPR technique uses high frequency radio waves to determine the presence of subsurface objects and structures. Energy is radiated downward into the subsurface from an antenna which is pulled slowly across the ground at speeds varying from about 0.25 to 5 mph, depending upon the amount of detail desired and the nature of the target. The radio wave energy is reflected from surfaces where there is a contrast in the electrical properties of subsurface materials. These surfaces may be naturally-occurring geologic horizons (soil layers, changes in moisture content, voids and fractures in bedrock) or manmade (buried utilities, tanks, drums, etc.). The reflected energy is processed and displayed as a continuous strip chart recording of distance versus time (where time can be thought of as proportional to depth).

The depth of penetration of a GPR system is highly site-specific, and depends, among other factors, on (1) the soil types at the site (clean sands are best), (2) moisture conditions (dry is best), and (3) the frequency of the antenna (the lower the frequency, the deeper the penetration, and the less the resolution capability).

Typical applications for GPR include delineating the boundaries of buried hazardous waste materials and the perimeters of abandoned landfills; finding steel reinforcement bars and voids in concrete structures; recording the depth of geological interfaces, bedrock, and coal seams; locating and mapping buried utilities; bottom and shallow subbottom profiling on lakes; and determining glacial ice stratification and thickness.

C.1.2.2 Principles. The radar system consists of a control unit, an antenna assembly (transmitter/receiver), and a recording device for analog field recordings. A tape recording unit may also be present for further data processing after field activities are completed. The antenna transmits electromagnetic (EM) pulses of short duration into the ground. The pulses are reflected from geologic or man-made surfaces and are picked up by the receiver which transmits the signals to the control unit for processing and analog display. Shallow objects appear near the top of the strip chart recording (less time elapsed between the outgoing pulse and the return of reflected energy), whereas deeper objects appear further down the recording (more time elapsed).

The time required for the EM pulse to traverse the path down to and back from the reflecting medium is measured in nanoseconds (ns), where 1 ns equals $1x10^{-9}$ seconds. The two-way travel time is proportional to the burial depth of the reflecting medium and is dependent upon the dielectric properties of the medium through which the EM pulse

travels. The dielectric properties of a medium are related to the moisture content and composition of a material.

Figure C-2 depicts the relationship between a single EM pulse generated by the controller and the resulting strip chart recording which would result from many such EM pulses (by permission of GSSI, Inc.). Figures C-3 and C-4 illustrate various features as they would appear on a GPR recording.

The propagation velocity of the EM pulse is determined by the relative dielectric permittivity (er) of the material through which the pulse travels. The er is a measure of the degree to which a medium can resist the flow of the EM pulse: the higher the er, the lower the resistance to flow, and vice versa. For most earth materials and rocks, the er does not exceed 10 and is always greater than 1, the value for a vacuum. Table C-2 gives typical permittivity values for commonly encountered materials. The er is related to the propagation velocity by the formula

$$(1)\quad er = (c/Vm)^2,$$

where "c" is the propagation velocity in free space ($3x10^8$ meters per second or approximately 1 foot per ns), and Vm is the propagation velocity through a material. It follows that $er^{0.5} = c/Vm$ or $1/Vm = [er^{0.5}]/c$. Since c 1 ft/ns, then

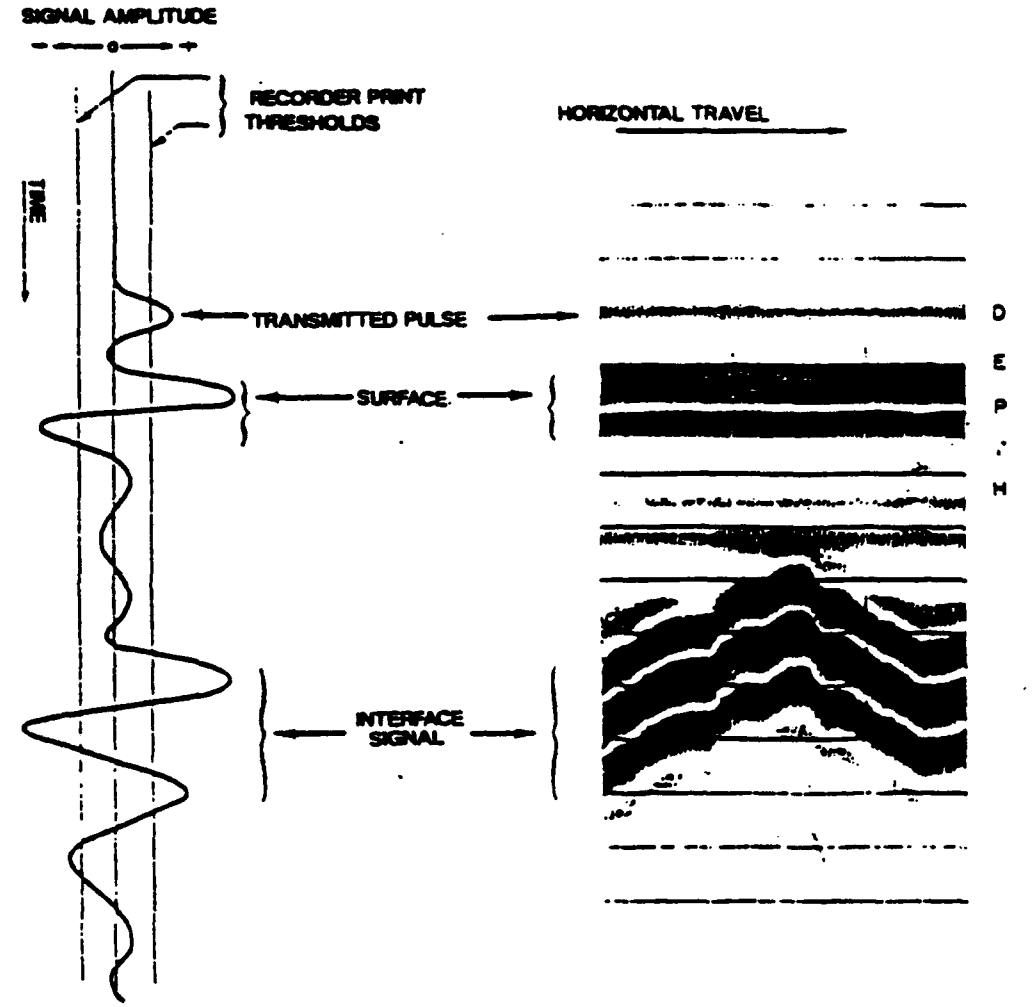
$$(2)\quad 1/Vm \quad er^{0.5},$$

where units are in ns/ft (one-way travel time).

Formula (2) gives a method for estimating the propagation velocity for a medium (and therefore the depth to a reflecting horizon) if the soil conditions are known. If they are unknown or their properties cannot be estimated accurately enough, a reflector of known depth can often be used to calibrate the GPR recordings to site conditions.

C.1.3 Magnetometer Survey

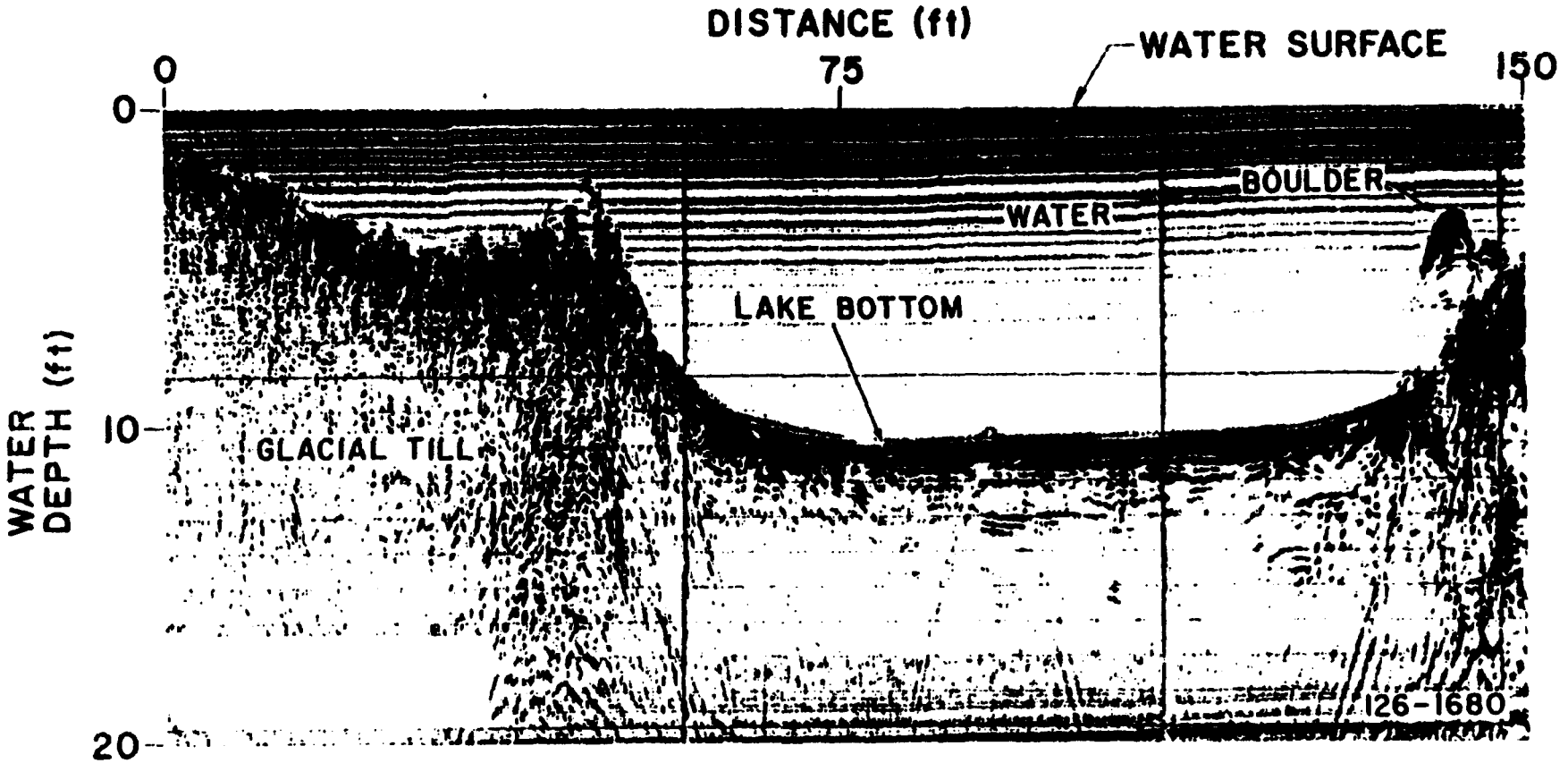
C.1.3.1 Introduction. The magnetometer survey is a versatile, relatively inexpensive, geophysical exploration technique. The focus of national attention on the hazardous waste problem has prompted the routine use of magnetometers for locating repositories of buried (drummed) wastes. Locating and quantifying these materials is essential to any remediation effort, and magnetometer surveys can provide an extra measure of safety to those personnel involved in the clean-up activities.



(A) SKETCH OF A SINGLE PULSE AND REFLECTIONS AS SEEN BY THE RECEIVER

(B) EXAMPLE OF PROFILE INFORMATION AS DISPLAYED BY THE GRAPHIC RECORDER

FIGURE C-2
TYPICAL GPR SYSTEM DATA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.



C-8

FIGURE C-3
GPR PROFILE - LAKE BOTTOM
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLA
ABB Environmental Services,

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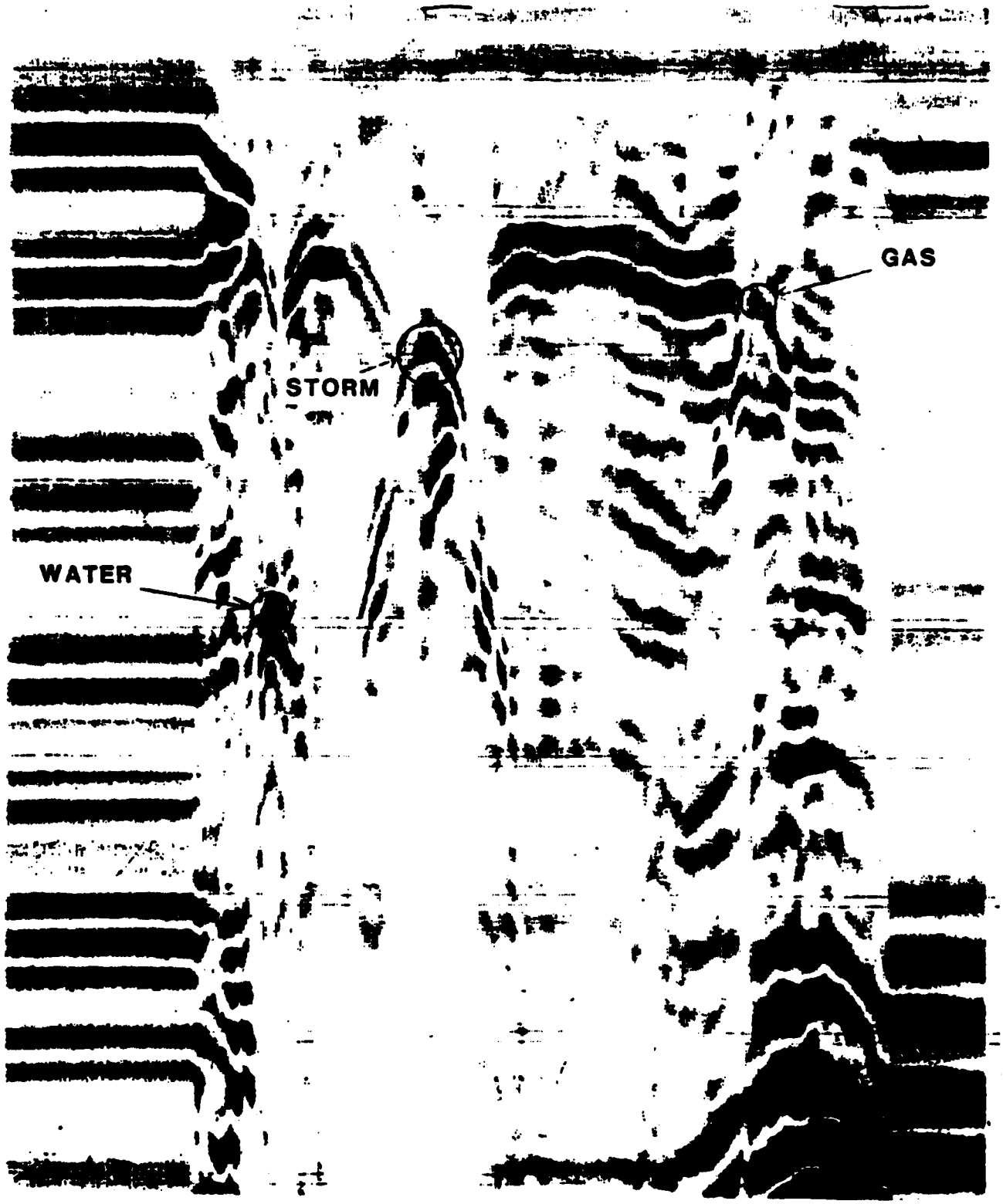


FIGURE C-4
GPR PROFILE - BURIED UTILITIES
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

TABLE C-2
APPROXIMATE VHF ELECTROMAGNETIC PROPERTIES OF VARIOUS MATERIALS*

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

MATERIAL	RELATIVE DIELECTRIC PERMITTIVITY	PULSE VELOCITY (NS/FT)
air	1	1
freshwater	81	9
seawater	81	9
sand (dry)	4-6	2-2.4
sand (saturated)	30	5.5
silt (saturated)	10	3.1
clay (saturated)	8-12	2.8-3.3
average dirt	16	4.0
dry sandy coastal land	10	3.1
marshy forested flatland	12	3.5
rich agricultural land	15	3.9
pastoral land, hilly, forested	13	3.6
freshwater ice	4	2.0
permafrost	4-8	2.0-2.9
granite (dry)	5	2.2
limestone	7-9	2.6
concrete	6.4	2.5
asphalt	3-5	1.7-2.5

* Modified from Geophysical Survey Systems, Inc.

C.1.3.2 Principles. At BAAP a "proton precession" type magnetometer was employed. This device utilizes the precession of spinning protons of hydrogen atoms in a sample of hydrogen-rich fluid (e.g., kerosene, alcohol, or water) to measure the total magnetic field intensity. Protons spinning in an atomic nucleus behave like tiny magnetic dipoles which can be aligned (polarized) by an external magnetic field. The protons are initially aligned parallel to the earth's field. A second, much stronger magnetic field is produced approximately perpendicular to the earth's field by introducing electric current through a coil of wire. The protons become temporarily aligned with this stronger field. When this stronger field is removed, the protons tend to realign themselves with the earth's field, causing them to precess about this direction at a frequency of approximately 2,000 Hz. The precessing protons will generate a small electric signal in the same coil used to polarize them with a frequency proportional to the total magnetic field intensity and independent of the coil orientation. By measuring the signal frequency, one can obtain the absolute value of the total earth's field intensity to an accuracy of 1 gamma or better. The total magnetic field value measured by the proton precession magnetometer is the net vector sum of the ambient earth's field and any local induced and/or remanent (permanent) perturbations.

C.1.3.3 Interpretation. For typical manmade iron or steel objects, the approximate depth of burial and the amount of metal that produces an observed magnetic perturbation (or anomaly) may be quantified. The size of the anomaly (T) can be expressed as:

$$T = M/r^n$$

where "M" is the magnetic moment of the source "r" is the depth to the source, and "n" is a measure of the rate of decay with distance (n = 3 for a dipole source and 2 for a monopole source).

Assuming a dipole source, the weight of a metal object (in pounds) can be expressed by the following relation:

$$\text{Weight} = (T*r^3)/M$$

where "M" is the magnetic moment per pound of iron and varies from approximately 175 to 1750, "r" is the depth in feet (below the sensor), and "T" is the anomaly amplitude in gammas.

The depth, "r", of a magnetic source can be estimated by a number of techniques, but perhaps the simplest is by the "half-width" rule. This states that for simple anomaly sources, the depth to the center of the anomaly is equal to the "half-width" of the anomaly. The half-

width is the horizontal distance between the maximum value of the anomaly and the point at which the value is half the maximum value (Figure C-5).

A further refinement in magnetic studies is permitted with the addition of vertical gradient measurements. This involves the simultaneous acquisition by two sensors of two values of the total field. The sensors are mounted on a staff that is held vertically during a measurement. A known distance (commonly half or 1 meter) separates the sensors on the staff. The vertical gradient value is derived by obtaining the difference between the total field values of the lower and upper sensors divided by the distance between them. Vertical gradient measurements tend to be more sensitive to the presence of near-surface metal objects than total field values alone.

There are commercially available magnetometers that record field data in an internal memory, which can be "dumped" at the completion of field activities onto a personal computer. These instruments can record the total field value, the vertical gradient, the time and date of the measurement, and the station location (input by the user), as well as a number of parameters that permit an evaluation of data quality. When vertical gradient measurements are the primary focus of a survey, the diurnal variation is inconsequential, because any variation affects the two sensors on the magnetometer sensor staff equally.

C.2 RESULTS

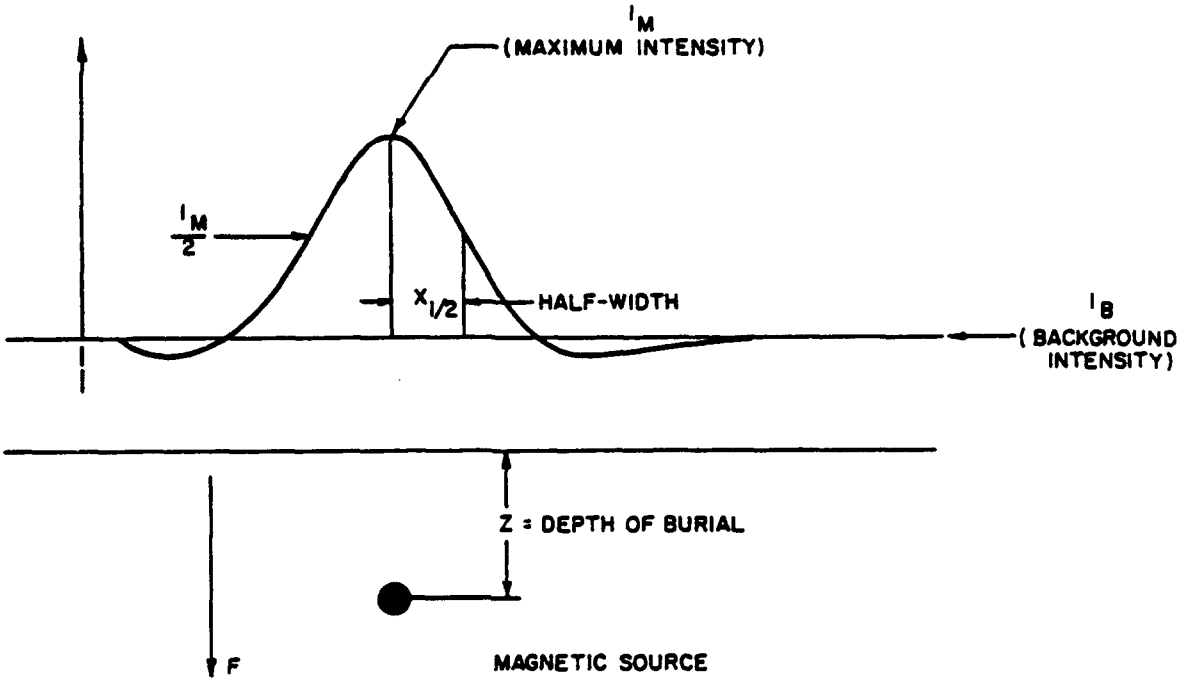
The results of the TC, GPR, and magnetometer surveys conducted at Landfill 1, the Deterrent Burning Ground, and the 1949 Pit are presented in this section.

C.2.1 Landfill 1

A geophysical survey, consisting of both TC measurements and GPR profiling, was conducted at Landfill 1. The purpose for this work was to accurately define the boundaries of the landfill. A 100- by 100-foot survey grid was established prior to the start of field work to serve as lateral control for the measurements to follow. Jordan accomplished this with a compass and fiberglass tape and tied the survey grid into landmarks, where possible.

A Geonics EM-31DL Terrain Conductivity Meter was used for the TC survey. Measurement stations were established every 20 feet within the survey area, and all stations were referenced to the 100- by 100-foot grid. Measurements were recorded on a digital data logger, and included both the quadrature- phase and in-phase components of the induced magnetic field. The quadrature- phase component gives the TC value in millimhos per

DEPTH CALCULATION/METAL QUANTITY
FOR TOTAL FIELD MEASUREMENTS:



T = MAGNETIC ANOMALY INTENSITY

= MAXIMUM ANOMALY INTENSITY MINUS BACKGROUND INTENSITY

$= I_M - I_B$

$$= \frac{M_{fps}}{r^3} = \frac{1.75 \times 10^2 \text{ to } 1.75 \times 10^3}{(1 \text{ to } 2)\, r^3}$$

where "M_{fps}" is the magnetic moment per pound of iron and "r" is the distance between the magnetometer sensor and the object (the depth of burial) "z" is equal to "r" minus the height of the sensor above the ground.

DEPTH CALCULATION FOR GRADIOMETER MEASUREMENTS

$$r = \frac{-nT}{\frac{dT}{dz}}$$

where "n" is the "falloff" factor and generally varies from 1 to 2, depending on the magnetic source, "r" is the separation between the midpoint between the two sensors and the object.

FIGURE C-5
MAGNETOMETER DATA INTERPRETATION
REMEDAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

meter. The in-phase component, used primarily for calibration purposes on the EM-31, is significantly more sensitive to metallic objects and, hence, is useful for looking for buried metallic objects, such as tanks and drums. Data from the in-phase component may be thought of as being equivalent to a metal detector survey.

A GSSI SIR System III GPR system with 500 MHz antenna was used for the GPR survey. GPR traverses were make at 10-foot intervals in three separate areas within Landfill 1.

The results of the TC and GPR surveys are presented as Figures C-6 through C-8. Figure C-6 presents the TC quadrature-phase contours (ground conductivity). Figure C-7 portrays the TC in-phase contours (sensitive to metallic objects). Figure C-8 presents the landfill perimeter as mapped by these survey results (including the GPR results).

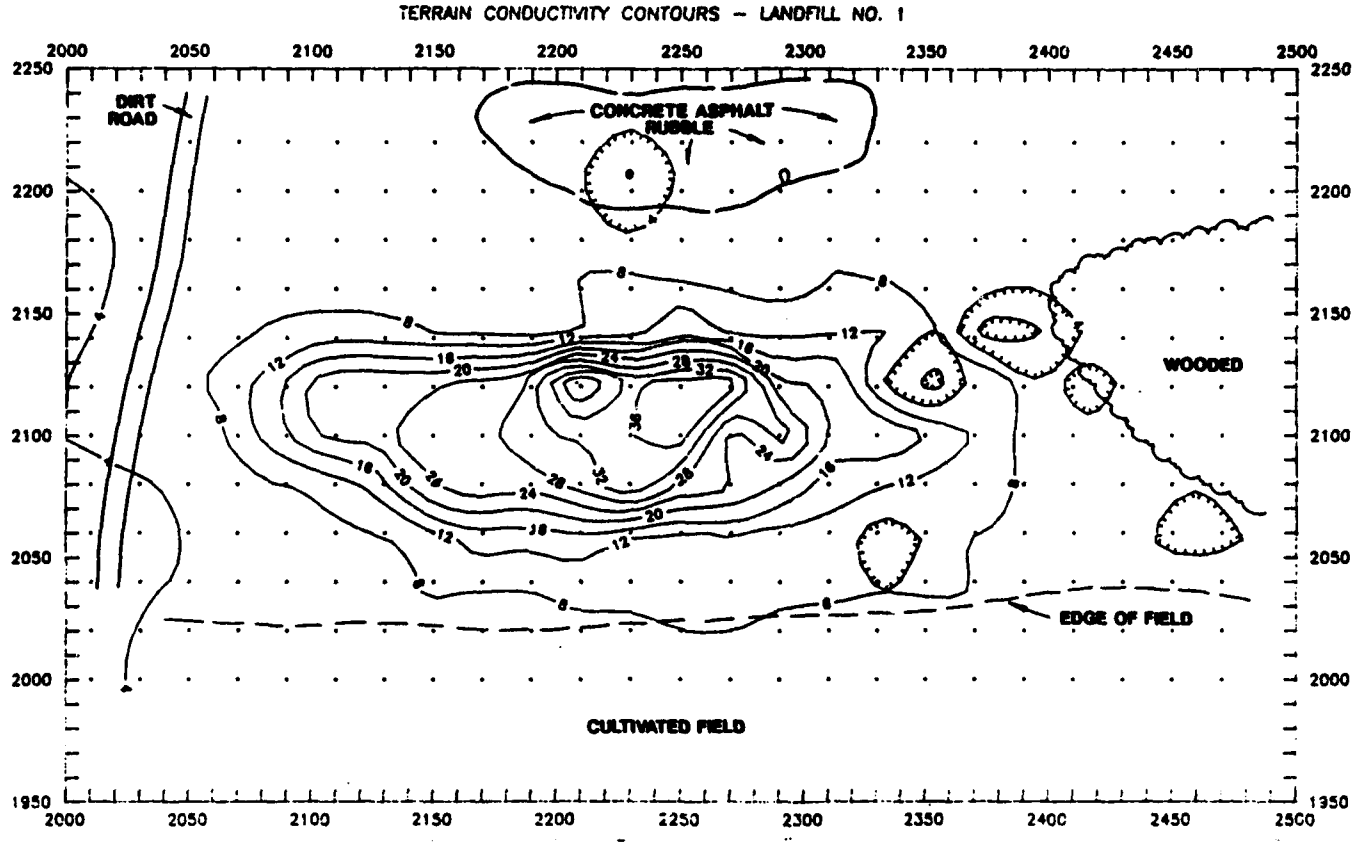
The only significant anomaly on Figure C-8 is an east-west-oriented elliptically-shaped TC "high" in the central portion of the study area (labeled TC-H3). TC-H3 is undoubtedly caused by the presence of metallic refuse and the production of electrically conductive leachate by infiltration of surface water runoff.

GPR traverses were located as indicated on Figure C-8. The transition across the boundary separating natural sediments from the refuse disposed in the landfill is characterized by strong, shallow reflections typical of landfills (Refuse typically retains moisture which generates electrically conductive leachate, producing a large contrast in the electrical properties of subsurface materials). The landfill boundary mapped during the field survey is indicated on Figure C-8. There is a striking similarity between the boundary mapped by GPR and the TC contours presented in Figure C-6 (the 8 millimho per meter contour has been superimposed onto Figure C-8 for illustrative purposes.

C.2.2 Deterrent Burning Ground

The purpose for geophysical surveys at the Deterrent Burning Ground was to locate former pits in which the burning of deterrent took place. Field methodology and instrumentation for the surveys were discussed in Section C.2.1. Information derived from these field activities was used for planning the locations for explorations, including both monitoring wells and test pits.

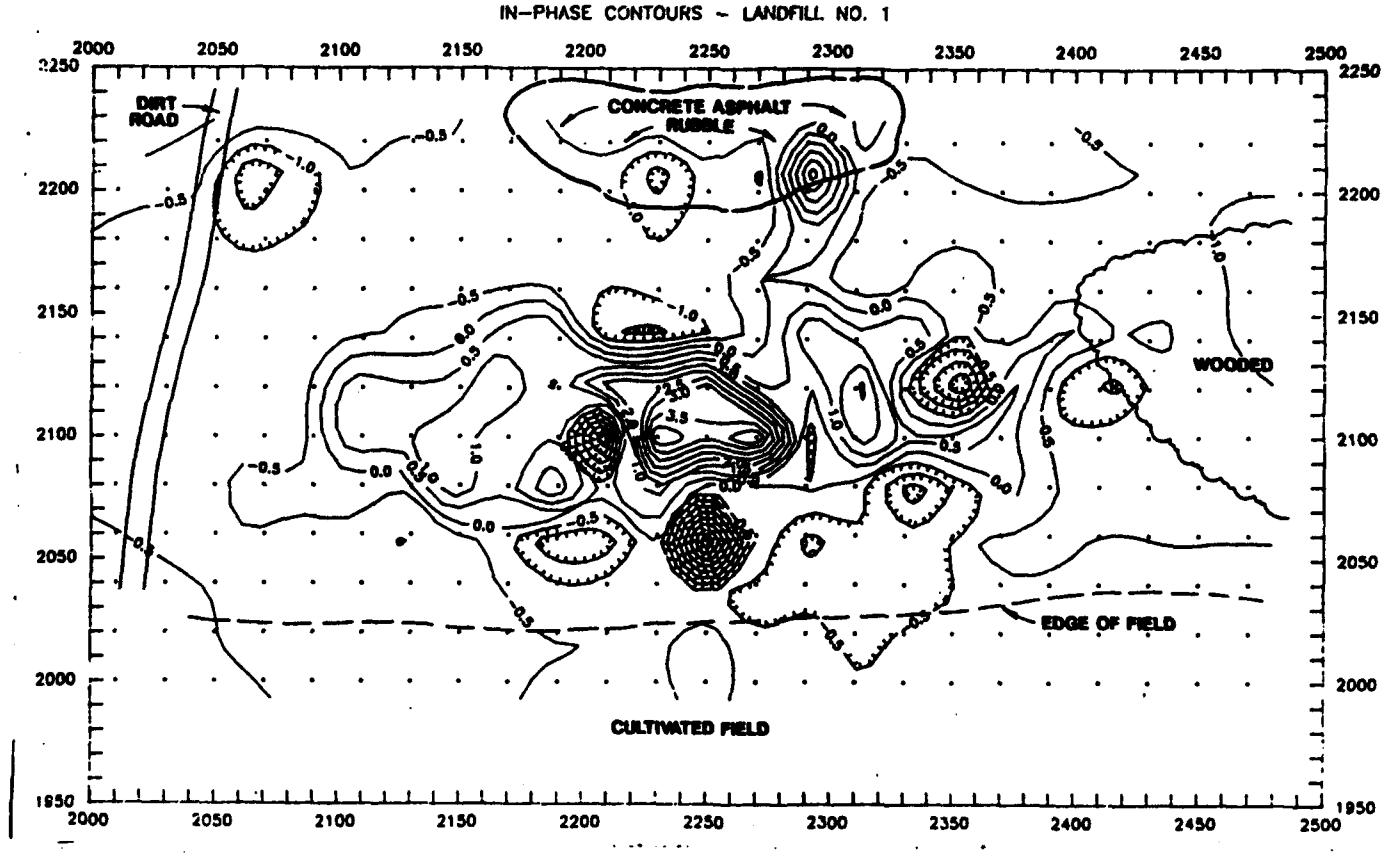
The results of the geophysical surveys at the Deterrent Burning Ground are presented in Figures C-9 through C-11. Figure C-9 presents the TC quadrature- phase contours (ground conductivity). Figure C-10 portrays the TC in-phase contours (more sensitive to the



SCALE
0 50 100 FEET

FIGURE C-6
TERRAIN CONDUCTIVITY
QUADRATURE PHASE CONTOURS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

6653-12

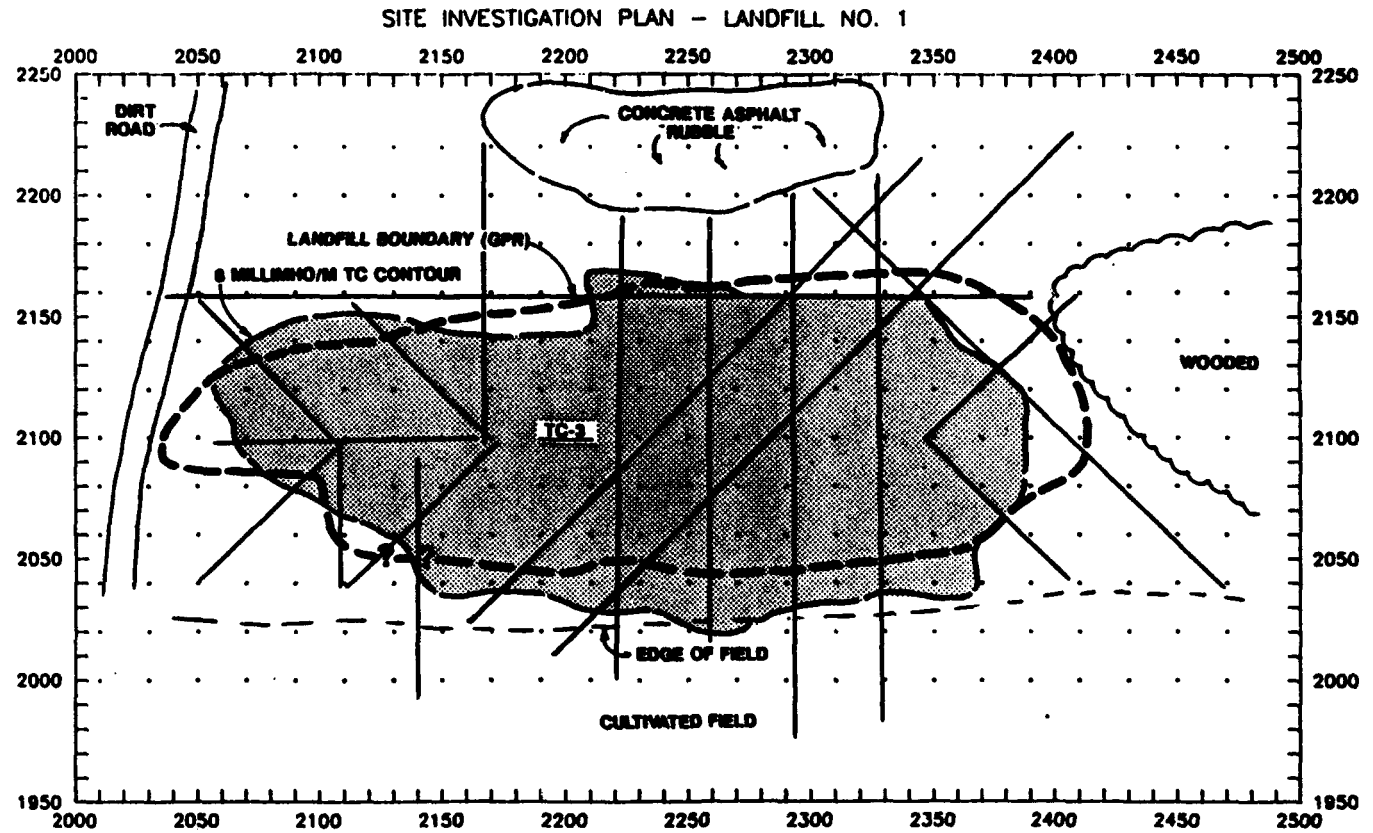


SCALE
0 50 100 FEET

FIGURE C-7
TERRAIN CONDUCTIVITY IN-PHASE CONTOURS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

ABB Environmental Services, Inc.

6663-12



LEGEND

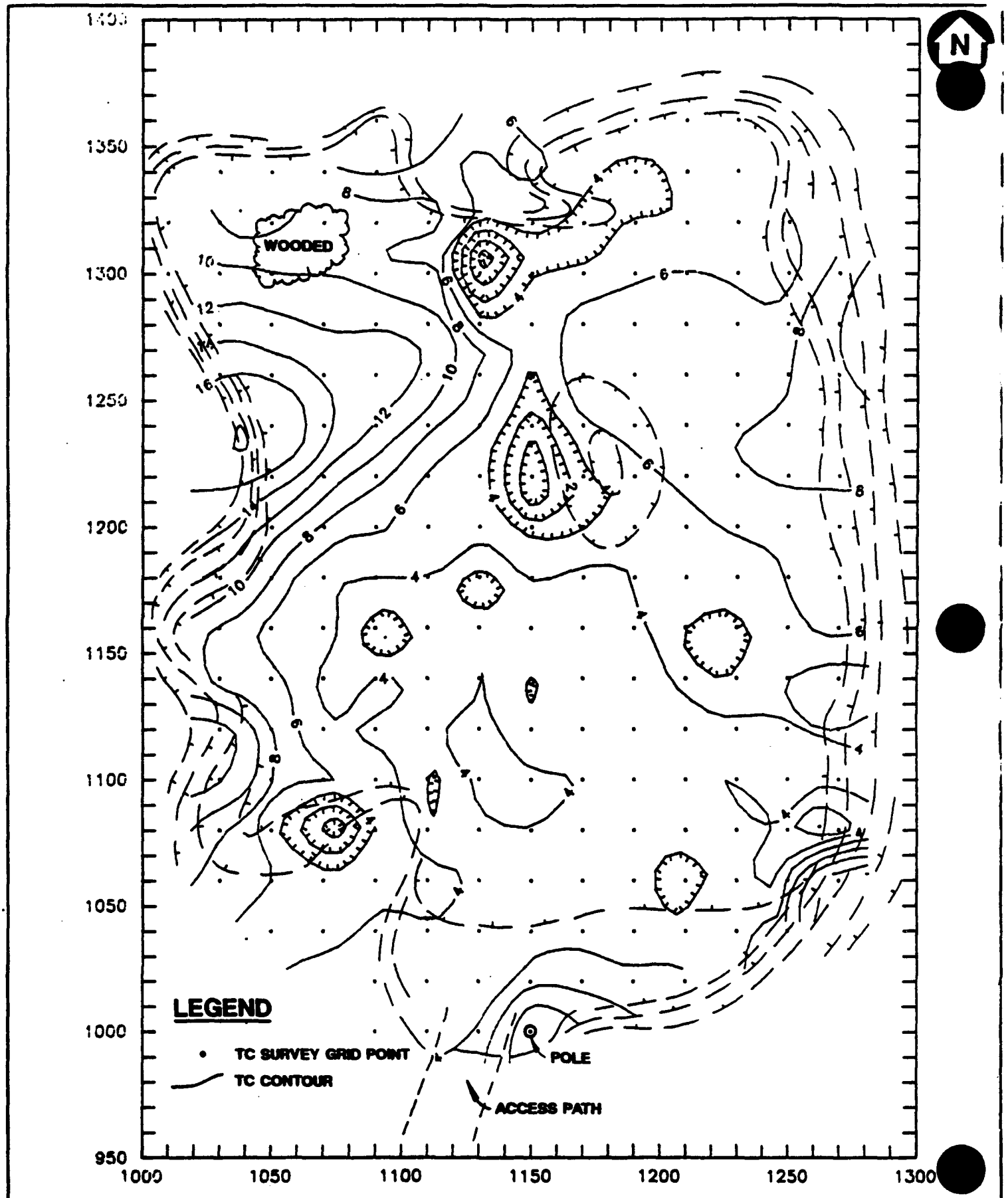
- TC SURVEY GRID POINTS
- GPR TRAVERSE
- HIGH CONDUCTIVITY ZONE IDENTIFIED BY TC
- AREA OF STRONG SHALLOW REFLECTIONS IDENTIFIED BY GPR

SCALE

0 50 100 FEET

FIGURE C-8
SUMMARY OF GEOPHYSICAL SURVEY RESULTS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

2265-12



SCALE

0 50 100 FEET

FIGURE C-9
TERRAIN CONDUCTIVITY QUADRATURE PHASE CONTOURS
DETERRENT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

6853-12

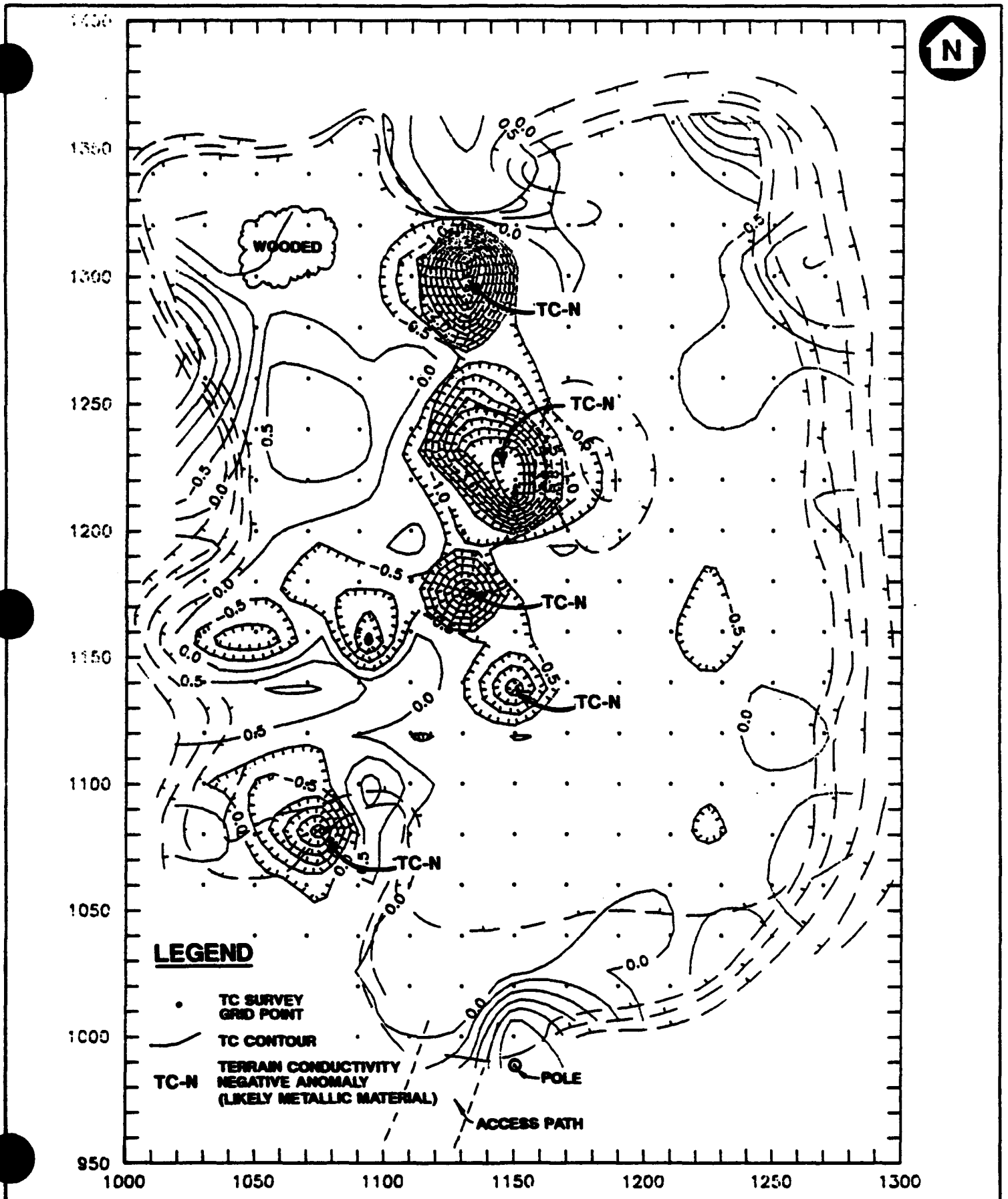


FIGURE C-10
TERRAIN CONDUCTIVITY IN-PHASE CONTOURS
DETERRENT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

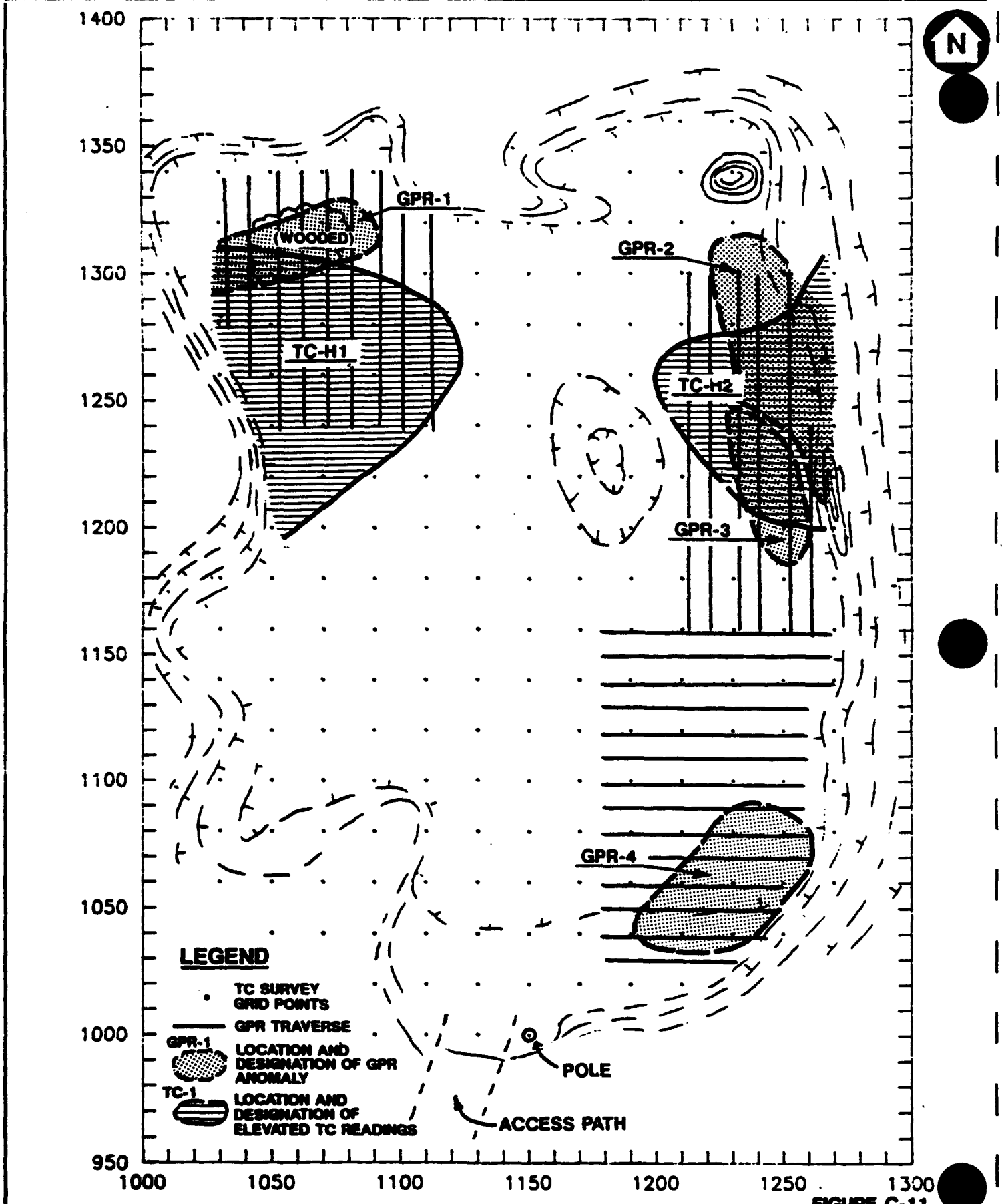


FIGURE C-11
SUMMARY OF GEOPHYSICAL SURVEY RESULTS
DETERRENT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

presence of metallic objects). Figure C-11 summarizes the subsurface features which were mapped (including the GPR results).

GPR measurements were made in the Deterrent Burning Ground in those portions of the site where historical records and aerial photographs revealed pit locations where burning activities took place. GPR traverses were made at 10-foot intervals in these locations. Figure C-11 shows the locations of the traverses made in three separate areas within the Deterrent Burning Ground.

Two ground conductivity anomalies are evident on Figure C-9 in the northwest and northeast portions of the site (these are also shown on the summary map, Figure C-11). The negative anomalies on Figure C-10 (labeled TC-N) are probably caused by metallic debris either at the surface or buried close to the surface.

The most prominent anomaly on the summary map, Figure C-11, is a broad TC "high" in the northwest portion of the study area. This feature is labeled TC-H1. Site records indicate that the high ground west of TC-H1 was excavated and subsequently backfilled with refuse. It is probable that TC-H1 is an anomaly created by the generation of electrically conductive leachate in groundwater. A second, less pronounced TC high is located in the northeastern portion of the study area (labeled TC-H2). This anomaly is possibly related to the old deterrent burning pit, but it is diffuse and thus not useful for locating test pits or borings.

GPR traverses were made in the northwestern corner and along the eastern flank of the Deterrent Burning Ground (Figure C-11). Four anomalous zones were mapped (GPR-1, GPR-2, GPR-3, and GPR-4). Anomalies GPR-1 and GPR-2 are similar in that they are characterized by a distinct lack of reflections from subsurface strata. The reason for this is not known, but could be related to past site activities. Anomalies GPR-3 and GPR-4 are also similar to one another: they are characterized by shallow, moderate to strong reflections common in landfills. Refuse typically retains moisture which generates electrically conductive leachate, producing a large contrast in the electrical properties of subsurface materials.

C.2.3 1949 Pit

A geophysical survey consisting of both magnetometer and GPR surveys was conducted at the 1949 Pit at the Propellant Burning Ground. Prior to any magnetic measurements or GPR profiling, a 260-by-600 foot survey area with a 20 foot grid spacing was established using pin-flags, a compass, and a 100 foot tape. The survey grid was tied to the asphalt road bordering the eastern edge of the study area (Figure C-12). Grid points along the edge of

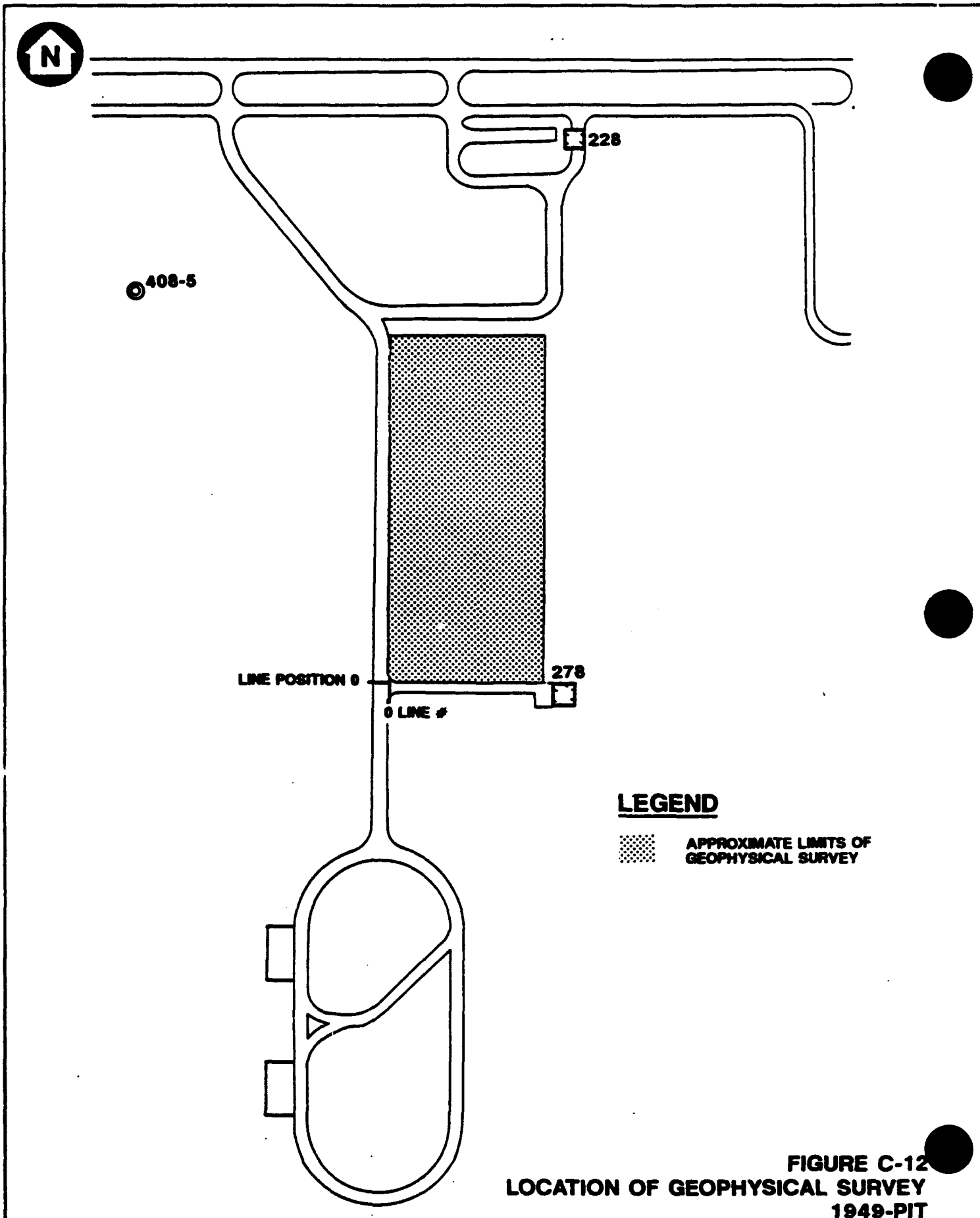


FIGURE C-12
LOCATION OF GEOPHYSICAL SURVEY
1949-PIT
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

the road (Line 000) were marked accordingly at 50 foot intervals with orange spray paint. Twenty foot intervals were marked on the road bordering the northern portion of the study area.

The geophysical investigation consisted of two surveys. Magnetometer and GPR surveys were used in conjunction with one another to help confirm the presence and location of buried metallic objects and the presence of former excavations. Magnetometer data aids in the detection of buried ferrous materials while GPR data helps to define the edges of excavations and can also detect the presence of metallic objects. Analysis of historical records and aerial photographs of the site from 1947 up to the present strongly suggested that the 1949 Pit Area of the Propellant Burning Ground may be an area where significant amounts of buried ferrous materials exist. A brief description of each survey follows.

For the magnetometer survey, an EDA Instruments Omni Plus Vertical Gradiometer was utilized for data acquisition. A total of 434 magnetic station measurements were taken within the pre-established 260 by 600 foot grid. Additionally, a magnetic base station was established to monitor diurnal variations in the earth's magnetic field. Base station readings (Table C-3) were taken approximately once per hour during the course of the magnetometer survey. Base station values fall within the range of expected diurnal variation.

All magnetic data were recorded in the instrument's internal data logger and down-loaded to a personal computer at the conclusion of each field day. These data were compiled and contoured using various computer applications software. Data evaluation was conducted in the field both during the survey and after initial computer processing.

Results from the magnetometer survey are presented in the form of vertical gradient contours (Figure C-13). Superimposed are surficial metallic objects encountered during the survey. Surface metallic debris consisted primarily of crushed powder drums, fence cable, and electrical cable. Based on the magnetic signature characterizing the site in Figure C-13, the site was divided into two areas. Area 1 contains significant amounts of buried ferrous materials. Area 2, on the other hand, is unlikely to contain any large quantities of buried ferrous materials. A discussion of both areas follows.

Area 1. Figure C-13 illustrates the magnetic signature of the 1949 Pit. The area showing the greatest concentration of magnetic anomalies was designated as Area 1. The magnetic signature of Area 1 is indicative of significant amounts of ferrous materials buried throughout this portion of the study area. These magnetic anomalies are found within a 500

TABLE C-3
BASE STATION VALUES
MAGNETOMETER SURVEY
AUGUST 21-22, 1990

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

DATE	TIME	TFV[1]
08/21	17:54	57318.5
08/21	18:19	57289.6
08/22	07:47	57152.8
08/22	08:47	57168.9
08/22	09:17	57166.5
08/22	10:42	57165.6
08/22	11:34	57159.5

Notes:

[1] Total (magnetic) field value, in gammas.

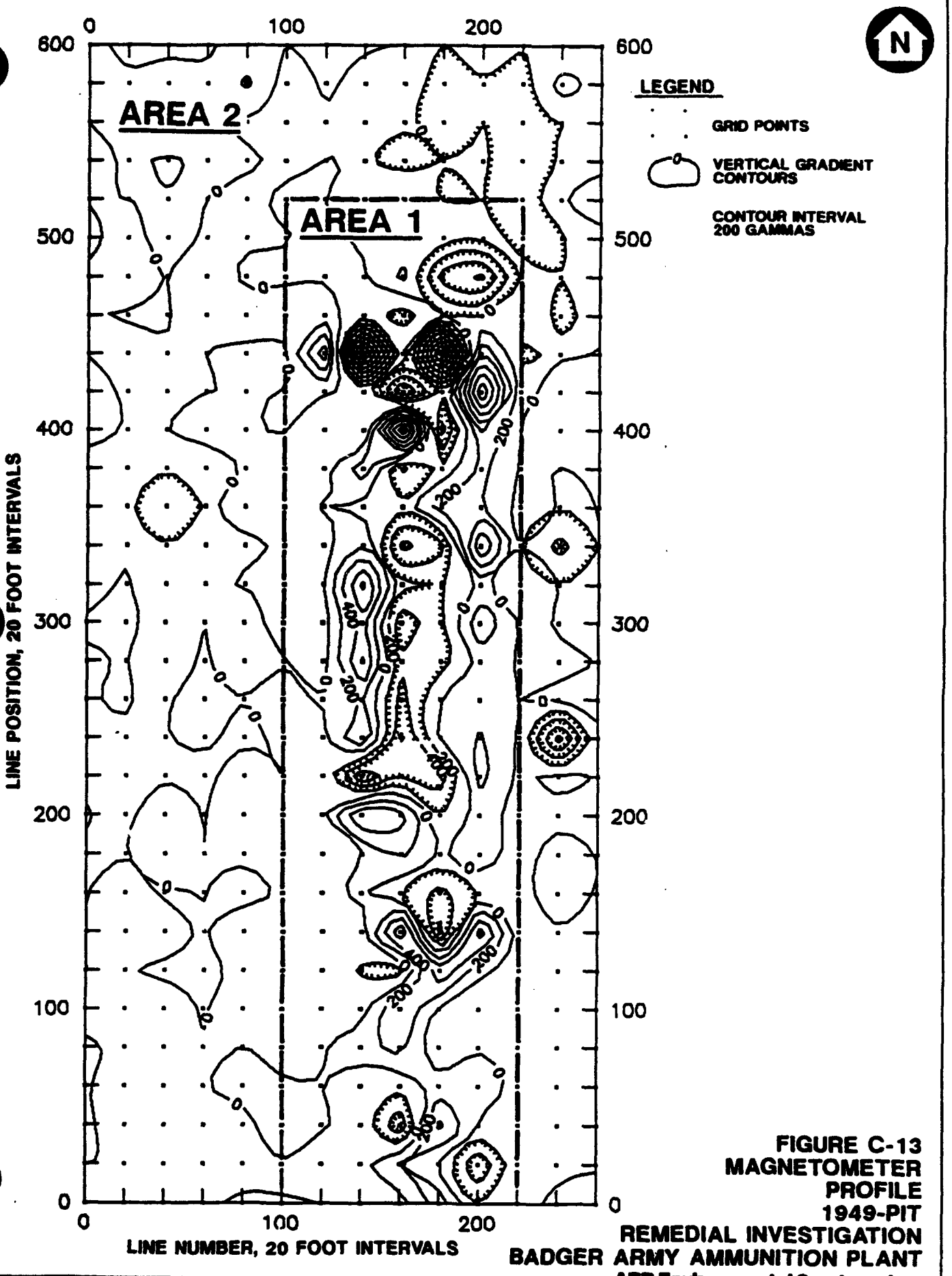


FIGURE C-13
MAGNETOMETER PROFILE
1949-PIT
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

6853-12

foot long by 80 to 100 foot wide corridor trending roughly north-south through the study area.

Anomalies displaying the highest relative amplitudes are located in the northern portion of Area 1. These anomalies encompass a roughly 80 by 120 foot area centered about the Line 160, Position 420. Anomalies in this portion of Area 1 are coincident with the location of what appears to be an asymmetrically-shaped burning ground pit (characterized by a dark area haloed by a light photo-toned area) in 1949 aerial photographs of the site. Anomalies at this location also correspond to the location of a prominent radar anomaly (RA-1) found approximately 2 to 3 feet below ground surface (bgs).

Other magnetic anomalies detected throughout Area 1 correspond to ground scar and the location of past landfilling activities observed in aerial photographs. The relative amplitudes of magnetic anomalies found throughout the central and southern portions of Area 1 are also indicative of significant amounts of buried ferrous materials.

The remainder of the site (Area 2) appears to have no significant magnetic anomalies. Even though portions of the area were found to have a steel cable fence, crushed powder drums, and steel/aluminum electrical cable on the surface, these metals did not appear to have an adverse effect on the resolution of buried metallic objects. Therefore, based on these data and field observations, magnetic anomalies detected in this area are interpreted to be a result of surficial metallic objects.

For the GPR survey a GSSI SIR System III GPR unit with a 500 MHz antenna was used for profiling within the pre-established 260 by 600 foot grid. Based on magnetometer survey results, GPR profiles were made perpendicular to the long axis of the area defined by the magnetometer survey (Figure C-13). A total of 26 GPR traverses were made in a roughly 120 by 500 foot area. Analog strip chart recordings were analyzed and interpreted in the field.

Based on the results of the magnetometer survey, Area 1 was chosen for further study using GPR. A total of seven radar anomalies or anomalous areas (labeled as RA-#) were identified and are outlined in Figure C-14. Table C-4 provides a listing of each identified anomaly; its observed characteristics and relationship to magnetic anomalies. RA-1 is the strongest reflector (2 to 3 feet bgs) encountered during the GPR survey and corresponds directly to the area where the largest magnetic anomalies are observed. The signature of this anomaly is consistent with a significant amount of buried ferrous materials and may be indicative of a large tank or buried drums and/or other metallic objects. Other shallow anomalies displaying strong reflective characteristics include RA-3, 4, 6, and 7. The

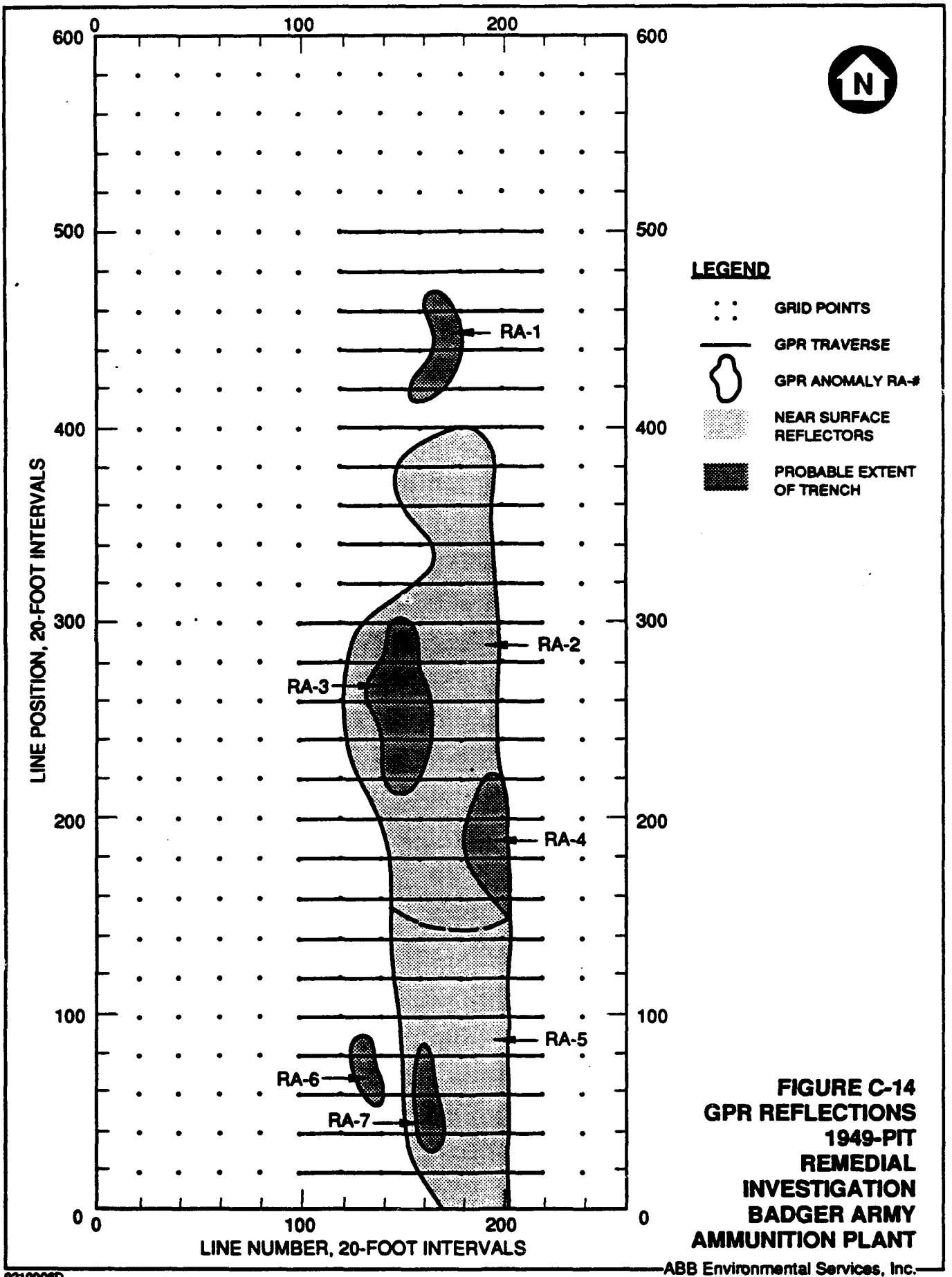


FIGURE C-14
GPR REFLECTIONS
1949-PIT
REMEDIAL
INVESTIGATION
BADGER ARMY
AMMUNITION PLANT

ABB Environmental Services, Inc.

92100060

TABLE C-4
GROUND-PENETRATING RADAR ANOMALY CHARACTERISTICS

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

RADAR ANOMALY	CORRESPONDENCE TO MAGNETIC ANOMALY	CHARACTERISTICS OF ANOMALIES/ANOMALOUS AREAS	INTERPRETATION
RA-1	Yes	Strong, narrow (≤ 10 ft.), continuous reflector, 2-3 feet bgs	Possible buried drum area and/or high concentration of various metallic objects
RA-2	Yes	Relatively weak, broad (20-80 ft.) discontinuous reflectors, extending 3-5 feet bgs	Trench/pit area with moderate concentrations of various metallic objects
RA-3	Yes	Strong, relatively broad (≤30 ft.) continuous reflector, extending 1-3 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-4	Yes	Strong, fairly narrow (≤20 ft.) continuous reflectors, 1-2 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-5	Yes	Moderately strong, broad (60 ft.) discontinuous reflectors, extending 3-5 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-6	NO	Strong, narrow (≤10 ft.) continuous reflector, 1-2 feet bgs	May correspond to area of concrete at surface
RA-7	Yes	Strong, narrow (≤10) continuous reflector, 1-2 feet bgs	Corresponds to area of concrete with wire mesh at surface

signature of these anomalies is indicative of buried concrete with wire mesh or rebar. This observation is consistent with the surficial presence of these materials in the vicinity of RA-7.

The remaining anomalous areas, RA-2 and RA-5 (3 to 5+ feet deep), coincide with the location of former possible landfilling activities. However, it should be noted that the radar signature between these anomalies is slightly different. RA-2 is characterized by weak, discontinuous reflectors whereas, RA-5 is characterized by moderately strong, discontinuous reflectors. This may reflect a change in the types of waste contained in each area, suggesting there may be a grater concentration of metals at RA-5. However, the difference between FA-2 and FA-5 may be a function of geologic conditions such as soils having a greater silt content. According to these data, the 1949 Pit area is approximately 400 feet long and 20 to 80 feet wide.

Conclusions and Recommendations. As a result of the magnetometer and GPR surveys, the following general conclusions can be made:

- Magnetic anomalies in Area 1 are interpreted to be the result of substantial amounts of buried metallic objects found within a 500 foot long by 80 to 100 foot wide corridor trending north-south through the study area. Area 1 radar anomalies suggest waste may extend deeper than three feet bgs.

- Wastes buried in Area 1 may include concrete with rebar, buried drums and building demolition debris.

- Area 2 shows no significant magnetic anomalies suggesting that no considerable amounts of buried metallic materials or debris exist in this area.

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APPENDIX D

DRILLING AND SOIL SAMPLING PROGRAM

D.1 Test Pit, Soil Boring, and Monitoring Wells Boring Logs

D.2 Field Data Records - Soil, Sediments, and Surface Water

D.3 Monitoring Well Construction Diagrams

D.4 Well Development Records

D.5 Regional Water Supply Well Logs

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Appendix D.1

Test Pit, Soil Boring, and Monitoring Wells Boring Logs

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TEST PIT LOGS

Boring Description	Contractor	Date Installed
Propellant Burning Ground		
PBT-90-01	ABB-ES	9/5/90
PBT-90-02	ABB-ES	9/5/90
PBT-90-03	ABB-ES	9/5/90
PBT-90-04	ABB-ES	9/5/90
PBT-90-05	ABB-ES	9/5/90
PBT-90-06	ABB-ES	9/6/90
PBT-90-07	ABB-ES	9/6/90
PBT-90-08	ABB-ES	9/6/90

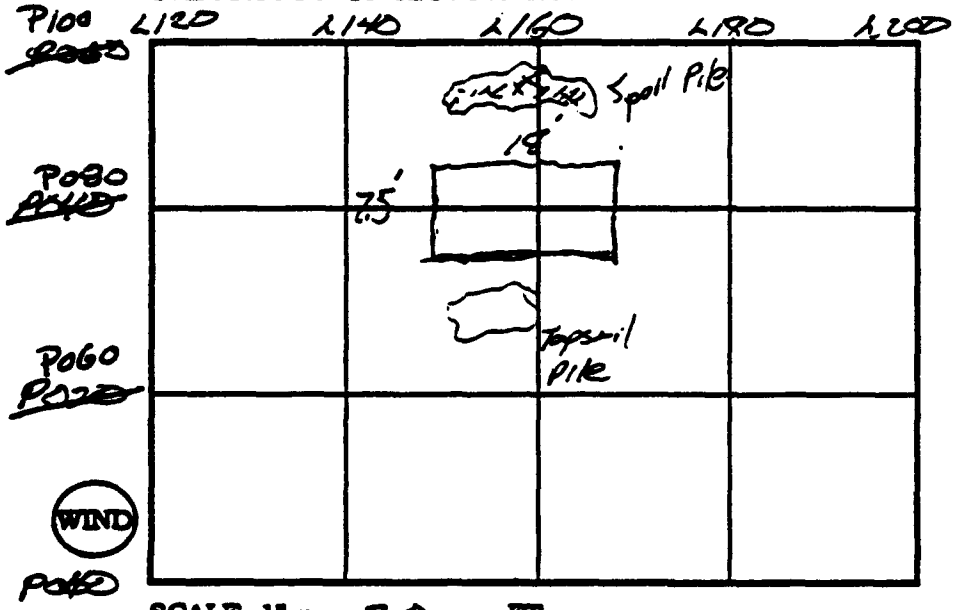
BAAP TEST PIT RECORD

SITE Propellant Burning Ground

TEST PIT PBT-90-01 DATE 9/5/90 TIME 0830 END

COORDINATES 2120 2080 GRID ELEMENT 20 spacing

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: Test pits are located according to existing coordinates/ survey grid. Dimension of TP-1 was 75' wide, 18' long and 13' deep.

CREW MEMBERS:

1. S. Calkin
2. D. Dunning
3. T. Buss
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	Y	N
Explosive Gas	Y	N
Avail. Oxygen	Y	N
OVA	Y	N
Other		

Photographs, Roll 1 ABB/EJ

Exposure #1,2

Photographs Roll 1 DBD

Exposures # 8,9

~~#1,2~~ 3, 3

Photos 1, 2, 3, 4-5.

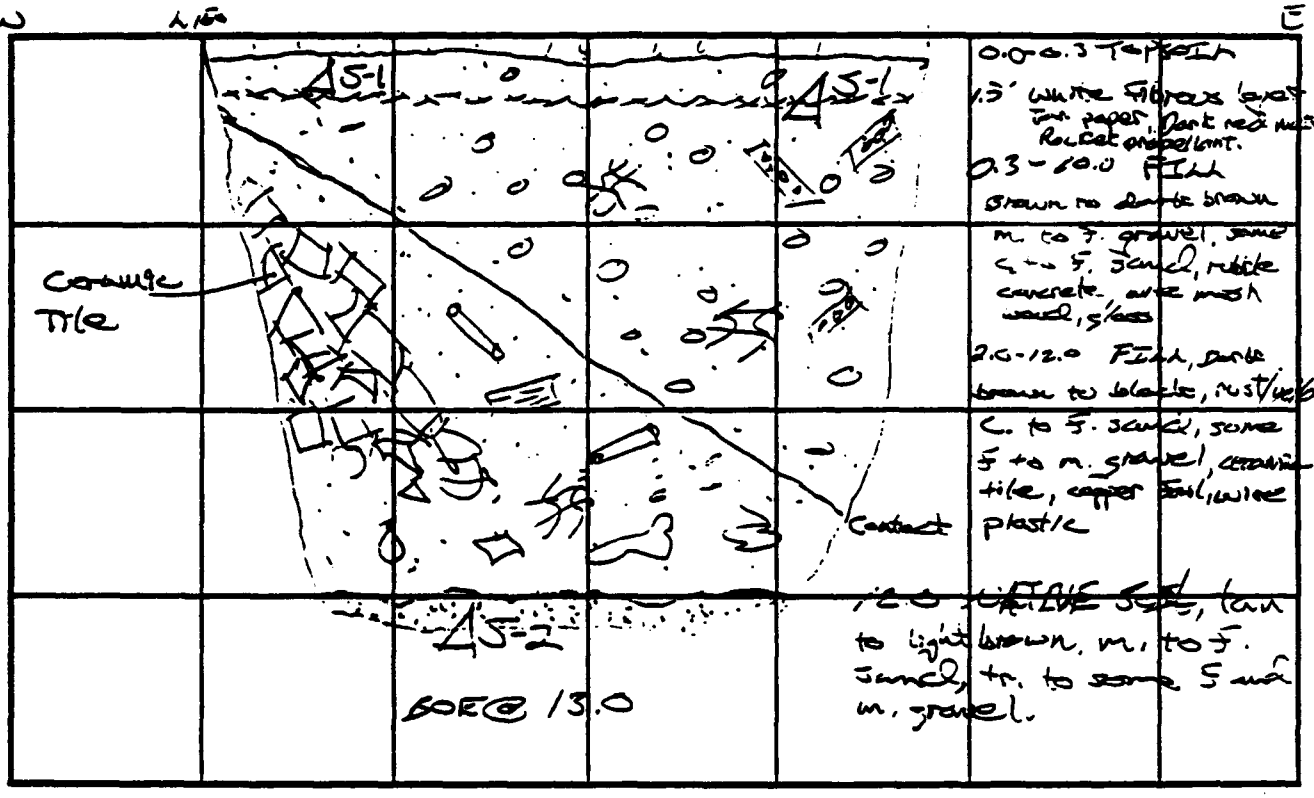
E.C.JORDAN CO.

BAAP TEST PIT RECORD

Profile Along Test Pit- PBT-90-01

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES: TP-1 DIM (7.5 x 18 x 13)

* S-1 is a composite sample consisting of a white fibrous material and dark red material (indicative of rocket propellant) given collect sample to analyze.

* S-2 is a grab/composite sample consisting of native soil, tan to light brown.

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	1.0	T900901	OKG
S-2	12.0-13.0	T900902	OKG
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

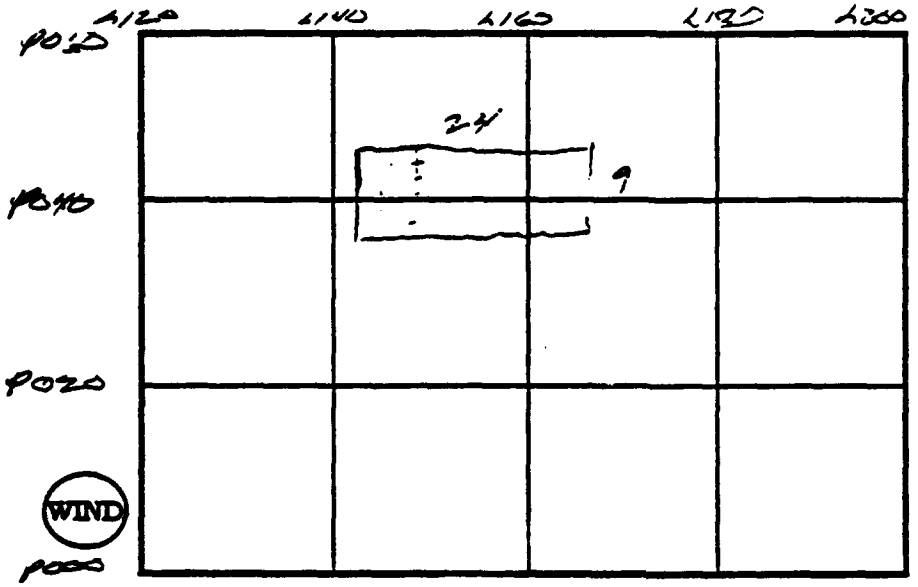
BAAP TEST PIT RECORD

SITE Propellant Burning Ground

TEST PIT PBT-90-02 DATE 5/5/92 TIME _____ END _____

COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: Soil sample T9002003 taken @ 3 ft. Mixture of flaky brick-colored material and fill that was adjacent to this. No second sample taken - native soil @ 4 ft

CREW MEMBERS:

1. S. Colborn
2. D. Dunlap
3. T. Buss
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	(Y)	N
Explosive Gas	Y	N
Avail. Oxygen	(Y)	N
OVA	Y	N

Other _____

Photographs. Roll _____

Exposure _____

Photo DBD 1½ ft depth red material #10, 3ft depth #11

Photo ECJ 1½ ft red material depth #4 or 5 → 7? #7 3 ft depth #9, 10 down to native soil

Photos 6 to 12.

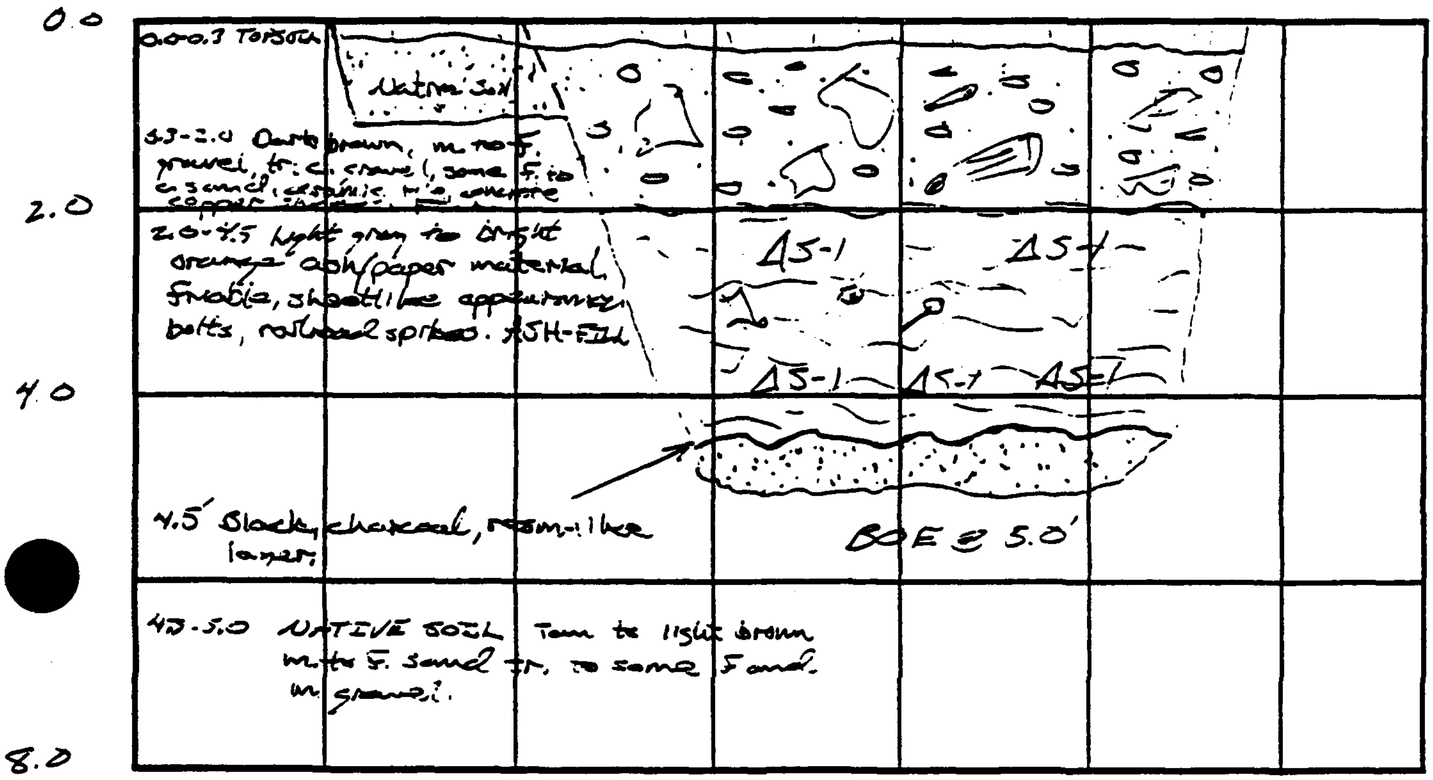
E.C.JORDAN CO.

BAAP TEST PIT RECORD

Profile Along Test Pit- TP PBT-90-02

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES: TP-2 was (9 x 24 x 5)

S-1 is a composite sample taken between 2.0 - 4.5' consisting of sediment and ash/paper materials

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	T9402003	BKG
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. ______

Attachments ______

SIGNATURE: ______

E.C.JORDAN CO.

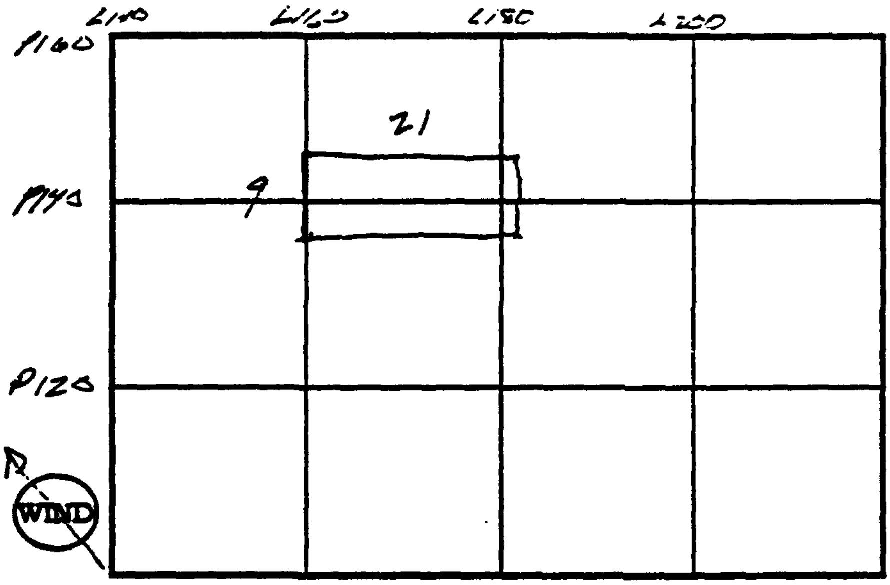
BAAP TEST PIT RECORD

SITE Propellant Burning Ground

TEST PIT PBG-90-03 DATE [illegible] TIME [illegible] END

COORDINATES GRID ELEMENT

SKETCH MAP OF TEST PIT SITE



SCALE 1" = ____ FT.

CREW MEMBERS:

1. J. Buss
2. D Calkin
3. D. Durling
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	Y	N
Explosive Gas	Y	N
Avail. Oxygen	Y	N
OVA	Y	N

Other

Photographs, Roll

Exposure

Photo ECT
#12 & 13, rebar & white & red material ≈ 3 ft + w/ backhoe bucket
#14 picture w/ anomaly
#15, 16, 17 colorful clay material
#18 - depth of pit 16 ft
DBD photos
#12, 13, 14 colorful stuff
#15, 16 multicolored rock
depth of pit 16 ft

NOTES: Sample # T9003005 taken below white layer in greyish layer beneath to assess affect of white layer

Sample T9003009 taken from bucket composite sample. Lots of metal anomalies betw 6 ft & depth of at least 9

Sample T9003012 taken from bucket & spoils sample. Composite sample. Blue, yellow, black moist clayey material

TP-3 Dim (9 x 21 x 16)

E.C.JORDAN CO.

photos 13 to 22

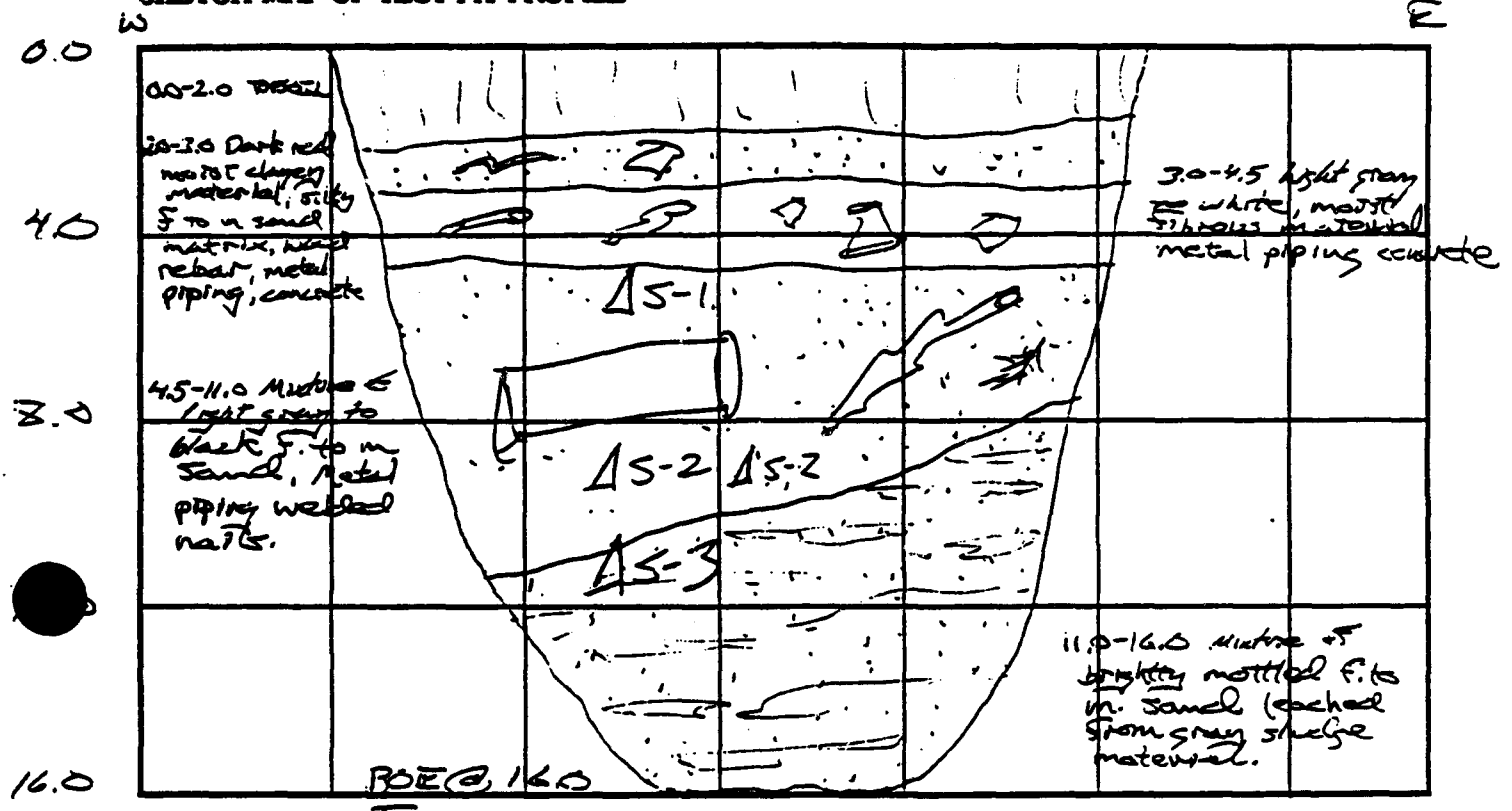
9008086T

BAAP TEST PIT RECORD

Profile Along Test Pit- PBT-90-03

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.

DEPTH (FT.)

NOTES: TP-3 dim (9 x 21 x 16)

* S-1 is a discrete sample, consist of light gray F to m. sand.

* S-2 is a composite/grab sample

* S-3 is a composite/grab sample consists of brightly colored, mottled F. to m. sand.

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	5.0	T9005005	BKG
S-2	9.0	T9003009	BKG
S-3	11.0	T9003011	BKG
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

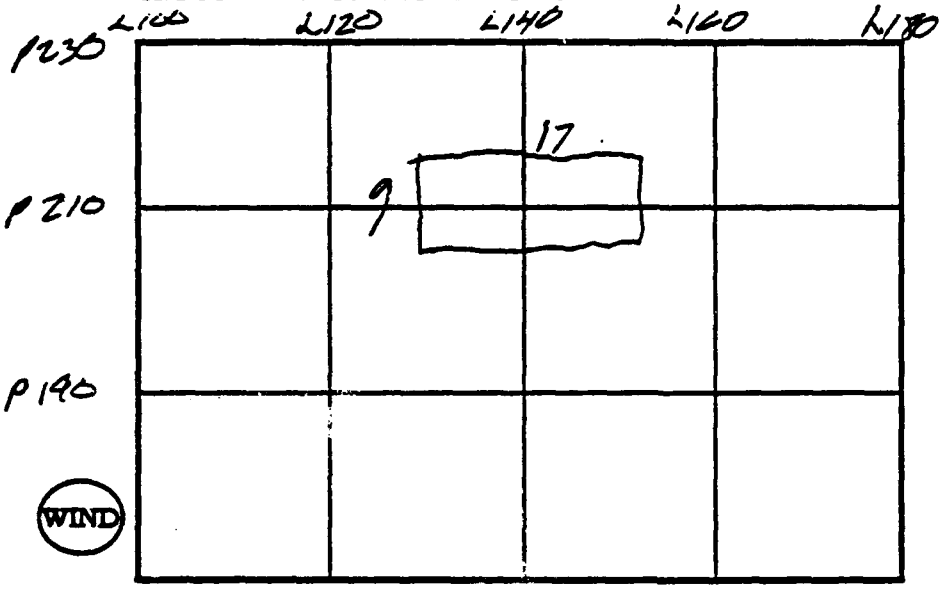
BAAP TEST PIT RECORD

SITE Propellant Burning Ground

TEST PIT # PBT-90-04 DATE 9/5/90 TIME 1515 END

COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-4 Dim (9x17x8)

CREW MEMBERS:

1.

2.

3.

4.

5.

6.

MONITOR EQUIPMENT:

PI Meter	(Y)	N
Explosive Gas	Y	N
Avail. Oxygen	(Y)	N
OVA	Y	N

Other _____

Photographs. Roll _____

Exposure _____

Photo 23

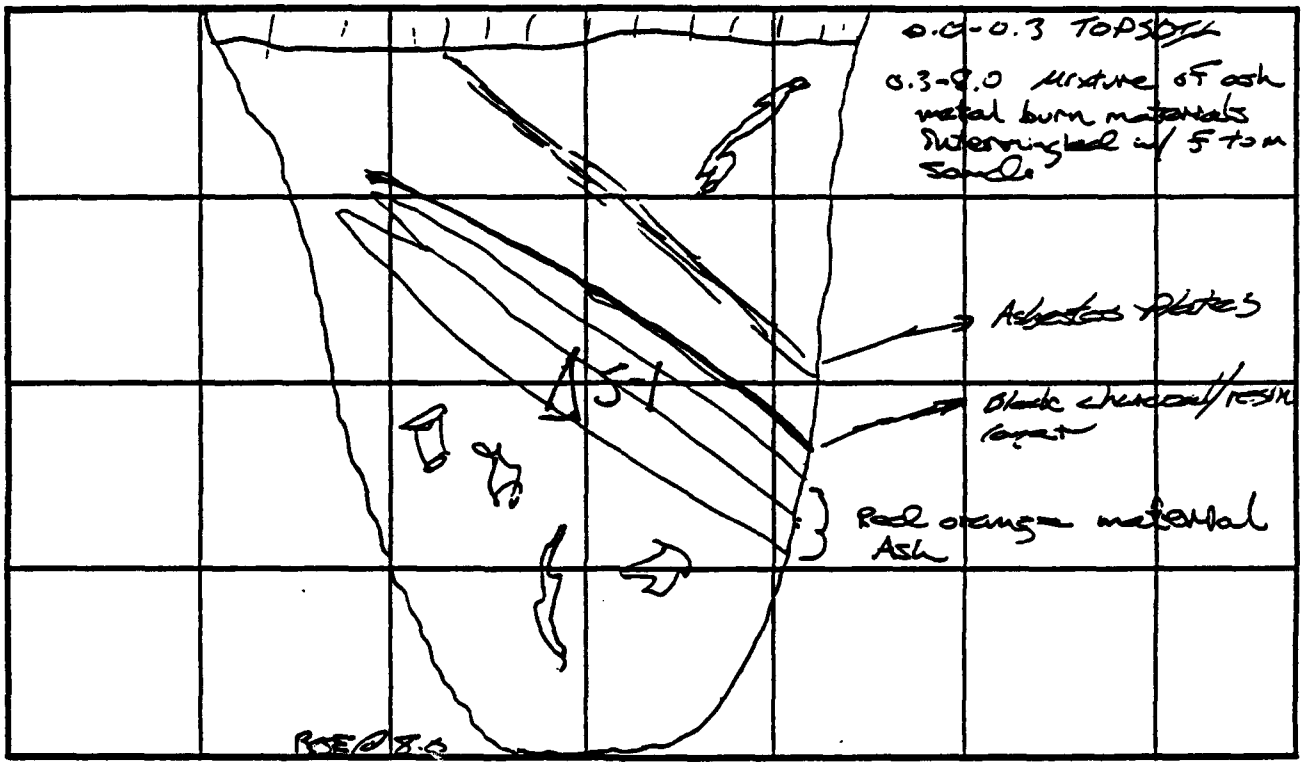
E.C.JORDAN CO.

BAAP TEST PIT RECORD

Profile Along Test Pit- * PIT-90-04

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

* S-1 is a composite sample consisting of red/orange material and fill material

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	9.0	[illegible]	BTG
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

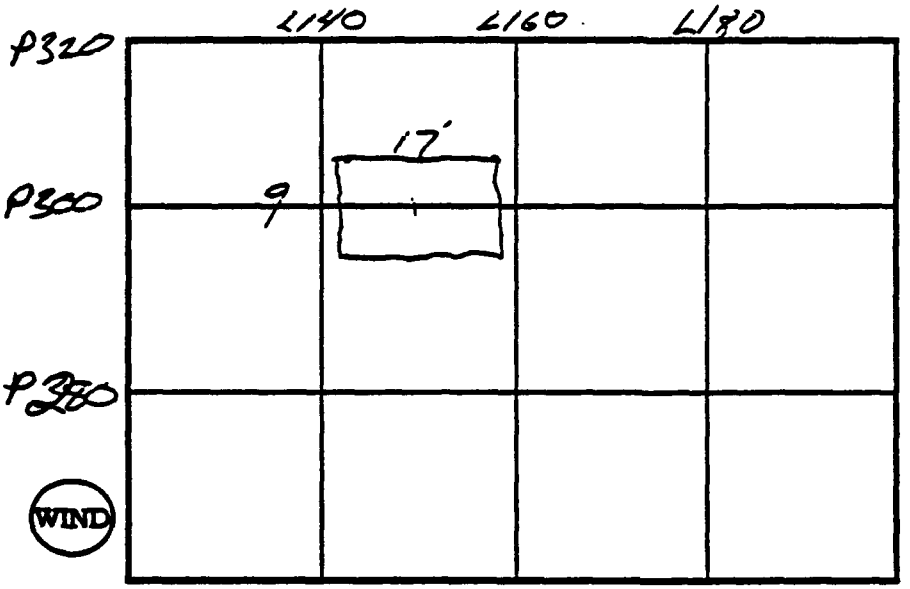
SIGNATURE: _____

E.C.JORDAN CO.

BAAP TEST PIT RECORD

SITE Propellant Burning Ground
TEST PIT PBT-90-05 DATE 8/5/90 TIME _____ END _____
COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-5 location tied to existing TP-5 drum (9 x 17 x 85)

CREW MEMBERS:
1. S. Carlson
2. T. Buss
3. D. Outling
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	(Y)	N
Explosive Gas	Y	N
Avail. Oxygen	(Y)	N
OVA	Y	N

Other _____

Photographs. Roll _____

Exposure _____

Photos 24+25

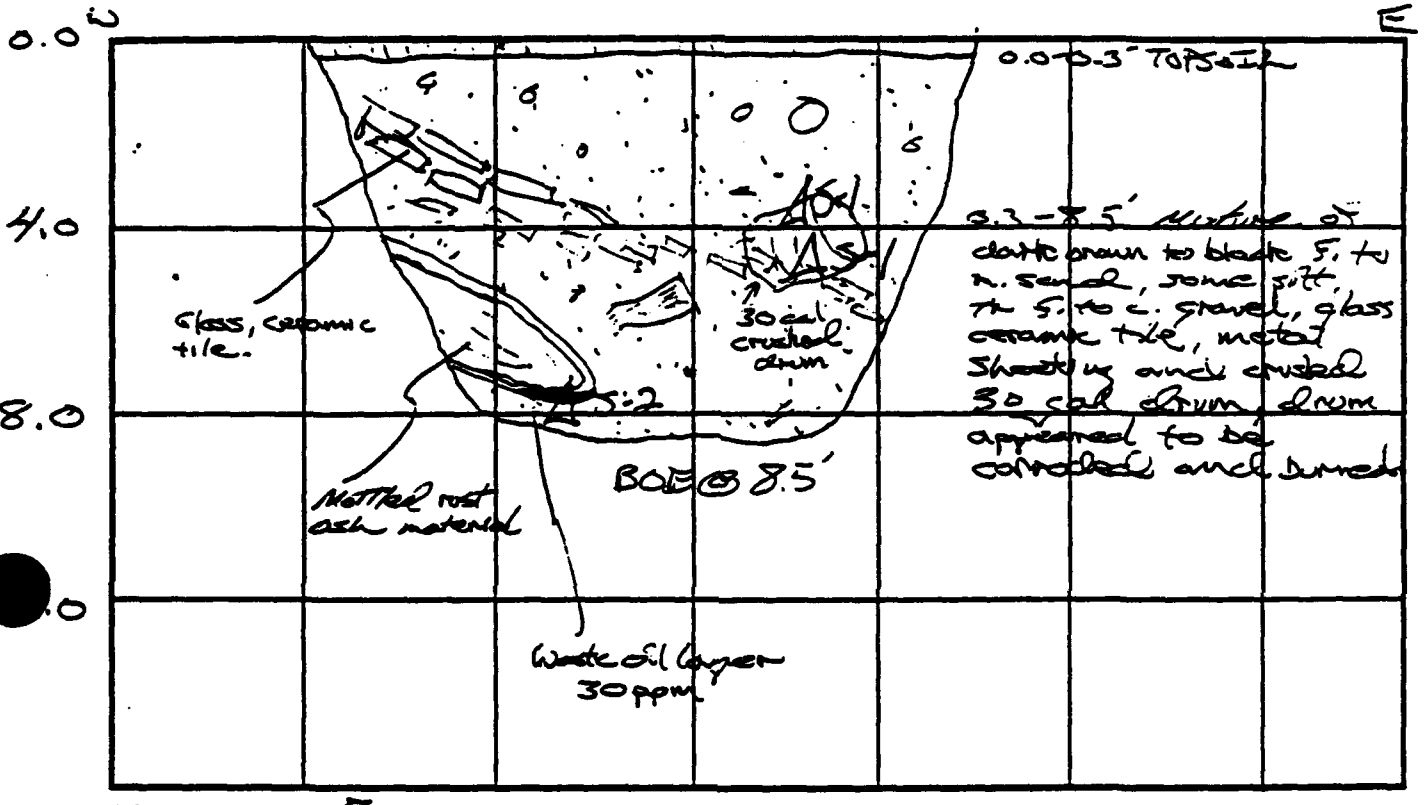
E.C.JORDAN CO.

BAAP TEST PIT RECORD

Profile Along Test Pit- PIT PIT-90-05

SITE Propellant Burning Ground "1949 pit"

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	~~3.0~~	79005307	0
S-2	8.0	79005308	30ppm
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

NOTES:

Sample #1 taken from soil that remained on drum after it was pulled out "discrete"

Sample #2 was a composite sample of a layered material including an alledged waste oil layer that registered 30ppm on the ovm. It smelled like waste oil.

Pictures ECJ

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

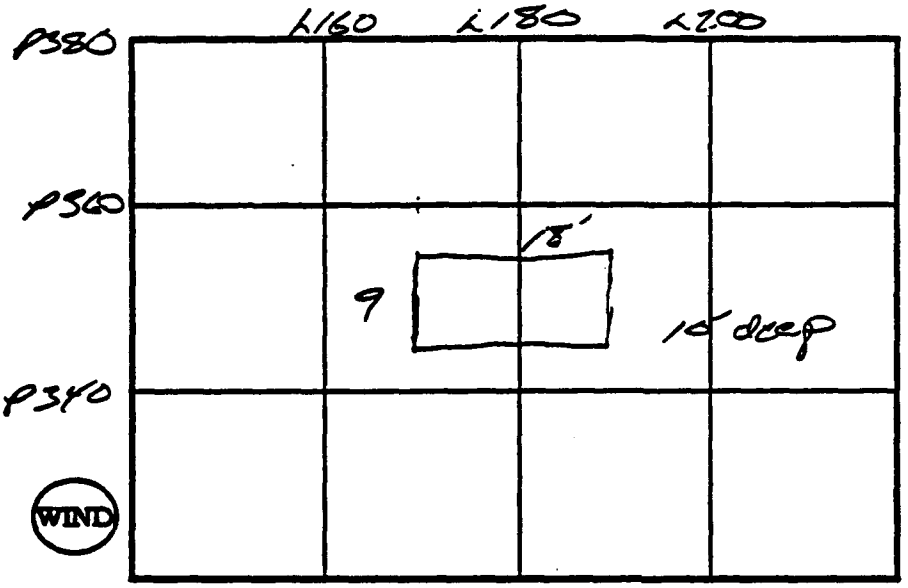
BAAP TEST PIT RECORD

SITE Propellant Burning Ground

TEST PIT # PBT-90-06 DATE 9/6/90 TIME 0815 END 0833

COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-6 is located approximately at the existing geophysical survey grid.
TP-6 Dim (9 x 18 x 10)

CREW MEMBERS:

1. S. Calkins
2. D. Dunning
3. T. Bliss
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	(Y)	N
Explosive Gas	Y	N
Avail. Oxygen	(Y)	N
OVA	Y	N

Other _____

Photographs, Roll _____

Exposure _____

photos 28 + 29

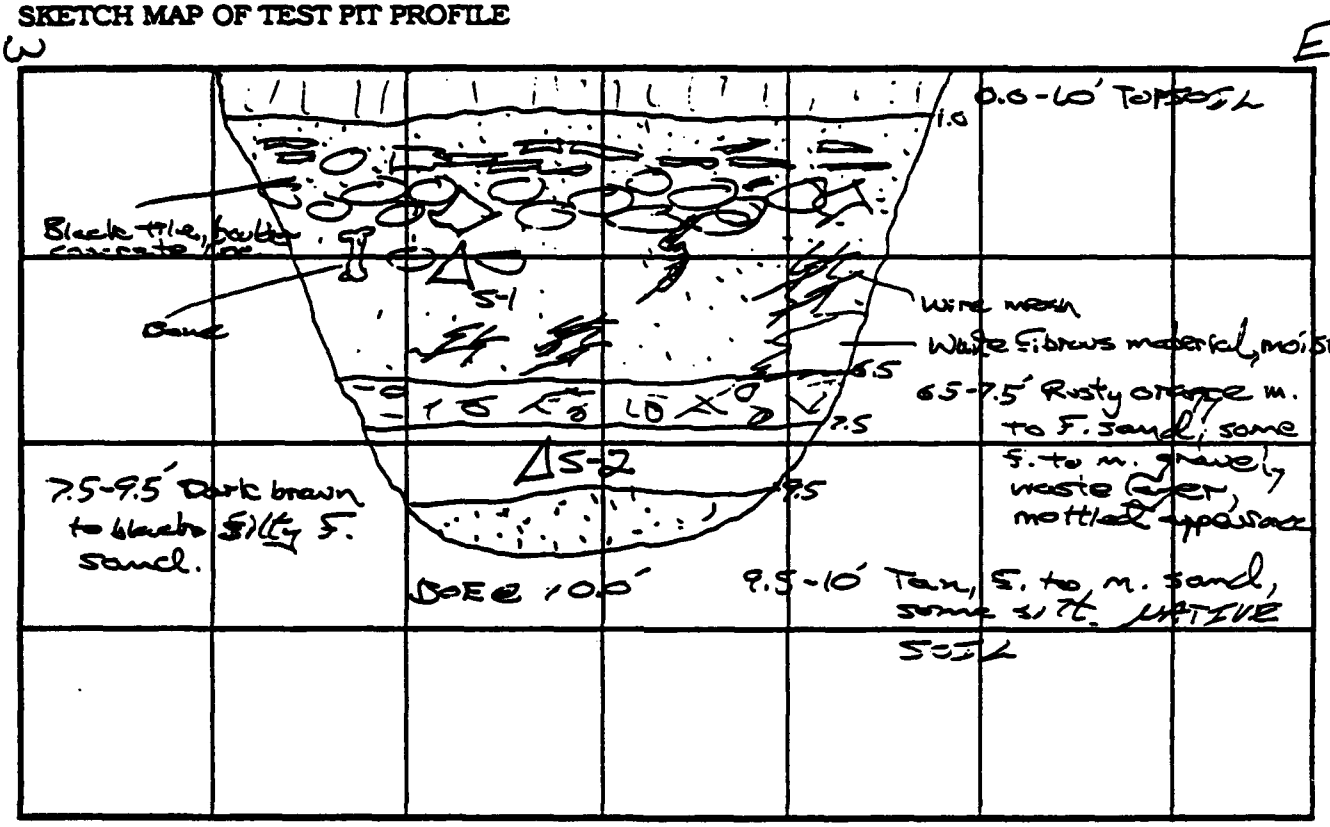
E.C.JORDAN CO.

BAAP TEST PIT RECORD

Profile Along Test Pit- # PRT-90-06

SITE Propellant Burning Ground "1949 pit"

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 **FT.**
DEPTH (FT.)

NOTES:

Sample 1 taken at 3 ft. May reflect a general waste type in this area, OVM read 5 ppm

Sample 2 taken at 9 ft. Also to reflect general waste. Native soil at 10 ft.

Pictures ECJ 27, 28 (?)

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	79006003	~~0~~ 5
S-2	9.0	79006009	0
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

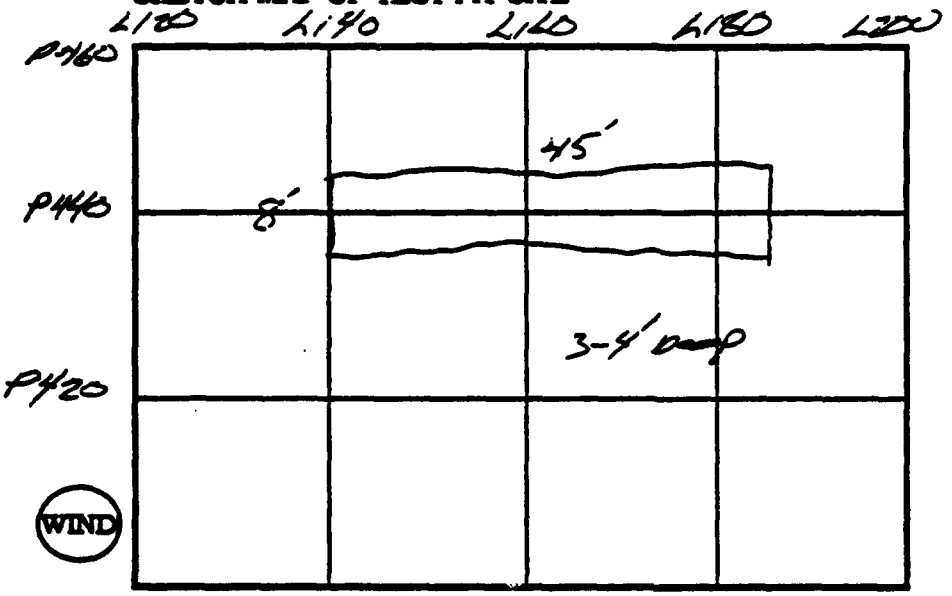
BAAP TEST PIT RECORD

SITE Rocket Burning Ground

TEST PIT TP PBT-90-07 DATE 9/6/90 TIME 1000 END 1115

COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-7 location tied to existing geophysical survey grid

TP-7 dims (8 x 45 x 3-4)

CREW MEMBERS:

1. O. Darling
2. T. Bird
3. S. Calkin
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	(Y)	N
Explosive Gas	Y	N
Avail. Oxygen	(Y)	N
OVA	Y	N

Other _____

Photographs. Roll _____

Exposure _____

Photos 30-34

E.C.JORDAN CO.

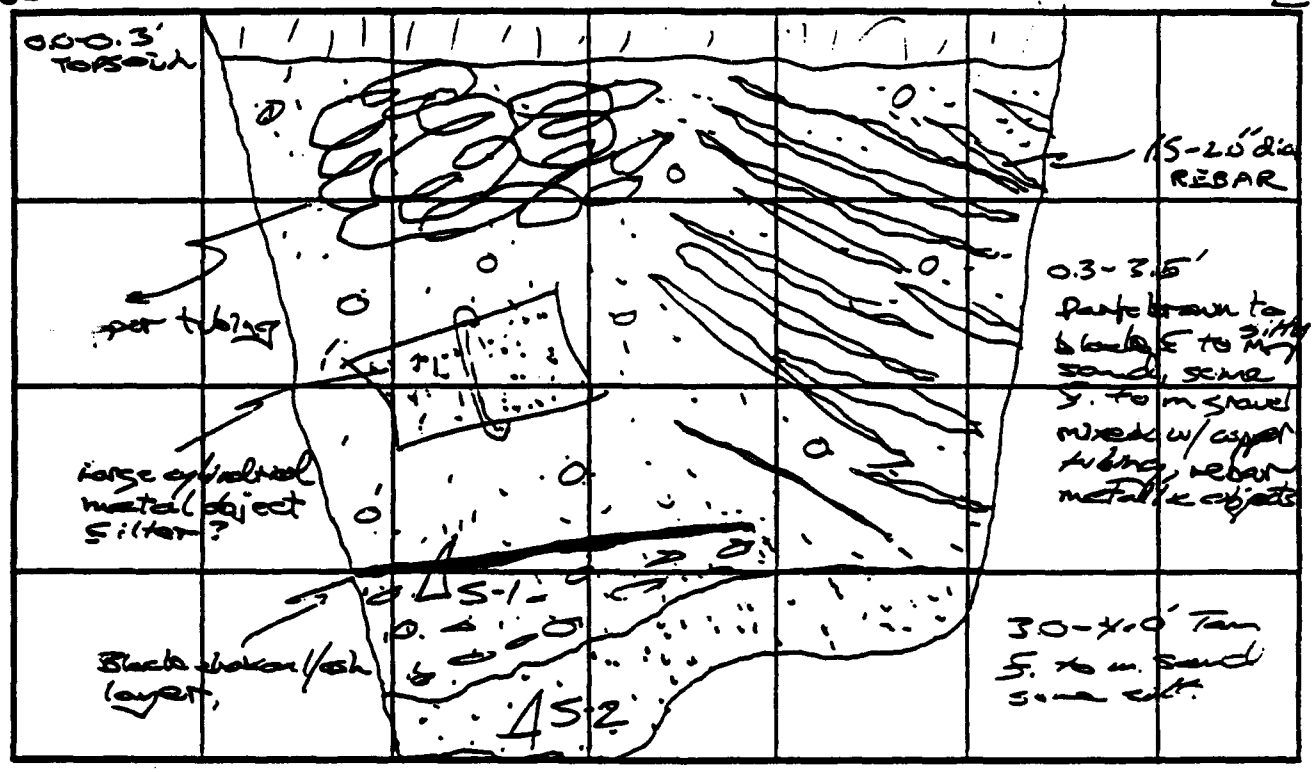
BAAP TEST PIT RECORD

Profile Along Test Pit- ✱ PBT-90-07

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE

W E



SCALE 1" = 10 FT.

DEPTH (FT.)

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	TP90705	BTG
S-2	4.0	TP90706	BTG
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

NOTES:

* S-1 is a discrete sample of a black charcoal/ash layer

** S-2 is a discrete sample of tan, F. to m. sand.

REFERENCE: Field Book, Pg. _____

Attachments _____

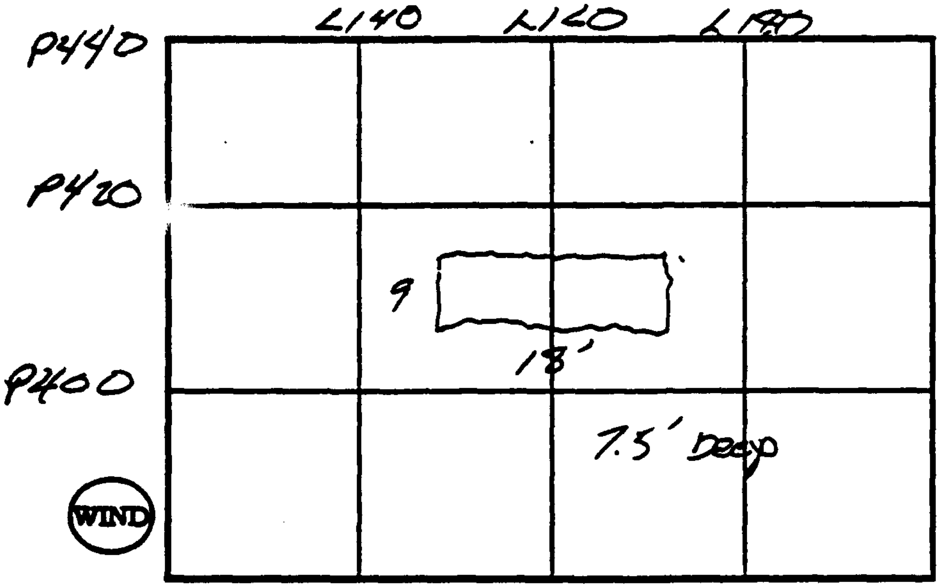
SIGNATURE: _____

E.C.JORDAN CO.

BAAP TEST PIT RECORD

SITE: Propellant Burning Ground
TEST PIT: PBT-90-08 DATE: 9/6/90 TIME: ______ END: ______
COORDINATES: ______ GRID ELEMENT: ______

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-8 located according to existing geophysical survey grid.
TP-8 dim (9x18x7.5)

CREW MEMBERS:

1. S. Calken
2. J. Buss
3. D. Dunlop
4.
5.
6.

MONITOR EQUIPMENT:

PI Meter	Y (circled)	N
Explosive Gas	Y	N
Avail. Oxygen	Y (circled)	N
OVA	Y	N

Other ______

Photographs, Roll ______

Exposure ______

Photos

E.C.JORDAN CO.

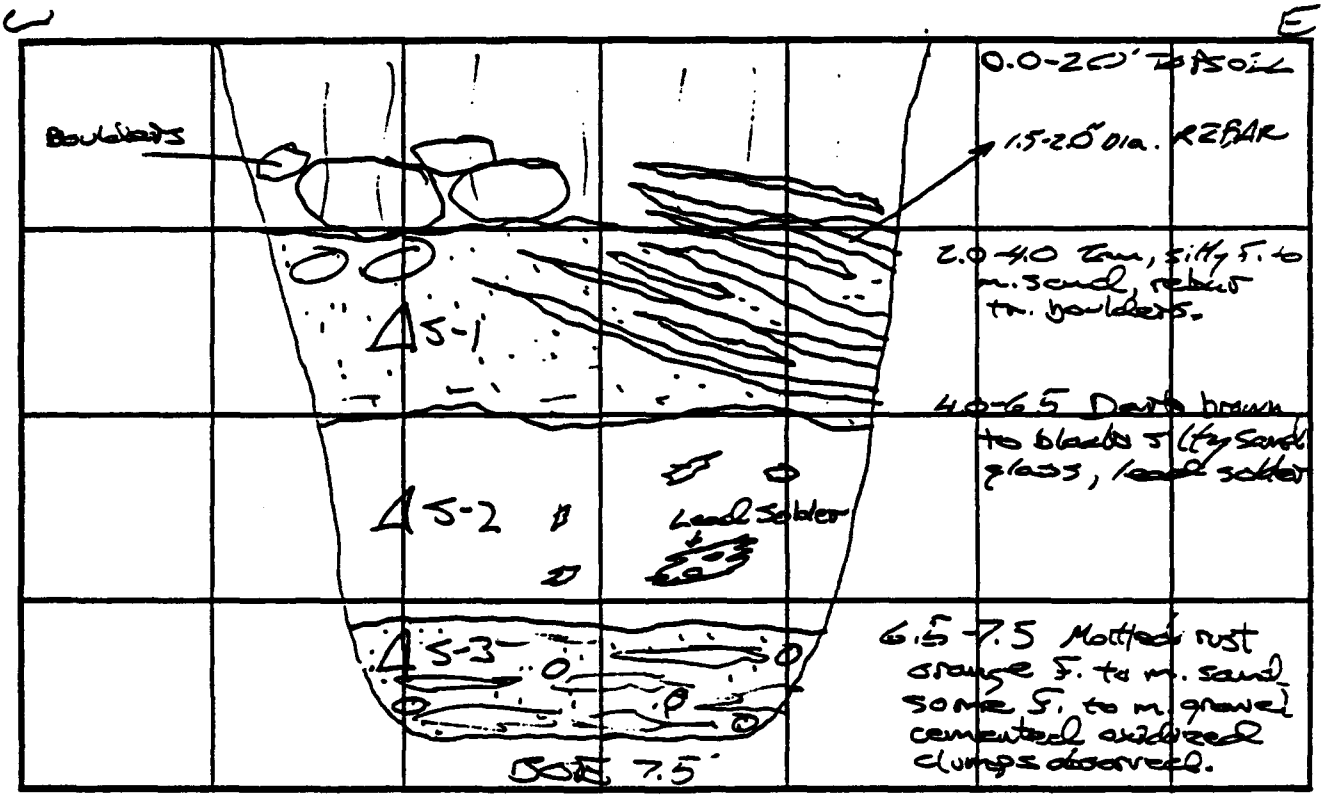
9000086T

BAAP TEST PIT RECORD

Profile Along Test Pit- PBT-90-08

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

* S-1 is a discrete sample consisting of tan, silty F. to m. sand

* S-2 is a discrete sample consisting of clayey brown to black silty sand

* S-3 is a grab sample consisting of mottled rust/orange cemented F. to m. sand.

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	7905003	BKG
S-2	5.0	7905004	BKG
S-3	7.0	7905005	BKG
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book. Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

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SEDIMENT LOGS

Boring Description	Contractor	Date Installed
Control Pond		
CP-1	Ayres	6/29/84
CP-2	Ayres	6/28/84
CP-3	Ayres	6/30/84
Ballistics Creek		
BC-1	Ayres	7/3/84
BC-2	Ayres	7/3/84
BC-3	Ayres	7/3/84
BC-4	Ayres	7/3/84
BC-5	Ayres	6/30/84
Ballistics Pond		
BP-1	Ayres	7/1/84
BP-2	Ayres	7/3/84
BP-3	Ayres	7/3/84
BP-4	Ayres	6/30/84
BP-5	Ayres	7/1/84
BP-6	Ayres	6/29/84
BP-7	Ayres	6/30/84
Control Pond		
Spike 1	Ayres	7/3/84
Spike 2	Ayres	7/3/84
Spike 3	Ayres	7/3/84
Spike 4	Ayres	7/3/84
Spike 5	Ayres	7/3/84
Spike 6	Ayres	7/3/84
Spike 7	Ayres	7/3/84
Spike 8	Ayres	7/3/84
Final Creek		
FC-1	Ayres	6/29/84
FC-2	Ayres	7/1/84
FC-3	Ayres	6/29/84
FC-4	Ayres	7/1/84

FC-5	Ayres	6/29/84
FC-6	Ayres	6/30/84
FC-7	Ayres	6/29/84
FC-8	Ayres	7/1/84
Final Pond 1		
FPI-1	Ayres	7/1/84
FPI-2	Ayres	7/2/84
FPI-3	Ayres	7/1/84
FPI-4	Ayres	7/3/84
FPI-5	Ayres	7/2/84
FPI-6	Ayres	7/1/84
FPI-7	Ayres	7/1/84
FPI-8	Ayres	7/1/84
FPI-9	Ayres	7/1/84
FPI-10	Ayres	7/2/84
FPI-11	Ayres	6/29/84
FPI-12	Ayres	6/29/84
FPI-13	Ayres	6/29/84
FPI-14	Ayres	7/1/84
Final Pond 2		
FPII-1	Ayres	6/30/84
FPII-2	Ayres	7/2/84
FPII-3	Ayres	7/2/84
Final Pond 3		
FPIII-1	Ayres	6/28/84
FPIII-2	Ayres	6/28/84
FPIII-3	Ayres	6/30/84
FPIII-4	Ayres	6/29/84
FPIII-5	Ayres	6/28/84
FPIII-6	Ayres	6/28/84
FPIII-7	Ayres	6/29/84
FPIII-8	Ayres	6/28/84
FPIII-9	Ayres	6/29/84
FPIII-10	Ayres	6/29/84
FPIII-11	Ayres	6/30/84
FPIII-12	Ayres	6/30/84
FPIII-13	Ayres	6/28/84
FPIII-14	Ayres	6/28/84
FPIII-15	Ayres	6/28/84

Final Pond 4

FPIV-1	Ayres	6/29/84
FPIV-2	Ayres	6/30/84
FPIV-3	Ayres	7/1/84
FPIV-4	Ayres	7/1/84
FPIV-5	Ayres	7/1/84
FPIV-6	Ayres	6/30/84
FPIV-7	Ayres	7/1/84
FPIV-8	Ayres	6/30/84
FPIV-9	Ayres	7/1/84
FPIV-10	Ayres	6/28/84

Nitroglycerine Pond

NG-1	Ayres	7/1/84
NG-2	Ayres	6/30/84
NG-3	Ayres	6/30/84
NG-4	Ayres	6/30/84
NG-5	Ayres	6/28/85
NG-6	Ayres	6/30/84
NG-7	Ayres	6/30/84
NG-8	Ayres	6/30/84

Oleum Pond

OP-1	Ayres	6/27/84
OP-2	Ayres	6/27/84
OP-3	Ayres	7/2/84
OP-4	Ayres	7/1/84
OP-5	Ayres	7/1/84
OP-6	Ayres	6/26/84
OP-7	Ayres	6/28/84
OP-8	Ayres	7/2/84
OP-9	Ayres	6/27/84

Rocket Area

RAD-1	Ayres	7/2/84
RAD-2	Ayres	7/3/84
RAD-3	Ayres	7/2/84
RAD-4	Ayres	7/2/84
RAD-5	Ayres	7/2/84
RAD-6	Ayres	7/2/84
RAD-7	Ayres	7/3/84
RAD-8	Ayres	7/3/84

RAD-9	**Ayres**	7/2/84
RAD-10	**Ayres**	7/2/84
RAD-11	**Ayres**	7/2/84
RAD-12	**Ayres**	7/2/84
RAD-13	**Ayres**	7/2/84
RAD-14	**Ayres**	7/2/84
RAD-15	**Ayres**	7/2/84
RAD-16	**Ayres**	7/2/84
RAD-17	**Ayres**	7/2/84
RAD-18	**Ayres**	6/30/84
RAD-19	**Ayres**	7/1/84
RAD-20	**Ayres**	6/30/84

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WEG SAMPLE NO.: CP-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 25
0 - 12"	SM	Brn w/ blk streaks & mottles. Silty, fine sand. A few silty laminations in bottom 2" of zone. 5YR 3/2 fine roots thru zone.
12" - 31"	SP	med. to light brown fine sand. w/ brn. mottles throughout. Bottom 2" has chunk of blk. fine-sandy silt. 10YR 6/6
		Perm Sample 0"-6".

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		non-Plastic											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond - Water LOGGED BY: WFG SAMPLE NO.: CP-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 6
0 - 4"	OL	Gry-brn pond bottom muck. Organic Silt. 5Y 2.5/2, organic odor.
4 - 15"	SP	Gry fine - med sand. 1" sandy (fn) Silt on bottom 5Y 5/2
END		Perm 7"-12"
		no remaining sample after bottling for chemical analysis.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
4-15"		Non-plastic											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Central Pond LOGGED BY: WFB SAMPLE NO.: CP-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB3
0-9"	OL	Saturated olv. brn organic muck. 5Y2.5/2
9"-14"	SP	gry-grn uniform fine Sand w/ few dark mottles. Wet but not sat. 5Y4/2
14"-22"	CH	Dk. olive clay. med. to highly plastic. Soft 5Y 2.5/2
END		
		PERM @ 15"-21"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-15 7"													

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AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/94 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Creek LOGGED BY: WEG SAMPLE NO.: BC-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 3
0-16"	ML	Brn sandy silt. Top 1" is mostly organic leaf stems, dead grass, etc. held together w/ silt. From 1"-2" is very moist light buff colored silty clay. color 10YR 6/4 (moist) (Dry - white). From 2"-16" is predominant brn color - 5YR4/4. A black sand patch at 13". Sand increased in bottom 2". Also present is weathered gravel up to 1½" dia.
16"-25"	SP	Brn fn - med sand. 5Y3/4
End		Perm 18"-23"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOUNDNESS			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-20 9'-2"	23.1	12.1	11.0										

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Creek LOGGED BY: WEG SAMPLE NO.: BC-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID1 (ID0?)
0 - 8"	SM	Brn silty sand, somewhat sticky. Sand is mostly fine-med but some cs sand & fine gravel are present.
8" - 22"	ML	Gry & brn clayey, sandy, silt w/ tr gravel up to 2". Some gravel is weathered. Clay and silty sand occur in non-homogeneous patches. Some black sand size material at 19"-20" in an isolated patch. Clay zones are stiff. 7.5 YR 4/2 - clayey silt 7.5 YR 4/4 - sandy patch 5YR 3/2 - clay
END		
		Perm 0-5"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-18 14"-18" clay patch	22.8	13.1	10.7										

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistrea Creek LOGGED BY: WFG SAMPLE NO.: BC-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID2
0-22"	ML	Brn Silt w/ f. sand. Some mottling & v. thin wavy laminae. Roots @ 5" & 10" (1/8" & 1/4" dia.). From 8"-10" is sandy zone. Fine Roots @ 20". A 1" sandy zone @ 19". 5Y 3/2
22"-25"	SM	Brn & gry med sand & silt. Lg. root @ 25" Predominant sand layer at 22". Remainder is med sand & silt mixed. 5YR 3/2
25"-29"	CL	Rusty / olv. brn stiff clay. Some v. thin layering, especially in bottom 2". 5YR 4/6

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-19													
"-29"	33.3	16.8	16.5										

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Creek LOGGED BY: WFG SAMPLE NO.: RC-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 7
0 - 12"	SP-SM	gry-brn, wet, silty med. sand w/ abundant leaves, twigs & wood pieces. Organics decrease w/ depth. 5YR 3/2
12"-18"	sludge	Gry to blk, v. soft, saturated sludge like, material. Pudding texture & behavior. 7.5YR 2/0
18"-19"	SP	1" med-cs sand. w/ some fine sand. 5YR 3/2
19"-24"	CH	Gry, soft clay w/ some silt. Severely weathered 1" gravel piece @ 23". 7.5YR 3/0
24"-27"	SM	Gry, silty, sand w/ gravel. 7.5YR 4/0
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-12 20"-29"	62.5	19.5	43.0										

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3409.00

SAMPLE LOCATION: Ballistics Pk. LOGGED BY: WFG SAMPLE NO.: BC-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 30
0-13"	CL	Dk gray-brn silty clay w/ numerous roots. Last 3" blk color increases. Soil feels moderately plastic. 5Y2.5/2
13-16"	CH	Blk. very plastic silty clay. Bottom ~1" saturated. Roots present but finer than above. Lumpy texture. 2.5Y2/0
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-13													
"-16"	59.4	35.1	24.3										

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AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 2/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFG SAMPLE NO.: BP-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB 30
0-10	SW	Brn Cs & fine Sand. 10YR4/4
10-26"	CL-ML	Gry Brn firm ~~gravelly~~, sandy, silty clay w/ tr. gravel. 10YR3/2
End		
		Perm 5"-10"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-9													
0-13"	20.5	13.1	7.4										

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco / Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFG SAMPLE NO.: BP-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 6
0 - 9"	ML	Dk. gry - brn silt w/ some clay. Roots through interval. 5Y2.5/1
9" - 22"	CL	Olb - brn, very stiff silty clay. Abundant fine black specs. 5Y4/2 Looks like carbon?
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-23 18"-22"	50.5	21.1	29.4										

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: _____ PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFG SAMPLE NO.: BP-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		BP-3 was retained but not logged due to low sample recovery. Chemical analysis was not performed, either. Sample BP-4 was obtained from the Ballistics Pond in the vicinity of this location as a replacement.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFC SAMPLE NO.: BP-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB0
0-8"	CL?	Olive brn very soft clay? near saturation. Feels like Jello. Tube head imprint in top of sample. 5Y 3/2
8-19"±	Sludge	Blk "jello" sludge. Interval 8"-19" sheared during extraction. 2.5Y 2/0
19"-33"	Sludge? Clay?	Blk & olive brn marbled clay/sludge. 5Y 2.5/2 – 2.5Y 2/0

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-35 2'-6"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFC SAMPLE NO.: BP-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		IB20 photo (2)
0-22"	Sludge	Black color in upper part changing to olv. brn w/ blk mottles deeper. Chocolate pudding texture. Saturated & v. soft in upper part, firmer below.
END		Color when mixed 2.5Y2/0

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WEG SAMPLE NO.: BP-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-8"±	Sludge	Photo IA24 Streaked blk.-gray sludge. Color 7.5YR 2/0 (moist) Sample taken with a clam shell bottom sampler. Then transfered to shelby tube for transport.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
m-2													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eng/ENV DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFG SAMPLE NO.: BP-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-8" ±	Sludge	Photo IB1 Sample collected w/ clamshell bottom sampler. Depth about 8". Sample transfered to Shelby Tube for transport. Gray - blk saturated sludge. Smell sulfur? Texture of chocolate pudding. 542.5/1
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
m-8													

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AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		ID 16
0-6"	SM	Dk. brn silty fine sand. Tr gravel. 5Y 3/2
6"-18"	SP	Yellowish brn uniform fine sand, some thin silty bands, Bottom 2" darker brn & mottled. Tr fine gravel. 10YR 4/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 17
0-11	SM	Dk. brn silty fine sand w/ Tr gravel. 5Y 3/2
11-17"	SP	Yellow-brn uniform fine sand. Tr plant root or twigs 10YR 4/4
17"-23"	SM	Brn. Silty sand. 1½" wood piece at 18". 2.5Y 4/2
23"-29"	SP	Yellow brn silty fine sand. Some olv.-brn silty zone that separate from the sand. 10YR 4/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env. DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Area LOGGED BY: WFG SAMPLE NO.: Spike 3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		ID 15
0 - 12"	SM	Dk brn - brn silt & Fine sand. Decaying root @ 9". 5Y3/2
12 - 19"	SP	Brn. (yellowish) fine, uniform sand. Tr. gravel. Some silt in top 1". 10YR6/6
19" - 30"	SM	Yellowish brn fine sand mixed w/ "clods" of olv. brn silt containing some clay. 10YR4/4
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 19
0 - 8"	SM	DkBrn. fine sand & silt. w/ roots. 5Y3/2
8" - 12"	SP	Yellowish brn uniform fine sand. 10YR6/6
12" - 18"	SM	Brn. silty fine sand. 5Y4/2
18" - 26"	SP	Yellowish brn uniform fine sand. One 1" gravel piece at 19". 10YR6/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFB SAMPLE NO.: Spike 5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		ID12
0-8"	ML	Dk brn silt & fine sand. Abundant roots in top 2". 2.5Y 3/2
8-27"	SP	Yellow brn, uniform fine sand. 1" layer of mottled brn silt. 10YR 7/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		ID 11
0 - 6"	ML	Dk brn silt. Top 3" over saturated. 3"-6" near saturation. 5Y2.5/2
6" - 11"	SM	Olv. gry f-med. sand w/ tr. gravel. Bottom 2" had 1/4" layers of dk olv brn silt & no gravel. 5Y5/1
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin E.a/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: SP-Ke-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I 0 10
0 - 4"	SM	Dk gry-brn fine-med sand w/ some silt. Abundant organic plant debris. 5Y2.5/2
4 - 9"	SP	gry-brn fine sand. Abundant fine roots. Tr cs sand. 5Y3/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFB SAMPLE NO.: Spike 8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 9
0-6"	SP	Gry brn f.-med sand w/ abundant grass, twigs, & other organic plant matter. Tr. gravel. 5Y 3/1
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6-29-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: PSW SAMPLE NO.: FC-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA-20 (2)
0-2"	SP	Sand, fine grained, medium brown (7.5YR 5/4) trace silt, 1/4" thick silty seam at 2"
2-5"	SP	sand, fine grained, light brown (10Y 6/3) trace of silt, wood fibers
5-10"	ML?	Silt?, medium reddish-brown, saturated and mushy (5YR 3/4)
10-14"	SM	Sand, coarse to fine, medium reddish-brown (7.5YR 3/4), small gravel bottom 1½"
14"-27"	SP	Sand, coarse to fine, medium yellow-brown, trace silt, scattered fibers
		Atterberg Pan M-1
		Perm sample 20"-27"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 7-1-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: PSW SAMPLE NO.: FC-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IC6
0-4"	OL	Silt, dark brown (10YR4/1) with straw, roots, fibers, snail shells, organic smell, saturated
4"-10"	OL	Silt, black (7.5YR2/0) with strong organic smell, a little sub angular gravel at bottom, trace sand, saturated, firm
10"-17"	ML	Silt, medium gray-brown (10YR3/2), sandy, with a few scattered mottles, firm, saturated
17"-23"	GM	Gravel, medium gray-brown (10YR5/1), fine to coarse grained, sub angular to subrounded, with some silt and sand, friable, saturated
23"-25"	SM	Sand, dark brown (5YR2.5/1), fine to coarse grained, with some silt and subrounded gravel, wet
		Atterberg pan S-98

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WFG SAMPLE NO.: EC-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA27
0 - 9"	SM	Dk. brown silt w/ some fine sand. Cross bedded @ 2-3" rs ± clean fine sand vein w/ powder pellet 5/16" Ø 5-4 2.5/1
9-16"	SW	± clean fn - cs sand. 1/8" powder pellet at top of zone. 5/16" Powder pellet at 10". Thin zone @ 16" contains 50% 1/32" Ø Powder pellets. 2.5 4 3/2
16" - 29"	SP - SM?	Oline brn to black silty fine sand. w/ tr cs sand to fn grav. Top 2" v. near saturation. 5-4 2.5/2
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-17 "20-23"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Qin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WEG SAMPLE NO.: FC-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB29
0 - 9"	CL	Dk gry brn stiff silty clay w/ some v.f. sand. Few roots. 5Y2.5/1
9"-28"	SM	Dk brn Silt and sand w/ Tr grav. 10 YR3/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-4 6"-8"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WEG SAMPLE NO.: FC-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 19 (2)
0 - 11" ±	SP-(ML)?	Blk. silty sand w/ tr fn grav. 1½" grav. @ 8". Powder pellets present in top 2"-3". 5Y2.5/2
11" - 22"	SW-SP	Olive Brn gravelly, (silty?) sand 5Y 3/2
22 - 25	GP	Brn sandy gravel. Grav. is angular to rounded. 5Y 3/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
SS-3 2-5"													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WFG SAMPLE NO.: FC-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB18
0-5"	SM	Dk. Brn - blk silty sand. Some fine blk sub-angular grains (charcoal?)
5"-26"	SP-SM	Dk brn to brn, silty, gravelly sand. Strong organic decay odor 5-13", small zone at ~20" contains small blk sand grains in association w/ gold colored metallic grains. Later shows one shiny plane i.e. v. thin. Look somewhat like muscovite mica.
END		NOTE: Muscovite mica confirmed under microscope. Small black grains believed to be mica books viewed on edge.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
L-1 0-5"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Eav DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WFB SAMPLE NO.: EC-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 28
0 - 10' Refusal	ML-CL ?	Dark brown to black clayey silt of mod. plasticity. Tr of gravel. color 5Y2.5/1
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-3L 10"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: WEB SAMPLE NO.: EC-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ED28
0-6"	SP (SM)?	Gry fine-med sand w/ few ⅛" veins dk gry silt 2.5Y 5/2
6-8"	SM	Dk gry silty fine sand. Roots common. 5Y 3/1
8"-12"	SP-SM	Gry & Olv. Silt and sand w/ a few blk mottles. 5Y 4/4
12"-26"	ML	Olv. brn med-fn sand and silt. Tr gravel (weathered sandstone). 5Y 4/4
END		
		Perm 14"-20"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLIDS/UNIT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-8													
10-13		N-P											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: WFG SAMPLE NO.: FPI-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ICO
0-22"	ML	Dk. brn clayey silt. Top 3" thick root zone. Few f. roots throughout. Slightly darker near bottom 10YR 3/1
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-7 9-12"													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFB SAMPLE NO.: FPI-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		· photo IC 11
0 - 19"	ML	Dk. brown, crumbly silt w/ some clay. A few tap roots extend through interval. 2.5 Y 3/2
19" - 30"	ML	Brn. Silt w/ fine blk "specks" of unknown origin. Specks are cylindrical and tend to be sub-vertical. They are easily broken w/ thumb nail & resemble carbon when broken open. Dia ≈ 1/32 - 1/16" 10 YR 3/2
END		

Perm. 24 - 30"

TEST RESULTS

ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FP1-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC3
0 - 4"	SM	Brn. Silty fn sand 10YR 4/4
4" - 13"	SP	Rusty brn fn sand. 7.5YR 5/6
13 - 29"	SP	Brn f-m. sand. Bottom 3" is moist (near sat.) and contains some silt. 7.5YR 4/6
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		non-plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFG SAMPLE NO.: FPI-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	ML	Brn silt w/ fine roots. (Top soil) 10YR3/2
2"-19"	CL	Very Stiff, olv. brn Clay w/ some silt. From 8" - 19" abundant fine blk specs that "smear" when core is cut open. 5Y4/3
19"-23"	SM-SC	Rusty brn, silty fine sand w/ some clay. 7.5YR4/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MI-13 7'-10"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 7408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 15
0 - 12"	ML	Dk. brn, soft - firm silt w/ tr v.f. sand, slightly crumbly. Tr. v.f. roots. From 8"-12" some blk. large mottles are found which are saturated. Water comes out when squeezed. Plant leaf @ 4". 5YR 2.5/2 few snail shells.
12"- 20"	ML - OL ?	Blk, organic, soft, saturated silt and (organics ?) ½" layers of plant stems @ 12" & 15". From 18"-20" get increasing amount of v.f. sand, found in thin (1/16") layers w/ silt., alternating light & dark. 2.5Y 2/0 - 5Y 2.5/1
20 - 27"	SM	Blk, sandy silt w/ a few roots. near saturation. Some coarse sand. Also fine blk granules. 2.5Y 2/0
END		Sample taken in water at pond outlet. Perm 4"-9"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-2 -4'													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7-1-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO.: FPI-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-7"	ML	Silt, dark brown (5YR2.5/1) with trace organics, roots - topsoil
7"-12"	ML	Silt, medium gray-brown (5YR3/1) scattered roots and fibers
12"-25"	ML	Silt, medium yellow-brown (10YR 4/2) trace of mottling along root channels
		Photo IC2
		Atterberg Can 6

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFG SAMPLE NO.: FPE-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo Ec 1
0-6"	CL	Mottled Dk brn w/ lt. brn spots, firm, silty clay 5Y2.5/2
6-17"	CL	Dk. brn, stiff, clay. some fine roots, Color grades into next lower interval. 5Y2.5/1
17"-24"	CL	Olv. brn clay. stiff. 10YR 3/3
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-5													
21-24													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 2/1/84 PROJECT NO.: 7408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IC5
0 - 9"	ML	moist, firm, dk olv-brn silt. Bottom 1" is banded brn & blk and contains ~50% v.f. sand. 5Y2.5/2
9" - 19"	SM	brn. f. sand w/ some zones of blk sandy Silt. Some ~~65~~ sand included. Some hard blk pieces up to 3/8" seem to be coal. 2.5Y4/4 - 2.5Y2/0
19" - 25"	SM	Yellowish-brn. f. - m. sand and silt. w/ some clay. 2.5Y4/4
END		
		Perm 19" - 25" Sample taken in 1 ft. water.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-99 16"-19"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 7-1-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO.: FPI-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	SM	Sand, medium yellow-brown (10YR 4/3 & 10YR 5/6) fine grained, with a little silt, a little subangular to subrounded gravel, friable, moist
2"-10"	CL	Clay, medium yellow-brown (2.5Y 5/2) with a little subangular gravel, moist, firm, with scattered sandy pockets
10"-26"	ML	Silt, medium yellow-brown (10YR 5/2) scattered mottling, roots
		Photo IC4
		Atterberg Can MT 29

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Sample taken in water. (7") photo IC 14
0-4"	SM	Brn. fn-med sand w/ irregular lenses of dk. brn silt-clay. 10YR2/2
4"-25"	ML-OL	dk. olv. brn w/ blk zones. Soft silt. At 4-5" is transition from above. @ 5", 10" 13", 17", & 19" are ½" to 1" layers of black, partially decayed leaves & leave stems and few twigs. In layers @ 10" & 19" is a thin ($\frac{1}{16}$") layer of lt. gry, fine clay & silt. In-between layers have texture of jello/pudding. 5Y2.5/1
25"-27"	SM	DK. brn fine silty sand. 10YR2/2
END		Perm 19½-25

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-1 0-4"		Non-Plas.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/29/84 PROJECT NO.: 3408.04

SAMPLE LOCATION: Final Pond 2 LOGGED BY: WFC SAMPLE NO.: EPI-11

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 16
0 - 1"	OL (OH?)	Dk. gray - blk. organic silt. organic smell. 5Y2.5/1
1" - 21"	CL - CH	Brn silty clay w/ gray and blk. mottles. Sandy zones @ 15-16" and 19-20". A 1" cherty pebble @ 7". 5Y4/3 ∴ Roots end ~ 11".
21 - 28"	SP	Brn. silty fine sand w/ gray mottles 2.5Y4/4. Tr. sdstn. gravel.
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
5-4 4"-6"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO.: FPI-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA-22 (2)
0-6"	ML	silt, black (5YR2.5/1), with some fine sand
6"-11"	ML	silt, dark gray-brown (2.5Y 3/2) with a little fine sand
11"-28.5"	ML	silt, medium gray-brown (5Y4/2) with orange mottling (2.5YR 4/6).
		Perm sample 17"-23" ✓
		Atterberg Pan M-1

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6-29-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: PSW SAMPLE NO.: FP-T-13

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photos IA 18 (2)
0-½"	ML	silt, med. brn. (topsoil) with fine roots 10YR 3/2
½"-24"	ML	silt, medium gray-brown 2.5Y 4/2, with orange 5YR 5/6 mottling, with some roots, sand seams
24"-30"	SM	Sand, medium brown 10YR 4/4, with a little silt, fine to medium grained
30"-32"	SP	Sand, med. yellow-brown 10Y 5/4 with a trace of silt, fine to medium grained
		Atterberg Sample Pan S-6
		Perm Sample 7"-13"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFG SAMPLE NO.: FPE-14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID27
0 - 1½"	ML	Brn. silt (top soil). Roots. 10YR 2/2
1½" = 19"	CL	Stiff, Olv. gry sandy, silty, clay. Tr grav. Sand is in scattered zones & is brn. 5Y4/3
19" - 23"	SM	Dk. brn gravelly sand and silt. 5Y3/2
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-3 8-10'													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 2 LOGGED BY: WFC SAMPLE NO.: EPIT-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB16
0 - 6	ML	Brn. clayey silt w/ blk and lt. gry laminations. 0-2" Sod w/ roots. Fractures approx. parallel to laminations. 5Y2.5/2
6" - 13"	ML	Dk brn to blk, crumbly, silt, w/ blk pieces up to 7/8" w/ sub-conchoidal fractures. (Carbon charcoal?) 5YR 2.5/1
- 18"	SC	Brn. gravelly, sandy clay. 10YR 3/3
18" - 23"	SP	Ang., weathered sndstn gravel ~~and~~ and sand. Tan - (yellowish) 5YR 6/8
END		
		Perm @ 9" - 6"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
L-5 14"-18"													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: WFG SAMPLE NO.: FPII-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IC29
0 - 8"	ML	Dk. brn silt. Top 2" top soil. From 2"-3½" slight laminations are visible. From 3"-5" light colored lumps are present. Appear to be residual weathered rock still retaining the relic angular shape. From 3"-8" are found crumbly black chunks that readily break when touched. Resemble carbon. It leaves a black streak and does not behave like weathered rock. 10YR 3/2
8" - 14"	ML	Dk brn silt. Only few light weathered areas as above. Blk lumps are not present. This zone has fine voids laying horizontally giving some hint at bedding. Voids decrease as 14" is approached. 7.5YR 3/2
14" - 23"	SM	Yellowish-brn sand layered w/ olive gry silt. 1" sand zone at top. layers are ~¼". 7.5YR5/8
23" END 25"	SP	Tan, gravelly, med-cs sand. 10YR6/3

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-16 10-13"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco / Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 2 LOGGED BY: WFG SAMPLE NO.: EPIC-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC16
0 - 16"	ML	Dk brn silt w/ organic debris. Tr. sand. 0-4" saturated and tr grav. 13"-16" is saturated to near sat, and contains more sand than above. Also 3" long by ¾" wood. 5Y2.5/2
16 - 26"	ML	Olv. brn, sandy, silt. (non-homogeneous). Some zones very clayey. 5Y5/3
END		
		Sample taken in 4" water.
		Perm 22 - 26"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-3													

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AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/28/84 PROJECT NO.: 3408.007

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FP III-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 15
0-3"	ML	Dk. brn. silt - low plasticity. Tr fine gravel. 5YR 2.5/2
3"-18"	SM	Dk. brn sand and silt w/ some gravel - mostly in upper 7" of zone. Grav. is weathering sandstn. 5YR 2.5/2
18"-24"	ML	Med. brn silt w/ some sand. low - mod plasticity. Tr of wht gravel. 2.5YR 3/4
End		
		Note: Sample was 28" in Shelby Tube but after extraction was 24" w/ no soil loss

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
5-5 "-24"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pad 3 LOGGED BY: WEG SAMPLE NO.: FPIII-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 13
0-12"	S.M	Dark brn silty fn sand. 5Y 2.5/1
12"-27"	SP	Lt. Brn fine sand. 7.5YR 6/4
END		
		Perm. sample 7"-12"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
0-12"		Non-plastic											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFA SAMPLE NO.: EP III-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		· photo I B 15
0 - 5"	CL	Olv. brn silty clay w/ tr fine sand. Roots to 2". Slightly mottled & stiff. 5Y 4/3
5" - 8"	CL	V. stiff sand and clay w/ tr. grav. Olv. brn. Clay binder is v. plastic. 5Y 4/3
8" - 28"	SM	Brn. silty fine sand. ~~w/ t~~ Tr grav. @ 12 - 20". Cs sand & up to 2½" Ø grav from 20" - 28". 2.5Y 5/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
L-3 5"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6-29-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: PSW SAMPLE NO.: FP IV-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-1½"	(OL) ML	silt, dark brown, with roots and organics 10YR 2/1
1½-7"	ML	Silt, dark brn 10YR 3/1
7-18"	ML	Silt, dark brown, with sand and gravel, fine roots 10YR 3/1
18-19"	SM	Sand, silty, stratified, with med. yellow brown seams in dark brown matrix 10YR 3/2

Photo IA 17

Perm sample 13"-18"
Atterberg Pan S-19

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/28/84 PROJECT NO.: 3408

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FPIII-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA5
0-12"	ML	Brn. sandy silt. stiff. Increasing sand downward. 5YR 3/3
12-26"	SP	Light Brn. fine-med. sand. 2" at bottom is moist gravelly, silty sand. 10YR4/3
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
12"	5-10	Non-Plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 9 LOGGED BY: WEG SAMPLE NO.: FPIII-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo. IA 10
0-20"	ML	Lt. brn clayey silt w/ dk brn. mottle @ 2"-4". 1½" gravel piece @ 5". Grades to sandy silt @ 16". Some gravel present. 5YR 4/3
20-24"	SP	Lt. brn sand w/ some gravel. 2.5Y 4/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
20-24"		NP											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFC SAMPLE NO.: FPIII-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-5"	ML	Photo IA 26 — (un-numbered) Dk. Brown silt w/ a few blk laminations Very fine sand increasing toward bottom w/ tr grav. 3"-5" depth. 2.5Y3/2 roots
5"-22"	SP	brn gravelly, silty fine sand. 10YR 4/4
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
m-11 1'-3"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3409.00

SAMPLE LOCATION: Flood Pond 3 LOGGED BY: WFQ SAMPLE NO.: FPIII-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		(2) Photo. IA 9
0 - 12"	ML	Dk. brn. silt w/ tr. gravel. Lower 6" mottled w/ lt. brn silt. 5YR 3/2
12 - 18"	ML	lt. brn silt. w/ some dk. brn mottles. 5YR 4/4
18"-24"	ML	Dk. brn. silt as in 0-12" above. bottom 1" has 15-35% fn sand. Color as 0-12" but w/ dk mottled 5YR 2.5/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
SS-50 13"-15"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6-29-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond III LOGGED BY: PSW SAMPLE NO.: FP III-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA-21
0-6"	ML	silt, black (7.5YR 2.5/0), scattered gravel, roots
6"-16	ML	Silt, dark brown (10YR 2/2) with a little sand and small gravel, roots
16-23"	SM	Sand, dark brown (7.5YR 3/2), with silt
23-29"	SP	sand, medium brown (7.5YR 3/4), fine to coarse grained, trace silt and small gravel

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6-29-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond III LOGGED BY: PSW SAMPLE NO.: FP III-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-28"	ML	Photo 1A 23 silt, med. brown (5YR 4/3), with sand and gravel, scattered roots Perm sample 22-28"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FPIII-11

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB 9
0 - 3"	SP	Tan fine sand 7.5YR5/4
3" - 5"	ML	nearly saturated, brn silt. fine roots present small red ants present. 7.5YR3/2
5" - 8"	SP	Silty, brn, fn sand w/ tr cs sand 5YR3/3
8" - 27"	SP	Lt. brn. uniform fine sand. Zone of fn. blk sand in narrow band @ 14"-16" ±. Broken, weathered blk rock. well rounded. ~2" Ø. 7.5YR6/4
END.		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		Non-Plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FP3T-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB10
0 - 11"	SM	Dk. brn silty fine sand. (Top soil) Tr. gravel. 5Y2.5/2
11"-25"	SP	Brn to Tan uniform, fine sand. Tr gravel. Color lightens downward. 1½" Ø piece grav. @ 21" 2.5Y 5/6
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-3 3'-9"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 4/28/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond III LOGGED BY: WFC SAMPLE NO.: FP III-13

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 7
0-4"	ML	Top soil w/ grass roots. Brn-Blk. 5YR 2.5/2
4"-12"	ML	Blk. sandy silt. 5YR 2.5/1
12"-23"	ML	Blk to brn stiff silt w/ tr. sand. 5YR 2.5/2
		Perm. sample 18"-23"
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-18													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin RAAP DATE: 6/28/84 PROJECT NO.: 3408.98

SAMPLE LOCATION: Final Pond 1 Ditch LOGGED BY: WFG SAMPLE NO.: FPIII-14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA8
0-7"	ML	Dark brn. silt w/ tr. sand. 5YR 3/2
7-15"	ML	Brn. silt w/ fn. sand. 5YR 3/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-88 9"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Env/Eco DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pad 3 - Drainage Ditch LOGGED BY: WFC SAMPLE NO.: FPIII-15

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 14
0-11"	SM-SC	Mostly brn-gry fine sand but contains alternating layers of dk-brn to blk silt w/ some sand. → 10YR 3/1
11-16"	ML	Firm dk-brn to blk silt w/ tr fine sand. 5Y 2.5/1
-26"	SP	Brn fine-med sand. Tr of ang. fn grav. 5.5YR 4/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
5-10 -9"													

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AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/29/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: WEC SAMPLE NO.: FPIC-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo. IA-29
0-2"	SP	med. sand w/ some grav. & silt, grass roots. Brown. 10 YR 3/3
2"-8"	ML	Dk. brn to blk silt w/ tr. fn sand. 10R2.5/1
8"-26"	SC	Blk silty sand. 13-15" zone has some cs. sand - v.f. grav. 10R2.5/1
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-9 8"-21"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Diablo Exp/Enh DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: _____ LOGGED BY: WFG SAMPLE NO.: EPIT-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB5
0 - 9"	ML	Dk. greenish brown sandy silt. crumbly. Some scattered v.thin lamellae of lighter silt. 5Y 3/1
9" - 17"	ML	Dk olv. blk, crumbly silt (no sand). Multiple fine roots. 5Y 2.5/1
17" - 26"	ML	Blk silt w/ tr. sand. multiple fine roots. 2.5Y 2/0
END		
		Perm @ 13" - 17"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-10 2'-9"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: WFG SAMPLE NO.: EPIE-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB 23
0 - 12"	CL	Olv.brn - black, stiff, silty, clay. Slightly crumbly. Fine roots through zone. 5Y 2.5/2
12" - 26"	CL	Oliva-brn, stiff, silty clay. A few fine roots present. 5Y 4/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
A-4													
7-12"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFC SAMPLE NO.: FPNT-4"

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		IB24 photo
0-26"	CL	Dk. brn to blk silty clay w tr. v.f. sand. Fine roots thru zone. At 7"-8" is layer of lighter color (brn.) w/ concentration of fine roots. Darker zone 10"-18"±. color 10"-18" 5Y 2.5/1. Remainder is color 5Y 2.5/2
END		
		Perm @ 8"-14"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
A-2 14"-18"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFB SAMPLE NO.: FPIT-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I1326
0 – 13"	ML	Brn sandy silt w/ tr grav. Sand is fn to med. Roots throughout interval. 10YR2/1
13"-24"	CL	Dk. brn, v.stiff clayey silt w/ some v.f. sand. Zone @ 19"-21" contains cs sand & gravel. Also contains fine roots. 5Y2.5/1
24"-26"	SP	Lt. brn gravelly, fine sand. 10YR 4/4
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-10 16"-19"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/94 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FP4E-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo · I B11
0 -4"	ML	Dk. brn silt w/ tr sand. Contains some blk granules - composition uncertain. resembles carbon. 5Y 2.5/2
4" -22"	CL	Dk brn clay. Slightly marbled w/ brn lamellae. Fine roots throughout. Firm near top, stiffens dwn. 5Y2.5/1
22 -26"	ML	Blk, crumbly silt w/ fine sand (tr - some). 2.5Y2/0
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-5													
22"-26"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FPIV-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB 22
0-23"	CL	Gry-brn clay. At 9" is a 1" zone of silty, v.f. sand mixed w/ clay. Top 5" is root zone. 5Y 2.5/2
23-28"	CL	Blk, silty clay w/ tr sand. 2.5Y 2/0 w/ 1" zone of 5Y 2.5/1
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
A-1 23-28"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FPTV-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB8
0-10"	ML	Dk. brn silt w/ tr sand. A few roots, mostly in top 4". ½" ϕ plant stem @ 10". 10YR2/2
10"-26"	CL	Olv. brn silty clay. Firm to stiff. Slightly crumbly 10-14". Stiffens downward. One piece 3" well rounded rock @ 16"-18". ¼" plant stem @ 19". Tr. small ang. grav. below 20". 10YR4/2
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
11-12													
18"-22"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV. DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFB SAMPLE NO.: FPIV-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I B 25
0 - 10"	ML	Brn. crumbly clayey silt (top soil) w/ roots. 10YR2/1
10" - 26"	CL	Gry - brn silty clay. Gry 1/8" veins of clay scattered in lower 1/2 of zone. Fine roots, in lower half. 5Y 2.5/1
26" - 28"	ML	Blk sandy silt. Some very fine roots. 2.5Y2/0
End.		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
MT-2													
0-7"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/94 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FPIV-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 12
0-2"	SP	moist. brn fine sand 2.5Y 3/2
2" - 30"	SP	Lt. tan fine sand. 2.5Y 6/2
		24"-30" perm sample (M-23)
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		Non-Plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.60

SAMPLE LOCATION: Nitro Pond LOGGED BY: WFG SAMPLE NO.: NG-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC7
0-7"	SM	gry, f. sand & silt. Silt component increases to bottom. Top 3" is near saturation.
7"-10"	ML/SM	V. stiff, marbled dk brn & gry silt, 1" vein of silt w/ 50% ± of f. sand at 8½"-10"
11-26"	CL	Gry-brn, v. stiff clay. Some v. fine sand, mostly in thin (1/16"-⅛") layers from 19"-26". Soil tends to break apart on fine sand layers. From 20"-24" also have varves of clay/silt ± v.f. sand.
END		
		Perm 2"-7"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-97 -24													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/20/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond LOGGED BY: WFG SAMPLE NO.: N6-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB 13
0 - 12"	CL	Dk. olv. grn clay w/ tr. cs sand (ang.). over saturated in top 1"-2". Saturated to about 7". Lg piece wood @ 12". Soft to firm, when unsaturated. 5Y 2.5/2
12.- 22"	CL	Dk olv. grn clay (as above) but w/ brown clay mixed in irregular lenses and smears. Stiff. Tr. gravel. 5Y 2.5/2 w/ 5Y 4/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-37 4-8"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond LOGGED BY: WFC SAMPLE NO.: NG-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo. IB 4
0-1"	OL	Olv. brn organic muck. v. soft & sat. 5Y 3/2
1"-15"	CH	dk. olv. grn., stiff to v. stiff clay 5Y 2.5/2
16"-27"	CL	Brn. clay, stiff. some darker zones toward bottom. Large, weathered, rounded sndstn gravel, beginning 20"-22" 10YR3/3
END		
		Perm @ 16-20"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-7 -27													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Ohio BAAP DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond LOGGED BY: WFB SAMPLE NO.: NG-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB2
0 - 9"	ML	Olive brn silt w/ some fine sand. Dryer w/ depth. 5Y 3/1
9" - 14"	ML	Olive to brn fine sandy silt w/ tr. grav. Lower contact @ ~20° w/ horizon. Sand inc. to bottom. 5Y 3/2
14" - 19"	SP	Lt. brn sand, fine 2.5Y 4/4
19 - 22"	ML	Olive fn sandy silt. Stiff. small dark specks. Thin sandy vein @ 21". 5Y 4/4
END		
		PERM 9" - 14"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-4 1"-7"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitrogly. Pond. LOGGED BY: WFG SAMPLE NO.: NG-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 11
0 - 4" (approx)	ML	Gry. Brn. silt w/ some clay. Moderately plastic. 5YR 3/1
4" - 12"	SM	Gry. fine - med. sand. 8 - 12" had gry brn laminations of clayey silt. 2.5Y 5/2
12" - 25" (approx.)	SP	Brn. fine - med. sand. 3" gravelly layer @ 17". Beginning @ 20" sand is finer w/ tr. grav. Bottom 1" contains fine laminations of gry. silt. 2" plant stem or root in bottom. 10YR 6/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-73 17'		Non-Plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond-2 nd lagoon LOGGED BY: WFC SAMPLE NO.: N6-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB 14
0-11"	CL	Olv. brn silt w/ some clay. Some fine roots 5"-9". 5Y 3/1
11-21"	SC-SM	Olv. brn. clayey sand. Seams of clean± fine sand w/ thin lamellae of clay from 16"-21". 5Y 3/1
21-24"	CL	Olv. brn., stiff clay w/ fine varves of blk clay alternating w/ v.f. sand-silt. 5Y 3/1
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATE	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
N-6 11"-16"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond-2nd LOGGED BY: WFG SAMPLE NO.: NG-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB7
0-4"	SP-SM	Dk. brn silty sand w/ grass & Roots. 10YR 3/3
4"-10"	SP	Brn-tan gravelly sand. Gravel is sub-angular to rounded. Rusty at top fading to tan downward. 10YR 5/8
10"-25"	CL	Gray-brn, plastic, stiff clay. Color tends to darken w/ depth. 5YR 2.5/2
End		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
M-16 @ 23"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond 1-2 LOGGED BY: WFG SAMPLE NO.: NG-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB 12
0-24"	CL	Dk. brn, v. stiff clay. Thin streaks of lighter color. Top 3" is grass root zone.
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
0-24													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV. DATE: 6/27/84 PROJECT NO.: 3408.99

SAMPLE LOCATION: Oleum Pond LOGGED BY: WFG SAMPLE NO.: OP-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IA 3
0-4"	ML	Gry., moist, silt w/ roots. color 10R 3/1 (moist.) Strong organic/sulfur smell.
4"-12"	ML	Gry.-brn. - - silt w/some sand. Roots continue. Color grading lighter w/ depth. color 5YR 4/4
12"-27"	ML	Brn. sandy silt. - low-mod. plastic. Roots - fewer than above. color 7.5 YR 4/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
12"-22"	Non	S-20											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: OLIN ECO/ENV DATE: _____ PROJECT NO.: 3408.98

SAMPLE LOCATION: OLEUM POND LOGGED BY: _____ SAMPLE NO.: OP-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Sample OP-2 was retained but not logged due to low sample recovery. Sample OP-4 was taken immediately adjacent to OP-2's location. Please refer to OP-4 for a representative sample description.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408

SAMPLE LOCATION: Olson Pond LOGGED BY: WFG SAMPLE NO.: OP-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I C 12
0 - 23"	ML (MH)?	Gry, soft, clayey silt. Over saturated in top 2"; below sat. deeper. Much root material top 3". Becomes darker gray & stiffer @ 13". Organic or chemical smell top. 2.5 YR 4/0
23" - 32.	ML	Lt. gray, soft clayey silt near saturation, some dark mottles. 5 YR 6/2
End		
		Perm 16" - 21"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
5-95													
-33													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Olsen Pond LOGGED BY: WFG SAMPLE NO.: OP-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I B 19
0-5"	OL	Soft, gray-blk, saturated fine grained muck w/ organics. Decreasing saturation w/ depth & grading into interval below. 2.5Y 2/0
5"-31"	CL	Gry-brn, clay. Firm at top to v. stiff below. Bottom 2" are darker color. 5Y 4/1
END		
		Perm 19-25"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
L-9 10-15"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Ocean Pond LOGGED BY: WFC SAMPLE NO.: OP-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB21
0-28"	SP	Tan, uniform fine sand. From 10-28" sand is moist to near saturation. From 11"-12" zone has 50%± silt and is gray-tan color. 12"-16" has trace silt. color 2.5Y 7/4 (fairly dry)
END		
		Perm 17"-22" (L-11)

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		non-plast											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Ecc/Env DATE: 6/26/84 PROJECT NO.: 3408.98

SAMPLE LOCATION: Oleum Pond LOGGED BY: WFG SAMPLE NO.: OP-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 -		Photo IA0
0-6"	SP	fn - med. lt. brn. sand. Roots to 5" Layer of gry. clayey silt @ 5"-6" w/roots. 10YR 6/3
6"-9"	SP	fn - med, gel. - brn sand.
End.		2.5Y 5/4
		NOTE: No sample fraction remaining after chemical analysis.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
	—	non-plastic									—		

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO.: 3408.98

SAMPLE LOCATION: Okum Pond LOGGED BY: WFG SAMPLE NO.: OP-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	CL	Stiff brn. sandy clay color 5YR 3/4
6-18"	CL	Brn. sandy clay w/ gravel. ~~tight~~ Tan 1" zone of silty fine sand near end. Some 1" gravel, few pieces weathered angular sndstn. Color 5YR 3/3
END		
		Photo I A 4

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
9-11"	35	-22											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Oleum Pond - Upper Basin LOGGED BY: WFS SAMPLE NO.: OP-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 10
0 - 12"±	SM	Dk. brn. silt and sand, w some gravel. Roots to 6". At bottom of zone is an area of fine dk granular material w/ quartz. Appears to be severly weathered dk. xtaline rock. Muscovite mica also present. 7.5YR 4/6
12" - 26"	SP	brn to tan, uniform, fine sand w/ some grav. Gravel is mostly in top ½ of interval. Sand color lightens downward. 10YR 6/6 (moist) 10YR 7/3 (dry)
		Perm 20"-26"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		Non-plas.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin - Eco/Env. DATE: June 27, 1994 PROJECT NO.:

SAMPLE LOCATION: Oleum Pond - Upper Drain LOGGED BY: WFG SAMPLE NO.: OP - 9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA2
0 - 7"	ML	Brn., silt w/ tr. grav. & tr. sand Stiff. Discard 0-1" - grass. Fn. roots thru zone. Some dark mottles.
7" - 29"	ML	Brn., v. stiff silt w/ tr. fn sand. 1"x1" pocket severely weathered xtalline rock at 9" depth. Single 1/4" Ø root at 20" - 23". Crumbly when squeezed w/ fingers.
END		Atterbergs S-2 14"-15"
		color 5YR 4/4

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS: LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	UNIT WEIGHTS: WET	DRY	BOUYANT	MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS: TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
14"-15"	Pan	S-2											

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AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Pocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I C 23
0 - 5"	SP	Brn gravelly, fine sand. Fine roots through interval. 7.5 YR 4/6
5" - 22"	ML	Brn clayey silt w/ some fine sand. Tr gravel. Top 2" enriched in f. sand. At 13" is pocket of broken, angular grav. Bottom 1" has increasing amt of cs sand 10 YR 4/4
22" - 26"	SP	Brn. med. sand w/ some cs & f sand. A few clumps of silt/clay enriched sand. 7.5 YR 4/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-10													
-15													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFB SAMPLE NO.: RAD-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I D O
0 - 3"	ML	Brn Silt w/ tr vf. sand and gravel. 10 YR 3/3
3" - 15"	SM	Silty fine sand and some gravel. Gravel is rounded and not weathered. 10YR 5/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-17 12-15"		Non-Plast.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 7408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFB SAMPLE NO.: RAD-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 13
0 - 2"	ML	Dk. gry - Brn, gravelly, silt. Some fine roots. 5Y2.5/2
2" - 26"	CL	Olv. gry - brn., mottled, soft silty clay. Moderately plastic Severely weathered rock @ 26". 5Y4/2
END		
		Perm 15" - 21"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
S-94													
21-24													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Dec LOGGED BY: WFC SAMPLE NO.: RAD-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC28
0 - 12"	ML	Dk. brown sandy silt. Tr of co sand & fine gravel. Roots mostly in top 8". 5Y2.5/1
12 - 15"	ML	Brn. fine - med sand and silt. Vague dk bands 1/32 - 1/16" thick. 10YR 3/2
16" - 28"	CL	Gry silty clay. Strong odor. Clay mottled w blk granules & blk & rusty spots and vertical seams. Blk zone containing some sand and 3/4" dia wood at 15" - 17" in one side of soil core. 10YR 5/2
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-14 27"-28"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC26
0-9"	SM	Dk. brn silty fine sand. w/ roots & plant matter. 10YR3/2
9"-15"	ML	Brn. sandy silt w/ light & Dark mottles. Tr of cs sand and fine gravel. Some roots. 10YR3/3
15"-28"	SM	brn silty fine sand w/ tr. grav. 10YR5/4
		Perm 4"-9"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-12 10-15													

DEPTH	SAMPLE CLASSIFICATION	
		photo IC24
0–10"	sm	Dk brn silty, clayey sand w/ gravel in bottom 2" of interval. A few fine roots and one ⅛"-¼" woody root. 5Y2.5/2
10"–17"	ML	Mottled gry & brn clayey silt. Some gravel in lower 2". ½" & ¼" roots. 5Y4/2 – 10YR5/1
17"–29"	Sm	Brn silty sand w/ some gravel up to 2". 2.5Y5/4

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-11 3'-7"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Min Eng/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 4
0-14"	CL	Brn & Dk brn, stiff-v.stiff clay and silt. Top 3" show layering (~⅛"). Remainder has marbling & irregular swirls of dk brn & lighter silty clay. Some fine and one ¼" dia. "carbon" granules in bottom 3". One 2" gravel present at 12". 10YR3/2 - 5Y5/3
14"-22"	SM	Brn. fine to med sand w/ occasional silty zones. 7.5YR4/4
22"-26"	ML	Dk gry brn silt w/ some fine sand, fine roots and other fine organics. 5Y3/1

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-21 7"-10"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/3/84 PROJECT NO.: 7408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFB SAMPLE NO.: RAD-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 5
0-6"	ML	Dk brn silt w/ fine sand. Some Roots. 10YR2/1
6-9"	SP	Brn med. sand 5YR3/4
9"-14"	ML	Lt. & Dk brn silty fn sand. Sand streaks are lt. brn., silty areas are darker. Some layering. Silt fraction increasing downward. 1/4" root @ 10". 5YR3/2
14"-20"	CL	Olv. brn, stiff silty clay. some fine blk granules (carbon?) 10YR4/3
20"-28"	SM-SC	Brn clayey, silty sand. Tr. gravel. 5YR3/4
End		Perm 22"-27"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-22													
17-19													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo Ic 30
0-13"	ML	Brn. silt w/ some sand, Tr. gravel. Abundant roots up to ½" dia. Slightly lighter color toward bottom indicates transition to next layer. 10YR3/3
13-23"	SM	Lt. brn f. sand w/ some silt and tr lg gravel. At 16" & 22" is a ¼" layer of fine sand size black granules in association w/ gold color metallic appearing grains also f. sand size. Some gold grains are platey & some seem blocky. Platy grains strongly resemble muscovite mica. Between 16" & 20" are scattered thin layers of blk silty material. 7.5YR4/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-16 9"-12"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 2408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC19
.0-9"	ML	Brn silt & fine sand. Fine roots to 9". 5YR 4/4
9"-23"	SM	Alternating zones of sandy silt & silty sand. Dk. o/v. brown. Sandy silt zones have dk mottles and a wavy, marbled appearance. 5YR3/4
23"-27"	SM	Yellowish-brn uniform fine sand w/ some silt. 1/8" blk sand size material @ 25" (non-magnetic) Carbon? 10YR5/6

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	SOLVENT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-6 16"-19"													

AYRES ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-11

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo · IC 20 (2)
0-11"	SM	Brn Silty sand. Bottom 3" are lighter in color, contain less silt and the sand seems to be finer. At 4"-8" the silt is banded in the sand and is darker. 7.5Y4/4
11"-20"	ML	Blk silt. crumbly. Turning toward brn in bottom 2". Top ~2" containg thin cylindrical tubes of fine sand w/in blk silt. Tubes are sub-vertical and are 1-2" long. A ¼" twig or root is horizontal @ 17". 2.5Y2/0
20-29"	ML	Brn. soft clayey silt. Darker brn bottom 1"-2". All of this interval was squeezed out of Shelby tube when the sample was extruded. 10YR4/3 – 2.5Y3/2
		NOTE: Shelby Tube contained water upon opening.

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-7 23'-27'													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC18
0 - 8"	ML	Brn sandy silt w/ few blk mottles. Top 2" are darker brn w/ light colored mottles & roots, 5"-8" is blk w/ light mottles & is crumbly, also tends to fracture ~ horizontally. 10YR3/3, (2.5Y2/0) (5Y2.5/2 0-2") (5"-8")
8"-28"	SM	Dk. brn ± sand & silt. From 13"-16" is severly weathered rock but still contains some hard fragments. 10YR3/4
		Perm 16"-21"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-5 9"-13"													

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco / ENV DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFC SAMPLE NO.: RAD-13

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IC 17
0 - 2" ±	SP-SM	Brn. silty fine sand w/ tr. gravel, some fine Roots. 10YR 3/3
2" - 12"	SP - SM	Tan silty fine sand. Silt tends to occur in clumps which do not contain much sand. 10YR 6/4 & 10YR 4/4 (silt clumps).
12" - 29"	SP - SM	Brn. silty fine sand. 1½" silty layer @ ~22". The primary difference between 2"-12" & 12"-29" is one of color. 10YR 4/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-4 23"-27"		NON-PLAST.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 22
0-12"	SM	Brn. silty fine sand w/ roots 10YR4/4
12"-28"	SM	Yellowish-brn uniform fine sand, Occurring in alternating layers w/ brn silt. Silt layers < 1" thick except bottom 3" which is one silt zone composed of multiple 1/8-3/16" layers Zone splits on layer bedding. Layers contain v.f. sand. 10YR5/8
End		

TEST RESULTS

IPLE TH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		NON-PLAST											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFC SAMPLE NO.: RAD-15

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 21
0-6"	SM	Dk. brn silt & fine sand. 5Y3/4
6"-27"	SM	Brn uniform fine sand w/ some silt. Most silt is in layers up to ½" thick which are concentrated in interval 14"-19". 7.5YR5/8
		Perm 20"-25"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-8 10'-14"		NON-PLAST.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-16

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC25
0 - 6"	SM	Brn. silty sand w/ roots. (Topsoil, Loam) 10YR3/2
6" - 15"	SM	Tan silty uniform fine sand. From 12"-15" soil is in discs ~1" thick which are predominantly silt (light brn - gry.) 10YR5/6
15" - 28"	SM	Brn. sandy silt in 1" to 2" discs. Sand fraction is very uniform. 5Y5/4
28" - 30"	SP	Light Tan clean fine sand. 10YR7/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		Non-plastic											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Dix Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-17

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 27
0-9"	SM	Silty, brn., fine sand. (moist) Some fine roots. A few small, discontinuous silty zones. 5YR 4/4
9-16"	SM	Dk. brown fine sand w/ more silt than above interval. Approx 30-45% silt. Darker mottles are present. Bottom 2" show v. thin sandy lenses. 10YR 3/2
9-31"	SP	Brn. uniform fine sand. Top 4" has dark brn & rusty colored zones and lenses. 10YR 6/6
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
C-13 10"-15"		NON-PLAST.											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin DATE: 6/30/84 PROJECT NO.: 340800

SAMPLE LOCATION: Racket Drainage LOGGED BY: UFG SAMPLE NO.: RAD-18

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID17
0 - 3"	ML	Brn. silt w/ some v.f. sand. 10YR 3/3
3" - 17" ±	SM	Yellowish-tan v.f. uniform sand w/some silt. 2.5Y 5/6
17" - 27"	SP	Tan v.f. uniform sand. 10YR 6/6
END		
		Perm @ 21-27"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		Non-Plastic											

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 7-1-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Pocket Area Or. LOGGED BY: PSW SAMPLE NO.: RAD-19

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IC 8
0-9"	Muck (OL)	Muck, dark gray ( ), silty, soft, saturated, with roots and fibers, strong organic smell
9-18"	OL	silt, dark gray ( ), with organics, roots, strong organic smell, wet, firm, trace small subrounded gravel; blocky structure
		No Atterberg sample Perm sample 13"-18"

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURATION	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS

AYRES ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/Eqlv DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFC SAMPLE NO.: RAD-20

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IB6
0-3"	ML	Brn top soil w/ roots. Silt 10YR 3/2
3" - 8"±	SM	Brn silty fine sand. w/ roots 10YR 3/2
8" - 30"	SP	Brn to tan uniform fine sand. 2.5Y 6/4
END		

TEST RESULTS

SAMPLE DEPTH	ATTERBERG LIMITS			UNIT WEIGHTS			MOISTURE CONTENT	DEGREE OF SATURAT.	STRENGTH PARAMETERS				
	LIQUID LIMITS	PLASTIC LIMITS	PLASTICITY INDEX	WET	DRY	BOUYANT			TYPE TEST	UNCONFINED COMPRESSION	COHESION	FRICTION ANGLE	EFFECTIVE STRESS
		non-plastic											

BORING LOGS

Boring Description	Contractor	Date Installed
Background Wells		
BGM-91-01	ABB-ES	10/28/91
BGM-91-01X	ABB-ES	10/27/91
BGM-91-02	ABB-ES	11/6/91
BGM-91-03	ABB-ES	11/7/91
Propellant Burning Ground		
PBB-91-01	ABB-ES	10/12/91
PBB-91-02	ABB-ES	10/12/91
PBB-91-03	ABB-ES	10/12/91
PBB-91-04	ABB-ES	10/14/91
PBB-91-05	ABB-ES	10/15/91
PBB-91-06	ABB-ES	10/13/91
PBB-91-07	ABB-ES	10/13/91
PBB-90-01	ABB-ES	8/23/90
PBB-90-02	ABB-ES	8/23/90
PBB-89-01	ABB-ES	1/23/89
PBB-89-02	ABB-ES	1/25/89
PBB-89-03	ABB-ES	2/1/89
PBB-89-04	ABB-ES	2/6/89
PBB-89-05	ABB-ES	2/13/89
PBB-89-06	ABB-ES	2/14/89
PBB-89-07	ABB-ES	2/17/89
PBB-89-10	ABB-ES	1/19/89
PBB-82-01	Warzyn	2/18/82
PBB-82-02	Warzyn	2/22/82
PBB-82-03	Warzyn	2/18/82
PBB-82-04	Warzyn	2/22/82
PBB-82-05	Warzyn	2/16/82
PBB-82-06	Warzyn	2/16/82
PBB-82-07	Warzyn	2/16/82
PBB-82-08	Warzyn	2/17/82
PBP-91-01	ABB-ES	10/13/91
PBP-91-02	ABB-ES	10/14/91
PBN-91-06C	ABB-ES	10/22/91
PBN-91-06D	ABB-ES	10/12/91
PBN-91-12C	ABB-ES	10/23/91
PBN-91-12D	ABB-ES	10/16/91
PBN-89-01D	ABB-ES	1/20/89
PBN-89-02C	ABB-ES	3/19/89
PBN-89-04C	ABB-ES	4/16/89
PBM-89-05	ABB-ES	3/3/89
PBM-89-07	ABB-ES	3/3/89
PBM-89-09	ABB-ES	3/1/89
PBN-89-10D	ABB-ES	3/7/89

PBM-89-11	ABB-ES	3/7/89
PBN-89-12B	ABB-ES	4/15/89
PBM-85-01	AEHA	9/22/85
PBM-85-02	AEHA	9/17/85
PBM-85-03	AEHA	9/18/85
PBM-85-04	AEHA	9/24/85
PBM-85-05	AEHA	9/28/85
PBM-85-06	AEHA	10/4/85
PBN-85-01A	AEHA	9/15/85
PBN-85-02A	AEHA	10/1/85
PBN-85-03A	AEHA	10/3/85
PBN-85-04A	AEHA	9/30/85
PBM-82-01	Warzyn	3/18/82
PBM-82-02	Warzyn	3/17/82
PBM-82-03	Warzyn	3/16/82
PBM-82-04	Warzyn	3/16/82
PBM-82-05	Warzyn	3/17/82
PBN-82-01A	Warzyn	3/18/82
PBN-82-01B	Warzyn	3/10/82
PBN-82-01C	Warzyn	3/9/82
PBN-82-02A	Warzyn	5/1/82
PBN-82-02B	Warzyn	3/8/82
PBN-82-02C	Warzyn	3/9/82
PBN-82-03A	Warzyn	3/15/82
PBN-82-03B	Warzyn	3/15/82
PBN-82-03C	Warzyn	3/13/82
PBN-82-04A	Warzyn	3/12/82
PBN-82-04B	Warzyn	3/13/82
PBN-82-04C	Warzyn	3/11/82
PBN-82-05A	Warzyn	3/13/82
PBN-82-05B	Warzyn	3/11/82
PBN-82-05C	Warzyn	3/11/82

Landfill 1

LOB-90-01	ABB-ES	8/21/90
LOB-90-02	ABB-ES	8/21/90
LOM-91-01	ABB-ES	10/10/91
LOM-91-02	ABB-ES	10/25/91
LOM-89-01	ABB-ES	2/17/89
LON-89-02B	ABB-ES	2/18/89
LON-89-03B	ABB-ES	2/20/89

Settling Ponds and
Spoils Disposal Area

SPB-91-01	ABB-ES	10/14/91
SPN-91-02D	ABB-ES	10/9/91
SPN-91-03D	ABB-ES	10/8/91
SPN-91-04D	ABB-ES	10/2/91
SPN-89-01C	ABB-ES	3/29/89
SPN-89-02C	ABB-ES	4/14/89
SPN-89-03C	ABB-ES	4/13/89
SPN-89-04C	ABB-ES	3/30/89

Deterrent Burning Ground

DBB-91-01	ABB-ES	10/15/91
DBB-91-02	ABB-ES	10/16/91
DBB-91-03	ABB-ES	10/16/91
DBB-89-01	ABB-ES	1/20/89
DBB-89-02	ABB-ES	1/11/89
DBB-89-03	ABB-ES	1/9/89
DBB-82-01	Warzyn	3/11/82
DBB-82-02	Warzyn	3/10/82
DBB-82-03	Warzyn	2/24/82
DBB-82-04	Warzyn	3/9/82
DBN-89-02B	ABB-ES	2/2/89
DBN-89-04B	ABB-ES	2/7/89
DBM-82-01	Warzyn	3/22/82
DBM-82-02	Warzyn	3/19/82
DBN-82-01B	Warzyn	3/23/82
DBN-82-01C	Warzyn	3/22/82

Existing Landfill

ELB-82-01	Warzyn	3/12/82
ELB-82-02	Warzyn	3/15/82
ELB-82-03	Warzyn	3/11/82
ELB-82-04	Warzyn	2/23/82
ELB-82-05	Warzyn	2/23/82
ELB-82-06	Warzyn	3/17/82
ELN-91-07A	ABB-ES	11/10/91
ELN-91-07B	ABB-ES	11/9/91
ELM-91-10	ABB-ES	11/13/91
ELN-89-02A	ABB-ES	1/24/89
ELM-89-03	ABB-ES	1/25/89
ELM-89-05	ABB-ES	2/1/89
ELM-89-07	ABB-ES	4/18/89
ELM-89-08	ABB-ES	4/1/89
ELM-89-09	ABB-ES	4/13/89
ELN-82-01A	Warzyn	3/29/82
ELN-82-01B	Warzyn	3/30/82
ELN-82-01C	Warzyn	3/29/82
ELN-82-02A	Warzyn	4/1/82
ELN-82-02B	Warzyn	4/1/82
ELN-82-02C	Warzyn	4/2/82
ELN-82-03A	Warzyn	3/24/82
ELN-82-03B	Warzyn	3/25/82
ELN-82-03C	Warzyn	3/24/82
ELN-82-04A	Warzyn	3/26/82
ELN-82-04B	Warzyn	3/26/82
ELN-82-04C	Warzyn	3/25/82

Rocket Paste Area		
Nitroglycerine Pond		
NPM-89-01	ABB-ES	10/25/89
RPM-91-01	ABB-ES	10/25/91
RPM-89-01	ABB-ES	10/16/89
RPM-89-02	ABB-ES	10/13/89
New Acid Area		
NAN-81-01A	Olin	1981
NAM-81-02B	Olin	1981
NAN-81-03B	Olin	1981
NAN-81-04B	Olin	1981
Oleum Plant and Pond		
OPB-91-01	ABB-ES	10/29/91
OPB-91-02	ABB-ES	10/10/91
OPB-91-03	ABB-ES	10/10/91
OPB-91-04	ABB-ES	10/11/91
OPB-91-05	ABB-ES	10/11/91
OPB-91-06	ABB-ES	10/23/91
OPB-91-07	ABB-ES	10/23/91
OPB-91-08	ABB-ES	10/23/91
OPB-91-09	ABB-ES	10/23/91
OPB-91-10	ABB-ES	10/23/91
OPB-91-11	ABB-ES	10/23/91
OPB-91-12	ABB-ES	10/23/91
OPB-91-13	ABB-ES	10/23/91
OPB-89-01	ABB-ES	11/13/89
OPB-89-02	ABB-ES	10/14/89
OPB-89-03	ABB-ES	10/12/89
OPB-89-04	ABB-ES	10/13/89
OPB-89-05	ABB-ES	10/10/89
OPB-89-06	ABB-ES	10/26/89
OPB-89-07	ABB-ES	10/25/89
OPB-89-08	ABB-ES	10/26/89
OPB-89-10	ABB-ES	10/26/89
OPB-89-11	ABB-ES	10/26/89
OPB-89-12	ABB-ES	10/25/89
OPB-89-13	ABB-ES	10/26/89
OPM-89-01	ABB-ES	11/13/89
OPM-89-02	ABB-ES	10/27/89
OPM-89-03	ABB-ES	11/11/89
Old Acid Area		
OAB-91-01	ABB-ES	10/9/91
OAB-91-02	ABB-ES	10/9/91
OAB-91-03	ABB-ES	10/16/91
OAB-89-01	ABB-ES	10/17/89
OAB-89-02	ABB-ES	10/24/89
OAB-89-03	ABB-ES	10/17/89

OAM-91-01	ABB-ES	10/27/91
Old Fuel Oil Tank		
FTB-91-01	ABB-ES	10/22/91
FTB-91-02	ABB-ES	10/22/91
FTB-89-01	ABB-ES	10/24/89
PHM-91-01	Olin	6/6/91
B-1	Olin	6/5/91
B-2	Olin	6/5/91
B-3	Olin	6/6/91
B-4	Olin	6/7/91
Off-Post (South)		
PBN-91-01C	ABB-ES	10/24/91
PBN-91-02B	ABB-ES	9/28/91
PBN-91-02C	ABB-ES	9/30/91
PBN-91-03B	ABB-ES	9/26/91
PBN-91-03C	ABB-ES	9/27/91
PBM-90-01D	ABB-ES	8/24/90
PBM-90-02D	ABB-ES	8/19/90
PBM-90-03D	ABB-ES	8/16/90
PBN-90-04B	ABB-ES	8/6/90
PBN-90-04D	ABB-ES	8/5/90
SWN-91-01B	ABB-ES	10/15/91
SWN-91-01C	ABB-ES	10/16/91
SWN-91-01D	ABB-ES	10/14/91
SWN-91-02C	ABB-ES	10/22/91
SWN-91-03B	ABB-ES	10/8/91
SWN-91-03C	ABB-ES	10/2/91
SWN-91-03D	ABB-ES	10/1/91
SWN-91-03E	ABB-ES	11/10/91
SWN-91-03X	ABB-ES	11/7/91
SWN-91-04C	ABB-ES	10/13/91
SWN-91-04D	ABB-ES	10/9/91
SWN-91-05B	ABB-ES	10/12/91
SWN-91-05C	ABB-ES	10/12/91
SWN-91-05D	ABB-ES	10/10/91
Base-wide		
S1101	Warzyn	12/13/79
S1103	Warzyn	11/2/79
S1106	Warzyn	11/14/79
S1107	Warzyn	1/10/80
S1108	Warzyn	12/29/80
S1109	Warzyn	2/14/80
S1110	Warzyn	1/15/80
S1111	Warzyn	1/2/80
S1112	Warzyn	1/4/80
S1114	Warzyn	11/20/79
S1116	Warzyn	12/11/79
S1117	Warzyn	2/13/80

S1118	Warzyn	11/30/79
S1119	Warzyn	1/22/80
S1120	Warzyn	1/17/80
S1121	Warzyn	1/18/80
S1122	Warzyn	1/25/80
S1123	Warzyn	12/28/80
S1124	Warzyn	12/19/79
S1125	Warzyn	
S1126	Warzyn	2/11/80
S1127	Warzyn	2/8/80
S1128	Warzyn	12/19/79
S1129	Warzyn	2/7/80
S1131	Warzyn	12/6/79
S1132	Warzyn	2/4/80
S1147	Warzyn	1983
S1148	Warzyn	1983
S1149	Warzyn	1983
S1150	Warzyn	1983
S1151	Warzyn	1983
S1152A	Warzyn	9/26/85
S1152B	Warzyn	9/24/85
S1153	Warzyn	9/19/85

FIELD BORING LOG

Boring No. BGM-91-01

Project No. 06953-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-28-91	completed 10-28-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 78'	∇ below ground 64.5	Total Depth 78'
Logged by [illegible]	Checked by DRP	Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL
S-1	0-10'			BROWN CLAYEY SILT, RD, TR F SAND, COHESIVE, PLASTIC DAMP.	(SM)	0	0	0
S-2	10-20			LT BROWN-RED SILTY SAND, WGD, C, SOME M, SOME F GRAVEL.	(SW) ANALYTICAL SAMPLES 20-22'	0	0	0
SPOON #1	20-22'	12/24/[illegible]/40						
S-3	NO SAMPLE TAKEN			20-30'				
S-4	30-40'			LT BROWN SAND, WGD, M-C LITTLE F, LITTLE F GRAVEL	(SW) ANALYTICALS TAKEN	0	0	0
SPOON #2	40-42'	7/12/14/22				0	0	0
S-5	40-50			SAME AS ABOVE	(SW)	0	0	0
S-6	50-60			SAME AS S-4	(SW)	0	0	0
SPOON #3	60-62'	6/9/12/22			ANALYTICALS TAKEN. WATER IN SEDIMENTS			
S-7	60-70			LT BROWN SAND, RD, M LITTLE C, LITTLE F, LITTLE SILT	(SP) ▼ 64.5	0	0	0
S-8	70-78'			LT BROWN SILTY SAND, RD, F. B.O.E = 78'	(SP) 78'			
				SANDSTONE				

FIELD BORING LOG

Boring No. BGM-91-01X

Project N00685J-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-27-91	completed 10-27-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 40'	⚓ below ground —	Total Depth 40'
Logged by PRR.	Checked by DRP	Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
S-1	0-10'			BROWN CLAYEY SILT, MED, TR F SAND. COHESIVE DAMP (SM)		0	0	0
S-2	10-20'	10-17'		SAME AS ABOVE		0	0	0
		17-20		LT BROWN SAND, WGD, C, SOME F GRAVEL, SOME M SAND. (SW)				
SPOON #1		7/9/8/10			ANALYTICAL SAMPLE TAKE 20-22'			
S-3	20-30'			LT BROWN SAND, WGD, M-C SOME F, LITTLE F GRAVEL, TR SILT (SW)		0	0	0
S-4	30-40'	30-34		SAME AS S-3 (SW)		0	0	0
		34-36		BROWNISH-RED SILTY SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAV SLIGHTLY COHESIVE, LENSES OF GREY CLAY. (SW-SM)				
				WEATHERED SANDSTONE FROM 36-40				
				B.O.E. = 40'				
				BEDROCK = 38-40' SANDSTONE				
				Boring Abandoned on 10/28/91				

FIELD BORING LOG

Boring No. BGM-91-02

Project No 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-5-91	completed 11-6-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 87'	∇ below ground 76.5	Total Depth 87'
Logged by RRR	Checked by DRP	Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-1	0-10'			BROWN CLAYEY SILT, COHESIVE, PLASTIC, TR C SAND TR F GRAVEL	(ML) ↕ 11-5-91 11-6-91		0	0
S-2	10-20'			LT BROWN-RED SAND, WGD M-C, LITTLE F, LITTLE F GRAV LITTLE SILT	(SW)		0	0
SPOON #1	20-22'	7/11/14/19		SPOON # 1	ANALYTICALS TAKEN 9:25 2 VOA's 5 8-08		0	0
S-3	20-30'			LT BROWN SAND, WGD, M, SOME C, SOME F, TR F GRAV, TR SILT	(SW)		0	0
S-4	30-40			SAME AS S-3	(SW)		0	0
SPOON #2	40-42'	5/12/24/30		SPOON # 2	ANALYTICALS 10:13		0	0
S-5	40-50			SAME AS S-3	(SW)		0	0
S-6	50-60'			SAME AS S-3	(SW)		0	0
SPOON #3	60-62'	7/17/23/35		SPLIT SPOON # 3	ANALYTICAL SAMPLES		0	0
S-7	60-70'			LT BROWN SAND, PGD, M. SOME F, LITTLE C, TR SILT	(SP)		0	0
S-8	70-80			LT BROWN SAND, PGD, M-C LITTLE F, TR SILT.	(SP) ∇ 76.5'		0	0
S-9	80-87'			SAME AS S-8	(SP)		0	0
				B.O.E.= 87'				

FIELD BORING LOG

Boring No. BGM-91-03

Project No 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G. ROMANOWSKI	Date started 11-7-91	completed 11-7-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 100'	∇ below ground 79'	Total Depth 100'
Logged by TCRR	Checked by DRP	Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring PPM HNU JAR	Monitoring PPM HNU AIR	Monitoring PPM LEL
S-1	0-10'			LT BROWN-RED SAND, WGD M, SOME C, SOME F, SOME-LITTLE SILT, LITTLE F GRAVEL	(SW)		0	0
S-2	10-20'			LT BROWN SAND, WGD, M-C SOME F GRAV, LITTLE C GRAV LITTLE F SAND, TR SILT, TR COBBLES.	(SW)		0	0
SPOON #1	20-22'	43/12/19/12		SAME AS 20-30 (S-3) 21' BGS - 1" THICK CLAY LENS	ANALYTICAL SAMPLES S 8-08, 2 VOA's 11:10		4	0
S-3	20-30			LT BROWN SAND, WGD, M-C, LITTLE-SOME F GRAV, SOME F SAND, TR C GRAVEL.	(SW)		0	0
S-4	30-40			SAME AS S-3	(SW)		0	
SPOON #2	40-42'	10/12/15/29		SAME AS S-5	ANALYTICALS S 8-08 2 VOA's 11:30		0	0
S-5	40-50			LT BROWN SAND, MOD GD, M, SOME C, LITTLE F GRN, TR BLACK CLAY PELLETS & ORGANIC LOOKING CLAY)	(SW)		0	0
S-6	50-60			LT BROWN SAND, PGD, M, SOME C, LITTLE F, TR F GRAVEL.	(SP)		0	0
SPOON #3	60-62'	5/12/22/35		LT BROWN SAND, PGD, M-F LITTLE TO SOME SILT, SOME TO LITTLE M, TR C SAND.	ANALYTICALS 11:52 S 8-02, 2 VOA's		0	0
S-7	60-70			LT BROWN SAND AND SILTY SAND W/ INCREASE IN DEPTH PGD, F, TR M.	(SP)		0	0
S-8	70-80			LT BROWN SILTY SAND, PGD. F, NON PLASTIC, NON COHESIVE.	(SP) ▼ 79'		0	0
S-9	80-90	80-81 81-84 84-90		SILTY SAND AS ABOVE CLAY, COHESIVE, BRIME, BROWN LT BROWN SILTY SAND AS ABOVE	(SP)		0	0
S-10	90-100	90-95		LT BROWN SAND, PGD, F-M TR C	(SP)		0	0
		95-100'		- LT BROWN GRAVELY SAND WGD, SAND = M-C, LITTLE F LITTLE SILT GRAVEL = F, LITTLE C TR C	(SW)			

FIELD BORING LOG

Boring No. PBG9101

Project No 685304	Project Name USATHAMA BAAP		Page 1 of 4
Contractor MATHES	Driller T. CRANK	Date started 10/11/91	completed 10/12/91
Method HSA 4¼"	Casing Size ____	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 104.5	∑ below ground	Total Depth 106.5
Logged by SANDIN	Checked by DRP	Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
243	S-1	0-2	2/3/4/7	2.0/1.8	dark brown sandy silt organic rich dense.	Reference Sample		BKG	
250	S-2	2-4	2/3/4/4	2.0/1.3	dark brown sandy silty topsoil similar to S-1	Reference Sample		BKG	
3	S-3	4-6	1/4/4/4	2.0/1.0	Sample appeared to be topsoil with grass so rig was instructed to redrive spoon	Analytical Sample ~~P9109~~ P9101006 no sample		BKG	
	S-3 2nd time	4-6	wt. of hammer	2.0/0.1	No recovery				
310	S-4	6-8	1/3/2/2	2.0/1.8	brown to black sandy silt with clay, 7-8 feet black asphalt chunks mixed with sandy silt	ANAL. SPLE P9101008 Time on sple bottle start 1353		BKG	
1315	S-5	8-10		2.0/1.4	8-8.4 orange brn sandy silty clay	Reference Sample		BKG	

FIELD BORING LOG

Boring No. PBS7101

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 4
Contractor MATHES	Driller T. CRANK	Date started 10/11/91	completed 10/12/91
Method HSA	Casing Size —	HNU 11.7/10.2 @ 3	Protection Level D
Ground El	Soil Drilled 104.5	∇ below ground	Total Depth 106.5
Logged by RS	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
~~10-12~~	WT R 16 6"	10-12 feet bgs	~~2.0~~	light brown sand fine to coarse with 30-40% rounded gravel, loose dry	Analytical Sample P9101012		BKG	
1325 S-6	23-37 -50 3"		1.7					
S-7	12-14	50/5"	0.4 / 0.2	sand and gravel loose refusal on cobbles	Reference Sample		BKG	
1355 S-8	14-16	29/43 for 5½"	1.5 / 1.5	tan silty gravelly sand. 40% gravel loose, dry	Analytical Sample P9101016		BKG	
1405 S-9	16-18	47, 46 33, 33	2.0 / 1.8	tan gravelly sand loose, dry	Analytical Sample P9101018		BKG	
1430 S-10	18-20	14, 24 ~~47~~, 24	2.0 / 1.8	tan gravell sand becoming well sorted fine sand 19-20.	Reference Sample		BKG	
1440 S-11	20-22	6, 30, 37, 25	2.0 / 2.0	TAN GRAVELL SAND BECOMING WELL SORTED FINE SAND, MOIST, DENSE, OUTWASH	ANALYTICAL SAMPLE P9101022		BKG	
S-12	24.5-26.5	2-22 24-29	2.0 / 1.3	Tan Gravelly Sand moist, dense Outwash	Reference Sample		BKG	

FIELD BORING LOG

Boring No. PBB 9101

Project No 685203	Project Name USATHAMA CAAP		Page 3 of 9
Contractor MATHES	Driller T. CRANK	Date started 10/11/91	completed 10/12/91
Method HSA	Casing Size —	HNU 11.7/10.2 #3	Protection Level D
Ground El.	Soil Drilled 104.5	∑ below ground	Total Depth 106.5
Logged by ES	Checked by DRP	Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
500	S-13	29.5-31.5	15/84/25/35	2.0/2.0	tan sand fine well sorted moist tr gravel tr cse sd	Analytical Sample P9101031		BKG	
520	S-14	~~30.5~~ 39.5-41.5	5/18/45/35	2.0/2.0	tan sand fine moist, well sorted	ANALYTICAL SAMPLE P9101041		BKG	
530	S-15	49.5-51.5	3/12/25/32	2.0/2.0	tan sand fine well sorted moist trace gravel	ANALYTICAL SAMPLE P9101051		BKG	
545	S-16	59.5-61.5	14/22/31/35	2.0/2.0	tan sand fine well sorted, no gravel moist	Analytical Sample P9101061		BKG	
710	S-17	69.5-71.5	8/50/4"	0.8/1.0	tan sand fine poorly graded with trace gravel	Analytical Sample P9101071		BKG	
625	S-18	79.5-81.5	50/5"	0.4/0.0	NO RECOVERY	NO SAMPLE			
645	S-19	89.5-91.5	14/30/40/50 3"	1.6/1.9	tan sand fine poor graded very well sorted, moist tr. gravel	Analytical Sample P9101091		BKG	
1710	S-20	99.5-101.5	14/50/5"		sand and gravel loose, rock fragments	Analytical Sample NOT TAKEN			

FIELD BORING LOG

Boring No. PBB9101

Project No 685303	Project Name USATHAMA RAAP			Page 4 of 4
Contractor MAINES	Driller T. CRANE	Date started 10/11/91	completed 10/12/91	
Method HSA	Casing Size —	HNU 11.7 (10.2) ch 3	Protection Level D	
Ground El	Soil Drilled 104.5	∑ below ground	Total Depth 106.5	
Logged by E. S.	Checked by DRP	Date 10/14/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
1730 S-21	104.5 – 106.5	18/18/15/22	2.0/2.0	light brown fine to coarse sand moderately well graded fine well sorted sand 106 – 106.5 saturated Bob augers 104.5 spoon 106.5	ANALYTICAL SAMPLE P9101105		BKG	

FIELD BORING LOG

Boring No. PBB-91-02

Project No 6853-03	Project Name BAAP		Page 1 of 4
Contractor MATHES	Driller Keith Busch...	Date started 10-11-91	completed 10-12-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 110'	⊻ below ground: 105	Total Depth 110
Logged by RJM	Checked by DRP	Date 10/14/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	SP. SR.
~~[illegible]~~ (Sun) 15:12	S-1	0-1.5	3/4/6	1.5/1.3	Black Silty Clay; trace organic matl. and fine Sand; top soil, dry. (CL)	Reference		Bkg	Bkg	Bkg
15:21	S-2 PQ912008	2-3.5	2/5/5	1.5/1.0	Brown mottled Clay; little silt; trace fine sand; dry, soft, (CL)	Analytical				
15:24	S-3	4-5.5	2/4/4	1.5/1.0	Brown to Black fine Sand; little coarse sand and charcoal (fill): trace fine rounded gravel and silt; dry. (FILL) (SP)	Reference				
15:33	S-4	6-7.5	2/5/6	1.5/0	No Recovery	stone/boulder blocked spoon				
15:40	S-5	8-9.5	2/3/4	1.5/NR	No Recovery	1st attempt no recovery - 2nd attempt split spoon ~~[illegible]~~ fell in same hole - adv. augers to 10'				
15:47	S-6 PQ910012	10-12	8/22/25/42	2.0/1.5	Bottom 0.9' - Brown fine to Coarse Sand; little fine gravel, metal debris, fill; middle 0.9-1.2' - Black Silty medium Sand; trace medium gravel; ~~[illegible]~~; Top 1.2-1.5' - Brown medium to coarse Sand; little fine gravel; wet. Spoon smells sweet like acetone (SW/FILL)	Driller having difficulty removing plug - an old nail was lodged between the plug and the inside of the HSA. 15 ppm at augerhead w/HNU. Analytical		Bkg		15%

FIELD BORING LOG

Boring No. PBB-91-03

Project No. GE53-03	Project Name BAAP		Page 2 of 4
Contractor MATHES	Driller Keith Buxton	Date started 10-11-91	completed 10-12-91
Method HSA/CME 75	Casing Size 9.25"	HNU 11.7 (10.2)	Protection Level D
Ground El.	Soil Drilled 110'	& below ground 105	Total Depth 110'
Logged by RMT	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
16:12	S-7	12-14	50/45/40/47	2.0/1.6	Brown to tan fine to coarse sand; little fine to medium gravel; wet at top of spoon. (FILL) (GW)	50 ppm at auger head. Reference		Bkg	Bkg
16:20	S-8	14-16	100 for 3"	3"/0	No Recovery	FILL / NATIVE			Bkg
16:31	S-9 P902018	16-18	56/100	1.0/0.8	Tan Fine Sand; trace medium to fine gravel; dry (SP)	10 ppm at auger head - nothing in breathing zone. Tan air smells sweet occasionally in breathing zone. Analytical		Bkg	Bkg
16:41	S-10 P902022	18-20	12/18/24/29	2.0/1.5	Bottom 0.3' - Tan (FILL) clayey fine sand and silt; silt; Top 0.3-1.5' - Tan medium Sand, little fine to medium angular gravel and fine sand; dry (SC/SW)	15 ppm at auger head Analytical		Bkg	Bkg
16:50	S-11 P902022	20-22	16/16/23/37	2.0/2.0	Bottom 0.6' - Tan medium Sand; little fine sand coarse Sand; trace fine rounded gravel; middle 0.6-1.2' Tan Silty fine Sand; Top 1.2-2.0' - Tan to brown medium Sand; some coarse Sand; little fine rounded gravel and fine sand; dry (SP/SM/SW)	Analytical		Bkg	Bkg

FIELD BORING LOG

Boring No. P33-91-02

Project No 6253-03	Project Name BARP		Page 3 of 4
Contractor MATTERS	Driller	Date started 10-11-91	completed 10-12-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 110'	& below ground? 105	Total Depth 110'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL	
17:00	S-12 P9102027	25-27	15/16/21/27	2.0/1.8	Bottom 1.9' - Tan medium Sand; little fine sand; trace medium subrounded gravel; Top 1.4-1.8' Tan medium Sand; trace coarse sand and fine subrounded gravel; dry. (SP)	Analytical		Bkg	Bkg	Bkg
17:15	S-13 P9102032	30-32	12/18/27/32	2.0/2.0	Tan medium Sand; trace coarse sand and fine to medium subangular gravel; the sand is peppered with heavy minerals, dry (SP)	Analytical		Bkg	Bkg	17.4
17:40	S-14	40-42	11/16/25/36	2.0/1.7	Tan medium and fine Sand; trace coarse sand and medium angular gravel; dry Sample peppered w/ heavy minerals. (SP)	~~Analytical~~ (RHA) Reference		Bkg	Dkg	13.1
18:00	S-15 P9102042	50-52	14/23/25/36	2.0/2.0	Tan fine Sand; trace medium sand and fine rounded gravel; dry (SP)	Analytical		Bkg	Bkg	Bkg
					10-12-91					
07:40	S-16 P9102062	60-62	14/17/22/36	2.0/2.0	Tan medium Sand; some fine sand; trace medium subangular gravel and coarse sand; dry. (SP)	Analytical		Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. PBB-91-8

Project No 6853-03	Project Name BAAP		Page 4 of 4
Contractor MATHES	Driller Keith Bussdecker	Date started 10-11-91	completed 10-12-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 110'	▽ below ground ≈105'	Total Depth 110'
Logged by RHA	Checked by DRP	Date 10/14/91	

10-12-91

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL	
08:00	S-17 P910Z072	70-72'	25/50/49/69	2.0 / 1.5'	Tan to Brown medium Sand; Some coarse Sand; little fine to medium angular to subrounded gravel; trace fine sand; dry (SW) peppered w/heavy minerals	Analytical		Bkg	Bkg	Bkg
08:26	S-18 P9102082	80-82	27/50/53/57	2.0 / 2.0	Tan to brown medium and coarse Sand; little fine to medium rounded to subangular gravel; sample peppered w/heavy minerals; dry. (SW)	Analytical		Bkg	Bkg	
09:00	S-19 P9102092	90-92'	13/34/70/68	2.0 /	SAME AS ABOVE FROM 80-82' (SW)	Analytical		Bkg	Bkg	Bkg
09:30	S-20 P9102102	100-102	27/49/59/60	2.0 / 2.0	SAME AS ABOVE (SW)	Analytical		Bkg	Bkg	Bkg
								Bkg	▽	10:
10:30	S-21 P9102112	110-112	9/35/42/57	2.0 /	SAME AS ABOVE; WET (SW)	In water – 8' of heaving sand in augers. T.D. 110'				

FIELD BORING LOG

Boring No. PBB9103

Project No 685303	Project Name USATHAMA BAAB		Page 1 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-12-91	completed 10-12-91
Method HSA 4¼"	Casing Size ____	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 99'	∑ below ground	Total Depth 101'
Logged by E.S.	Checked by NRP	Date 10/14/91	

TIME

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
S-1	0-2	1-3-4-7	2.0/1.6	Dark brown sand silt with organics, plastic tarps 0.6, black chips (asphalt?) SM	REFERENCE SAMPLE		BKG	
1035 S-2	2-4	2-7-10-5	2.0/1.9	Dark brown organic rich sandy silty topsoil dense. Ash fragments SM	Analytical Sample P9103004		BKG	
1050 S-3	4-6	5-8-7-7	2.0/1.6	medium brown slightly sandy silt, moist, dense moderately plastic SM	Analytical Sample P9103006		BKG	
S-4	6-8	3-7-8-15	2.0/1.2	medium brown sandy silt, moderately plastic. SM	Reference Saw		BKG	
S-5	8-10	3-7-13-33	2.0/1.8	light brown sand fine to course with weathered fine gravel SW	Reference Sample		BKG	
120 S-6	10-12	50/5"	.8/1.0	tan fine to coarse sand with 40% gravel loose, dry SW	ANALYTICAL SAMPLE P9103012		BKG	
S-7	12-14	14-20-20-25	2.0/1.9	tan fine sand with 10% gravel and two sandy silt zones from 12.4-12.6 and 13.3-13.4 SP/SM	Reference Sample		BKG	

FIELD BORING LOG

Boring No. P9891[illegible]

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-12-91	completed 10/12/91
Method HSA 4 1/4"	Casing Size ——	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 99'	∑ below ground	Total Depth 101'
Logged by E.S.	Checked by DRP	Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
1140	S-8	14-16	7-16-20-27	2.0/1.9	14-19.4 tan sand V. fine well sorted, moist 14.4-14.8 tan sand well sorted, fine 14.8-15.9 tan sand fine-medium 15.1-15.9 light brown V.f. to fine sand well sorted SP	ANALYTICAL SAMPLE P9103016		SVG	
1150	S-9	16-18	[redacted]-12-12-28-28	2.0/1.15	tan finie sand well sorted loose SP orange tan last 0.5 feet with weathered dolomite. dry	ANALYTICAL SAMPLE P9103018		SVG	
	S-10	18-20	3-10-16-27	2.0/1.7	tan fine sand with 10% gravel, loose slightly moist. SP	REFERENCE SAMPLE		SVG	
1200	S-11	20-22	22-28-27-31	2.0/2.0	tan sand fine with some med-coarse and 10% gravel. grey sand layer @ 20.3-20.35 coarser sand interval 20.7-20.8 SP	ANALYTICAL SAMPLE P9103022		SVG	
	S-12	22-24	14-20 28-35	2.0/2.0	tan fine well sorted sand with coarser layers & coarse sand and fine gravel SP	Reference Sample		SVG	

FIELD BORING LOG

Boring No. PBB9103

Project No 685303	Project Name USATHAMA BAAP		Page 3 of 4
Contractor MATHES	Driller T. CRANK	Date started 10·12·91	completed 10/12/91
Method HSA 4¼"	Casing Size —	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 91'	& below ground	Total Depth 101'
Logged by E.S.	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATP	Monitoring LEL
	S-13	24-26	5-30-30-32	2.0/2.0	tan sand with multicolored gravel sand is predominantly fine with 5% med-quartz. SP/SW	Reference Sample		BKG	
	S-14	26-28	12-33-35-40	2.0/1.8	tan sand and gravel similar to S-13 loose, slightly moist. SW	Reference Sample		BKG	
	S-15	28-30	12-15-28-26	2.0/1.8	tan sand fine, well sorted with 5-10% rounded gravel, loose sl. moist. SP	Analytical Sample P9103030		BKG	
320	S-16	39-41	5-15-30-48	2.0/2.0	tan sand very fine-fine, well sorted trace fine gravel disseminated throughout faint horizontal laminations slightly moist. SP	ANALYTICAL SAMPLE P9103041		BKG	
1.35	S-17	49-51	10-20-34-43	2.0/2.0	tan sand fine, well sorted 49.7-49.8 med-cse sand. 49.8-51 fine sand occaissional faint lamina, tr coarse sd laminations. SP	ANALYTICAL SAMPLE P9103051		BKG	

FIELD BORING LOG

Boring No. PBB9103

Project No 685303	Project Name USATHAMA BAAP			Page 4 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-12-91	completed 10/12/91	
Method HSA 4 1/4"	Casing Size —	HNU 11.7 (10.2) D	Protection Level D	
Ground El	Soil Drilled 99'	∇ below ground	Total Depth 101'	
Logged by ES	Checked by DRP	Date 10/14/91		

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
1400	S-18	59-61	10-20-22-27	2.0/2.0	Sand tan fine 5% fine gravel occasional faint horiz laminations of coarser sand layering loose, slightly moist SP	ANALYTICAL SAMPLE P9103061		Not Analyzed	
1415	S-19	69-71	17-33-40-42	2.0/1.5	fine to coarse sand and gravel (50%) some of the gravel is weathered (dolomite ?) and friable. loose. dry. SW	ANALYTICAL SAMPLE P9103071		BKG	
1435	S-20	79-81	22-23-23-25	2.0/1.6	Gravel with 40% fine to coarse rounded sand. SW	ANALYTICAL SAMPLE P9103081		BKG	
1505	S-21	89-91	43/50 5"	0.9/0.9	Gravel similar to S-20 SW	ANALYTICAL SAMPLE P9103091		BKG	
1530	S-22	99-101	7/16/20 20	2.0/1.4	fine to coarse sand and gravel (40%) saturated SW	ANALYTICAL SAMPLE P9103101		BKG	
					WATER IN AUGERS AT 98.5 bgs				
					BOB 99 AUGERS 101 LAST SPLIT SPOON				

FIELD BORING LOG

Boring No. PBB-91-04

Project No 685303	Project Name BAAP		Page 1 of 5
Contractor MATHES	Driller Keith Bunsiman	Date started 10-13-91	completed 10-14-91
Method HSA / CME 75	Casing Size 4.75"	HNU 11.7 (10.2)	Protection Level D
Ground El.	Soil Drilled 105'	∑ below ground 10.2	Total Depth 105'
Logged by JZHA	Checked by DRP	Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	SZ SIZE
13:30	S-1	0-2	4/5/6/9	2.0/1.0	Bottom 0.4' Brown fine sandy Silt; trace organics; Top 0.4 - 1.0 - Brown fine Sand; little medium gravel; dry - Top Soil (SM)	Reference		Bkg	Bkg	BL
13:34	S-2	2-4	4/5/7/7	2.0/1.1	Brown Clayey fine Sand (SC) (Loess) dry.	Reference		Bkg	Bkg	BL
38	S-3	4-6'	10/26/35/38	2.0/1.5	Bottom 1.1' - Brown fine Sand; some medium sand; little coarse sand and fine to medium subrounded gravel (Fill?); Top 1.1 - 1.5 Brown Sandy Clay (Loess) (SC). dry	Reference		Bkg	Bkg	BL
13:51 910408	S-4	6-8'	22/49/50/95	2.0/2.0	Brown fine to coarse Sand; some fine to coarse gravel and rock frags.; trace green sand in middle of spoon; dry (GW/Fill?)	Analyticed		Bkg	Bkg	BL
14:00	S-5	8-10	19/41/50/53	2.0/1.6	Brown fine to coarse Sand; some fine to coarse gravel and broken rock frags., black Sooty material at top of spoon; dry (GW/Fill?)	Reference		Bkg	Bkg	BL

FIELD BORING LOG

Boring No. PBB-91-04

Project No 6853-03	Project Name BAAP		Page 2 of 5
Contractor MATHES	Driller Keith Burtlemeyer	Date started 10-13-91	completed 10-14-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.71 (0.2)	Protection Level D
Ground El	Soil Drilled 105'	∑ below ground 102	Total Depth 105'
Logged by RHA	Checked by DRP	Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
14:11 PB104012	S-6 PB10104	10-12	12/52/36/46	2.0/1.6	Brown to Tan fine to coarse Sand; some fine to coarse Gravel; dry (GW/Fill?)	Analytical		Bkg	Bkg
14:25	S-7	12-14	7/8/16/18	2.0/2.0	Tan fine sand; trace medium and coarse sand; dry. (SP)	Reference			
14:30	S-8	14-16	5/12/12/16	2.0/1.7	Tan medium sand; little fine sand; trace coarse sand at bottom of spoon; thin bed of black silt sand in middle of spoon; dry (SP)	Reference		Bkg	Bkg
14:39 PB104018	S-9	16-18	8/12/17/22	2.0/1.8	Bottom 1.1' - Tan fine sand; trace course and medium sand and fine rounded gravel; Top 1.9'-1.8' - Tan medium sand; some fine sand; little coarse sand; trace fine to medium gravel; dry (SP/SW)	Analytical		Bkg	Bkg
14:44	S-10	18-20	11/18/26/43	2.0/2.0	Tan to brown fine to coarse Sand; little fine to medium rounded gravel; dry (SW)	Reference		Bkg	Bkg
14:55 PB104022	S-11	20-22	22/21/26/34	2.0/1.7	SAME AS ABOVE FROM 18-20 with rock frags. and HM., dry; trace black to green sand at bottom of spoon. (SW)	Analytical		Bkg	Bkg

FIELD BORING LOG

Boring No. PBB-91-04

Project No. 853-03	Project Name BAAP		Page 3 of 5
Contractor NATHES	Driller Kevin Brassfield	Date started 10-13-91	completed 10-14-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 105'	∑ below ground 102	Total Depth 105'
Logged by RHH	Checked by DRP	Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	Spare
15:04	S-12	22-24	100/Refusal	0.5/0.3	Tan medium sand; some fine sand; trace fine to medium sub rounded gravel; dry. (SP)	Reference		Bkg	Bkg.	Bk
15:16 #104026	S-13	24-26	69/70/100	0.5/0.1	Tan medium sand; some fine sand; dry (SP)	Analytical collected VOCs only.		Bkg	Blc+	Bk
15:26 #104028	S-14	26-28	16/18/19/20	2.0/2.0	Tan medium and fine sand; trace coarse and fine to medium gravel; black wet (saturated) sandy seam near top of spoon and green sandy seam near bottom of spoon containing saturated. - 7 ppm (SP)	WATER Analytical VOC only		Bkg	Bkg	7.
15:35	S-15	28-30	13/16/18/20	2.0/2.0	Tan medium Sand; little fine sand; trace coarse sand; several layers of green stained sand - 5 ppm; damp (SP)	Reference		Bkg	Bkg	5.
15:51 #104032	S-16	30-32	15/40/36/20	2.0/	Tan fine to medium Sand; trace coarse sand and large rounded gravel and Mn. green stained soil at top of spoon.; dry. (SP)	20 ppm at auger head. Analytical 0 ppm on Carbon Tetrachlor. Dragon Tubes - Volatiles collected from top of spoon		Bkg	Bkg.	2.

FIELD BORING LOG

Boring No. PBB-91-[redacted]

Project No. 6853.03	Project Name BMAP		Page 4 of 5
Contractor [illegible]	Driller [illegible]	Date started 10-13-91	completed 10-14-91
Method HSA/CMR 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El.	Soil Drilled 105'	∇ below ground 102	Total Depth 105'
Logged by RHA	Checked by DRP	Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	Sample
16:00 P9104042	S-17	40-42	18/18/30/31	2.0/2.0	Tan fine Sand; trace med and coarse sand; dry (SP)	50 ppm at auger head at 35' bgs. Analytical.		Bkg	Bkg	1-L
16:20 P9104052	S-18	50-52	16/20/22/32	2.0	Tan fine Sand; little medium sand; trace coarse sand and fine to medium subrounded gravel. Heads of green stained sand throughout sample; dry. (SP)	Analytical		Bkg	Bkg	
16:35 P9104062	S-19	60-62	12/18/21/32		Tan fine sand; little medium sand; trace silty fine sand in thin lenses; green stained sand in bands throughout sample; dry - sample is aromatic - of chemicals (SP) 10-14-91	Analytical		Bkg	Bkg	&
08:06 P9104072	S-20	70-72	16/21/46/75	2.0/2.0	Tan medium Sand; little fine sand; trace coarse sand, and fine rounded gravel. Sample is stained green in many areas; dry in tan portions, damp in stained areas. (SP)	difficult drilling at 66'-cobble zone. Analytical		Bkg	Bkg	
08:38 P9104082	S-21	80-82	40/52/32/50	2.0/1.4	Brown to Tan fine to coarse Sand; some fine to coarse angular to rounded gravel and rock frags; dry (GW)	Analytical		Bkg	Bkg.	Ex

FIELD BORING LOG

Boring No. PBB-91-04

Project No 6853-03	Project Name BAAP		Page 5 of 5
Contractor MATHES	Driller K. Bunselmeyer	Date started 10-13-91	completed 10-14-91
Method HSA/MUD ROTARY	Casing Size 4.25	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 105'	∑ below ground 102	Total Depth 105
Logged by RHA	Checked by DRP	Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	Spl Sz.
08:55 P9104092	S-22	90-92	5/21/19/24	2.0/1.7	Bottom 1.1' - Tan fine and medium sand; trace coarse sand; Top 1.1-1.7' Tan medium sand; trace coarse sand and fine rounded gravel; dry. Slight chemical odor, but no staining (SP)	Analytical		Bkg	Bkg	Bk
[illegible] P9104102	S-23	100-102	43/40/31/18	2.0/2.0	Tan to Brown fine to coarse sand, some fine to medium gravel; dry (SW)	Analytical		Bkg	Bkg	Bk
9:45 P9104107	S-24	105-107	25/14/17/16	2.0/1.7	Brown fine to coarse sand; some fine gravel; trace medium gravel, wet. (SW)	Analytical Sampled BTW at 102' in augers. ∑ T.D. 105'		Bkg	Bkg	Bk

FIELD BORING LOG

Boring No. PBB9105

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 5
Contractor MATHES	Driller T. CRANK	Date started 10.14.91	completed 10.15.91
Method HSA 4¼"	Casing Size ——	HNU 11.7/10.2 #3	Protection Level D
Ground El.	Soil Drilled 99	∑ below ground	Total Depth 101
Logged by ES/DL	Checked by DRP	Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-2	7/7/4/6	2.0/1.6	0-0.5 gray to brown silty gravelly sandy fill 0.5-1.6 dk brown to brown sandy silty topsoil slightly plastic, dense ML	Reference Sample	BKG	BKG
S-2	2-4	3/4/5/3	2.0/1.5	brown sandy silt dense slightly plastic ML	Reference Sample	BKG	BKG
1045 S-3	4-6	3/19/21/37	2.0/1.4	tan sandy gravel, loose cobble pieces, dry SW	ANALYTICAL SAMPLE P9105006	BKG	BKG
S-4	6-8	17/29/39/44	2.0/1.6	tan sand, fine to coarse, loose with 30% gravel, dry SW	Reference Sample	BKG	BKG
S-5	8-10	35/50/5"	0.9/0.9	tan sand and gravel similar to S-4 SW	Reference sample	BKG	BKG
S-6	10-12	7/38/43 50/5"	1.9/1.4	tan sand and gravel similar to S-5 SW	Reference Sample	BKG	BKG
1120 S-7	12-14	28/40/50/5"	1.4/1.3	fine to coarse sand with 60% gravel loose, slightly moist GW	ANALYTICAL SAMPLE P9105014	5	BKG
S-8	14-16	25/30/35/40	2.0/1.6	tan to light brown gravelly sand fine to coarse, cobble and gavel fragments, loose, dry SW	Reference Sample	BKG	BKG

FIELD BORING LOG

Boring No. P9B9105

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 5
Contractor MATHES	Driller T. CRANK	Date started 10-14-91	completed 10-15-91
Method HSA 4 1/4"	Casing Size ——	HNU 11.7 (10.2) #3	Protection Level D
Ground El.	Soil Drilled 99	∑ below ground	Total Depth 101
Logged by ES	Checked by DRP	Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-9	16-18	19/38 40/43	2.0/1.5	tan to brown sand fine to coarse with 40% gravel SW	Reference Sample	BKG	BKG
S-10	18-20	6/12/18 24	2.0/1.6	tan Sand Fine well sorted, trace coarse sand, Fine gravel loose, slightly moist SW	Reference Sample	BKG	BKG
S-11	20-22	17/17/ 25/40	2.0/2.0	tan Fine sand well sorted moist occassional darker lamina and graybrown silt lamina. two areas of yellowish discoloration. slight odor. no tip response. SP	Reference Sample Headspace Ref. Jar 3	BKG	BKG
S-12	22-24	8/21 23/25	2.0/1.5	tan to light brown sandy gravel, loose no obvious discoloration slightly moist GW	Reference Sample	1	BKG
1350 S-13	24-26	8/16 25/50/5"	2.0/2.0	tan sand Fine well sorted to fine-med well sorted 0-100% gravel loose, slightly moist. 24.6-25.0 mottled penny size gray discoloration slight yellowish tint to most of sample SP	ANALYTICAL SAMPLE P9105026 Ref. Jar headspace 17 ppm	5	BKG

FIELD BORING LOG

Boring No. PBB9105

Project No 685303	Project Name USATHAMA BAAP		Page 3 of 5
Contractor MATHES	Driller T. CRANK	Date started 10-14-91	completed 10-15-91
Method HSA 4 1/4"	Casing Size —	HNU 11.7/10.2 #3	Protection Level D
Ground El	Soil Drilled 99	∇ below ground	Total Depth 101
Logged by E. SANDIN	Checked by DRP	Date 10/15/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
1405	S-14	26-28	4/28/38/33	2.0/1.6	tan gravelly sand Fine to coarse with 40% gravel and cobble pieces. loose. moist SW	ANALYTICAL SAMPLE P9105028	3	0%
	S-15	~~28~~ 30	21/19/30/36	2.0/1.8	tan-brown ~~to~~ Fine to medium sand with 20% fine rounded gravel slight yellowish tint to soil. odor. slight moist appearance SW	Reference Sample. Jar + headspace 6 ppm	5	0%
1430	S-16	~~30~~ 32	25/29/32/40	2.0/2.0	sand tan to tanyellow Fine well sorted to Fine to coarse with gravel, loose, slightly moist, odor SP	Analytical Sample P9105032	3	0%
1440	S-17	39-41	9/13/25/33	2.0/1.9	sand tan, Fine to coarse with 10-15% gravel. loose, moist SW	ANALYTICAL SAMPLE P9105041	1	0%
1510	S-18	49-51	7/21/30/19	2.0/2.0	Sand tan Fine well sorted with horizontal yellowish laminations occaissional zones of fine to coarse sand with gravel SP	ANALYTICAL SAMPLE P9105051	3	0%

FIELD BORING LOG

Boring No. PBB9105

Project No 685303	Project Name USATHAMA BAAP		Page 4 of 5
Contractor MATHES	Driller T. CRANK	Date started 10-14-91	completed 10-15-91
Method HSA 4¼"	Casing Size —	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 99	± below ground	Total Depth 101
Logged by E. SANDIN	Checked by DRP	Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
1530	S-19	59-61	2.0/2.0	Sand, tan, very fine well sorted with frequent cardboard thin coarser lamina. no apparent discoloration dry appearance SP	Analytical Sample P9105061	BKG	BKG
1545	S-20	69-71	2.0/2.0	Sand, tan, very fine well sorted slightly moister than S-19. odor 2' from spoon SP	ANALYTICAL SAMPLE P9105071	5	BKG
1600	S-21	71-73	2.0/2.0	Sand, tan very fine similar to S-20 SP	ANAL. SAMPLE P9105073	5	BKG
1620	S-22	79-81	1.4/0.3	Gravel loose with fine to coarse sand GW	ANAL. SAMPLE P9105081 VOC's only due to poor recovery	NA	BKG
1645	S-23	89-91	0.2/0.2	Spoon refusal due to gravel. GW	NO SAMPLE	BKG	BKG
1700	S-24	99-101	1.7/1.7	tan sand, fine, very well sorted, trace small gravel, trace coarser lamina SP	ANALYTICAL SAMPLE P9105101	BKG	BKG

FIELD BORING LOG

Boring No. PBB9105

Project No 685303	Project Name USATHAMA BAAP		Page 5 of 5
Contractor MATHES	Driller T. CRANK	Date started 10-14-91	completed 10-15-91
Method HSA 4 1/4"	Casing Size —	HNU 11.7/10.2 = 3	Protection Level D
Ground El	Soil Drilled 99	℄ below ground	Total Depth 101
Logged by E.S.	Checked by DRP	Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
1745 S-25	109-111	12/20/37/37	20/20	Sand, tan, Fine to medium, trace coarse sand and gravel. wet SW	ANALYTICAL SAMPLE P9105111	SPOON 5	BZ
				BOB 109 AUGERS 111 LAST SPLIT-SPOON			

FIELD BORING LOG

Boring No. PBB9106

Project No 68520.3	Project Name BAAP		Page 1 of 4
Contractor MATHES	Driller T. CRANK	Date started 10.12.91	completed 10-13-91
Method HSA	Casing Size 4 1/4"	HNU 11.7/10.2	Protection Level C
Ground El	Soil Drilled 109'	∇ below ground	Total Depth 111'
Logged by ES	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU CAR	Monitoring HNU ATR	Monitoring LEL
S-1	0-2	4-7-7 6	2.0/1.0	Dark brown silty sandy topsoil with roots	REFERENCE SAMPLE	1000+	BKG	
S-2	2-4	2/3/3/3	2.0/1.2	medium to dark brown silty sand with roots sm	Reference Sample		BKG	
S-3	4-6	2/3/3/3	2.0/1.1	medium to dark brown silt and silty sand less root matter. dense slightly plastic sm	Analytical Sample P9106006		BKG	
S-4	6-8	2/2/2/3	2.0/0.8	med brown sandy silt mod plastic moist sm	Reference Sample		BKG	
S-5	8-10	7/5/8/17	2.0/0.9	8-8.4 brn sandy silt mod plastic moist 8.4-8.9 multicolored glass fragments sm	Reference Sample		5	
0933 S-6	10-12	17/19/19/26	2.0/1.8	Black sandy ash occaissional glass fragments brown silty sand without ash in lower 0.4 of spoon	ANALYTICAL SAMPLE P9106012	70		

FIELD BORING LOG

Boring No. PBB9[illegible]

Project No 685303	Project Name BAAP		Page 3 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-13-91	completed 10-13-91
Method HSA	Casing Size 4¼"	HNU 11.7/10.2	Protection Level C
Ground El	Soil Drilled 109'	∑ below ground	Total Depth 111'
Logged by ES	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU AIR	Monitoring LEL
1015 S-7	12-14	12-33-50/3"	1.3/0.8	brown fine sand trace gravel, loose wet, SP	ANALYTICAL Sample P9106014	500	0	
S-8	14-16	50/50/3"	0.8/1.0	yellow tan fine sand trace gravel trace black waste, glass, friable texture. moist in part. SP	ANALYTICAL SAMPLE P9106016 5 ppm 4" above cuttings pile	600	0	
S-9	16-18	50/5"	0.45/0.1	Sand similar to above SP	Reference Sample 170 ppm 2" above cuttings pile	180	0	
S-10	18-20	11/32/50/50/5"	1.9/1.9	light brown sand fine to coarse moderately well graded to poorly graded fine sand. areas of slight gray discoloration loose. tr gravel SW/SP	Analytical Sample P9106020	500	0	
S-11	20-22	14/39/50/5"	1.4/1.5	brown Sand fine to medium mottled discoloration trace gravel SP	Reference Sample Analytical VOCs taken	80	0	

FIELD BORING LOG

FIELD BORING LOG			Boring No. PBB9106
Project No 685303	Project Name UISATNAMA BAAP		Page 3 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-13-91	completed 10-13-91
Method HSA 4¼"	Casing Size —	HNU 11.7 (10.2)	Protection Level C
Ground El	Soil Drilled 109'	⊻ below ground	Total Depth 111'
Logged by E.S.	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU (JAR / ATM)	LEL
S-12	24-26	13/30/ 50/5"	1.4 / 1.4	tan to light brown gravelly sand. Fine to coarse with rounded gravel. loose SW	ANALYTICAL SAMPLE P9106026	JAR: Spoon 1000 / ATM: breathing zone BKG	
S-13	29-31	27-37-40-35	2.0 / 2.0	brown gravelly sand 50% gravel. occaissional grayish discoloration SP/SW	ANALYTICAL SAMPLE P9106031	450 / BKG	
~~S-14~~	~~39-41~~				50-100 ppm Methylene Chloride headspace ref. jar (draeger tube)		
S-14	39-41	9/24/ 37/36	2.0 / 2.0	brown sand SW Fine to coarse with 30% rounded gravel loose, moist, grayish discolored apperence. finer zones produce highest tip readings and appear wetter	ANALYTICAL SAMPLE P9106041	550 / BKG	
S-15	49-51	3/14/ 29/40	2.0 / 1.8	brown sand fine to medium well sorted frequent thin grayer discolored lamina. wet oily appearence on grains SP	Analytical Sample P9106051	500 / BKG	

FIELD BORING LOG

Boring No. PBB91

Project No 685303	Project Name USATHAMA BAAP		Page 4 of 4
Contractor MATHES	Driller T. CRANK	Date started 10-13-91	completed 10-13-91
Method HSA 4¼"	Casing Size —	HNU 11.7/10.2	Protection Level C
Ground El	Soil Drilled 109'	∇ below ground	Total Depth 111'
Logged by ES	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-16	59-61	8/21 38/50	2.0 / 2.0	sand fine well sorted moist slightly yellowish greenish brown coloration some paper to pencil width laminations. darker graybrown. SP	ANALYTICAL SAMPLE P9106061	Spoon 500	BKG	
S-17	69-71	12/22 32/40	2.0 / 2.0	sand tan, very fine, well sorted, several greenish yellow lamina generally drier apperence trace coarse grains SP	ANALYTICAL SAMPLE P9106071	100	BKG	
S-18	79-81	50 / 5"	0.4 / 0	NO RECOVERY cobble in shoe	NO SAMPLE	—	—	
S-19	89-91	—	2.0 / 2.0	Gravel, loose, rounded with 30% med to coarse sand. damp GW	ROCKY DRILLING ANALYTICAL SAMPLE P9106091	BKG	BKG	
S-20	91-101	4/18/30/38	2.0 / 2.0	tan sand very fine-fine, well sorted SP loose, dry appearence	ANALYTICAL SAMPLE P9106101	BKG	BKG	
S-21	101-111	12-12 17-20	2.0 / 1.6	Gravel with 20-30% coarse to fine sand loose, wet. GW	ANALYTICAL SAMPLE P9106111	BKG	BKG	
				BOB 109' AUGERS 111' Last split spoon				

FIELD BORING LOG

Boring No. PBB-91-07

Project No 6853-03	Project Name BAAP		Page 1 of 4
Contractor MATHES	Driller Keith Bunselmeyer	Date started 10-12-91	completed 10-13-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 75'	⊻ below ground None	Total Depth 77'
Logged by RHI	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL	
15:00	S-1	0-2	2/6/5/7	2.0/1.4	Bottom 0.9' - Brown Silty Clay; thin layer of ash, charcoal and glass at top; Top 0.9-1.4 - Silty fine sand, grass; dry. Top soil (CL/SM)	Reference	Bkg	Bkg	Bkg	Bkg
15:07	S-2	2-4	4/5/10/11	2.0/1.3	Brown Silty Clay; trace coarse sand, stiff; dry. (CL)	Reference	Bkg	Bkg	Bkg	Bkg
15:10 P9107006	S-3	4-6	5/13/20/26	2.0/1.6	Bottom 1.1' - Brown fine to coarse sand; some fine to medium gravel (Fill) Top 1.1-1.6' - Brown Silty Clay; dry (Fill/CL); trace red fibrous matl.	(2 jar) Analytical	Bkg	Bkg	Bkg	
15:18 P9107008	S-4	6-8	21/40/52/50	2.0/	Brown fine to coarse sand, little fine to coarse rounded gravel; dry, fill, red fibers (GW/FILL)	Analytical	Bkg	Bkg		Bkg
15:26 P9107010	S-5	8-10	12/45/100	1.4/1.0	SAME AS ABOVE FROM 6-8' (GW/FILL)	Analytical	Bkg	Bkg	Bkg	Bkg
15:34 P9107012	S-6	10-12	30/100	0.75/0.75	SAME AS ABOVE (GW/FILL)	Analytical	Bkg	Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. PBB-9

Project No 68353-03	Project Name BAAP	Page 2 of 4
Contractor Mathes	Driller Keith Bunselmeyer	Date started 10-12-91 completed 10-13-91
Method HSA / CME 75	Casing Size 4.25"	HNU 11.7 (10.2)
Protection Level D	Ground El	Soil Drilled 75'
⊻ below ground None	Total Depth 86 77'	Logged by RHH
Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU (JAR)	HNU	LEL	O2
15:44	S-7	12-14	35/40/42/46		SAME AS From 10-12' (GW/FILL)	Reference	Bkg	Bkg	Bkg	Bkg
15:53 P9107016	S-8	14-16	13/22/28/28	2.0/2.0	Bottom 1.4' - Tan fine Sand; little medium sand; trace fine to medium subrounded gravel; Top 1.4-2.0 - Brown fine to coarse sand; little fine to medium gravel; dry (SP/FILL/SW)	Analytical FILL ? 15' NATIVE	Bkg	Bkg	Bkg	Bkg
16:00	S-9	16-18'	10/21/24/27	2.0/2.0	Tan fine sand; some medium sand; trace coarse sand; dry (SP)	Reference	Bkg	Bkg	Bkg	
16:11 P9107020	S-10	18-20	9/19/21/22	2.0/2.0	Tan fine Sand; some medium Sand; trace coarse sand and fine gravel; dry (SP)	Analytical	Bkg	Bkg	Bkg	
16:17	S-11	20-22	7/19/24/31	2.0/2.0	Tan medium Sand; some fine sand; little coarse sand; trace fine rounded gravel, peppered w/heavy minerals, dry. (SW)	Reference	Bkg	Bkg	Bkg	

FIELD BORING LOG

Boring No. PBB-91-07

Project No 6853-03	Project Name BAAP		Page 3 of 4
Contractor MATHES	Driller Keith Buschmeyer	Date started 10-12-91	completed 10-13-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 75'	∇ below ground None	Total Depth ~~80~~ 77'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATP	Monitoring LEL	Size
16:25	S-12	22-24	16/46/6/50	2.0/2.0	Tan medium sand; some coarse sand; little fine sand and fine to coarse gravel; dry (SW)	Reference	Bkg	Bkg	Bkg	Bkg
16:35 1107026	S-13	24-26	24/48/6/45	2.0/2.0	Tan medium sand; some coarse and fine sand; trace coarse sand and fine to coarse angular to sub rounded gravel; dry rock frag ments (SW)	Analytical	Bkg	Bkg	Bkg	Bkg
16:50	S-14	26-28	7/27/54/50	2.0/1.7	SAME AS ABOVE FROM 24-26'; dry. (SW)	Reference	Bkg	Bkg	Bkg	Bkg
17:00	S-15	28-30	7/20/22/46	2.0/2.0	Bottom 0.4' - Tan fine sand; trace medium sand, Top 0.4 - 2.0' - Tan medium sand; some fine and coarse sand; trace fine to coarse sub angular gravel; dry - (SP/SW)	Reference	Bkg	Bkg	Bkg	Bkg
17:06 9107032	S-16	30-32	18/36/50/68	2.0/2.0	Tan medium sand; little fine sand and coarse sand; trace fine to coarse sub-rounded gravel and rock fragments, sample impregnated w/HM (heavy minerals); dry - (SW)	Analytical	Bkg	Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. PBB-91-07

Project No 6853-03	Project Name BAAP		Page 4 of 4
Contractor MATHES	Driller Keith Bogschneider	Date started 10-12-91	completed 10-13-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 75'	∑ below ground None	Total Depth ~~80~~ 77'
Logged by RHH	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	
17:24 PS107042	S-17	40-42	24/35/42/56	2.0/2.0	Tan medium Sand; little fine sand; trace course sand and fine to medium sub rounded gravel and rock fragments; dry, mineral with HM. (SP)	Analytical	Bkg	Bkg	Bkg	
					10-13-91					
08:30 PS107052	S-18	50-52	25/52/56/59	2.0/2.0	Tan medium Sand; little fine sand; trace course sand and fine rounded gravel and HM; dry (SP)	Analytical	Bkg	Bkg	Bkg	Bkg
08:50 PS107062	S-19	60-62	22/35/43/50	2.0/	Tan medium and fine Sand; trace course Sand, fine rounded gravel and HM; dry (SP)	Analytical	Bkg	Bkg	Bkg	Bkg
09:20 PS107072	S-20	70-72	20/40/52/104	2.0/2.0	Tan Fine Sand; trace medium and course sand; dry. (SP)	Analytical cobbles at 73' Auger refusal at 75'.	Bkg	Bkg	Bkg	Bkg
10:50 PS107082	S-21	75-77 ~~80-82~~	64/100	0.6/0.5	Tan fine to course Sand; some fine to course gravel and rock fragments (sandstone; gabbro) dry. (GW)	Analytical	Bkg	Bkg	Bkg	Bkg
						T.D. ~~80~~ 75'				

FIELD BORING LOG

BORING NO. FB13-99-01

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/22/90	COMPLETED 8/23/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE#2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 101.5	WATER LEVEL: NA	TOTAL DEPTH: 101.5
LOGGED BY: [illegible]	CHECKED BY: P Bolen	DATE: 9/25/90	

TIP = 0.1-0.3 ppm

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-1.5	3 5 7	18"/15"	black topsoil 0-0.5 ft fn-med silty SAND SM 0.5-1.5	fill	bkgd	
S#2	5-6.5	7 14 18	17"/13"	Tan fine silty Sand 6.0-6.5 light brn Med fn Sand 6.5-7.5 gabbro (rotten) at 6.5 small red mat at 6.0 crse angular gravel at 6.5 ft silt balls fill	fill	bkgd	
S#3	10-11.5	17 27 22	15"/17"	crse gravel 10-10.5 med-fn+crse Sand 10.5-11.5 with fn gravel 11-11.5 likely fill.		bkgd	
S#4	15-16.5	7 20 28	17"/18"	crse-med SAND with some fn sand + crse gravel. some orange, burnt orange material	fill change at 20'	bkgd	
S#5	20-21.5	4/8/18	18"/18"	Tan Med SAND trace crse sand + gravel v. clean some possible burnt orange material. SP		bkgd	
S#6	25-26.5	6 15 25		Tan med fn SAND w/ crse Sand zone at 26 ft. stratified Native soil. SP			

FIELD BORING LOG

BORING NO. PBR-TE-01

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/22/90	COMPLETED 8/25/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE #2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 101.5	WATER LEVEL: NA	TOTAL DEPTH: 101.5'
LOGGED BY: J Binns	CHECKED BY: P Blair	DATE: 9/25/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#7	45-46.5	5 16 25	18" / 17"	Tan Med. fn SAND wt ~~crse~~ finely stratified zones at 46-46.5 ft. sampled for VOA, SVOA (SP)		bkgd	
~~S#8~~	~~70-71.5~~	~~13 / 33 / 23~~		coarse gravel/cobble zone at 55-69 ft. 65 ft sample moved to 70 ft.		bkgd	
S#8	70-71.5	13 35 25	18" / 10"	Coarse Gravel with Med to crse SAND. (SP-GP)			
S#9	85-86.5	4 15 16	18" / 18"	Tan Med-fn SAND wt crse sand at 85 and 86-86.5 ft (SP) Moist. wet at 100 ft.		bkgd	
S#10	100-101.5	3 6 7	18" / 10"	Tan crse-fn SAND+ fine grave SP.		bkgd	

FIELD BORING LOG

BORING NO. FBB-90-02

[redacted] NO.: 6298-11 | PROJECT NAME: USATHAMA- BAAP FS | PAGE 1 OF 2

DRILLING CONTRACTOR: LAYNE SOUTHWEST | DRILLER: G. Rodriguez | DATE STARTED 8/23 COMPLETED 8/23/90

METHOD: DUAL WALL | CASING SIZE: 9 IN. | TIP ID: TE #2 | PROTECTION LEVEL: D

GROUND ELEV.: | SOIL DRILLED: 96.5' | WATER LEVEL: ~97 FT | TOTAL DEPTH: 96.5'

LOGGED BY: J Buss | CHECKED BY: P Bolmer | DATE: 9/25/90

TE Bkgd = 0.0 - 0.3 ppm

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-1.5	4 8 18	18/18	black topsoil over brown silt + clay w/ little black asphalt-like waste at 0.5'		bkgd	
S#2	5-6.5	8 10 14	18"/18	light brown silty fn-med SAND becoming cleaner at 6-6.5 ft some dark red to purple waste maybe possible rock? some gravel at 5-5.5 ft.	→ NO WASTE	bkgd	
S	10-11.5	13 50/2"	6"/8"	fn-crse SAND with gravel some reddish brown silty fn SAND, waste?	fill	bkgd	
3#4	15-16.5	5 14 21	18/18	clean med SAND 15-16 ft crse SAND + gravel 16-16.5 ft some dark brown streaks. possible nat. soil	Native Soil	bkgd	
3#5	20-21.5	5 14 18	18/18	tan med-crse SAND w/ fn gravel stratified SP		bkgd	
S#6	25-26.5	5 13 20	18"/18"	Tan med fn SAND trace crse SAND, gravel + silt. SP		bkgd	

FIELD BORING LOG

BORING NO. PBB-90-02

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/23/90	COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP of: TE #2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 96.5'	WATER LEVEL: ~97 FT	TOTAL DEPTH: 96.5'
LOGGED BY: J Bliss	CHECKED BY: P Balmer	DATE: 9/25/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#7	45-46.5	5, 13, 20	18" /	Stratified Med Fn SAND with occasional crse sand moist V. clear bedding. SM-SP crse gravel/cobble zone at 60 to 65 ft.		bkgd	
S#8	65-66.5	5, 17, 18	18" / 6"	crse SAND and gravel some gabbro SP-GP crse gravel/cobble zone at 80-83 ft.		bkgd	
S#9	85-86.5	4, 8, 31	18" / 18"	Tan Med Fn SAND. Nos. trace gravel moist to V. moist. coarser matl. at 85-85.5 ft (SP)		bkgd	
S#10	95-96.5	3, 3, 9	18" /	Tan Med-crse SAND w/ some gravel. (SP)	▽ = 95 ft.		
				95 ft BOE			

FIELD BORING LOG

BORING NO. PBB8901

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/22/89	COMPLETED 1/23/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 7	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 875.5'	SOIL DRILLED: 102'	WATER LEVEL:	TOTAL DEPTH: 102'
LOGGED BY: PLB	CHECKED BY: JSP.	DATE: 2/27/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2'	50-47-18-20	20/1.6	0-.4 organics .4-1.6 Dk Tan clay, moderately plastic, stiff damp (CL)	Ref Plastic liner at 1.1	Bkg	
S-2	2-4'	14-12-10-10	2.0/.7	Bl silty clay, moderately plastic, firm damp (CL)	Ref	Bkg	
S-3	4-6'	2-4-6-9	2.0/1.2	Dk brown to bl clay, little silt, plastic Soft, damp, w/ some Charred layers (CH)	Took Analytical	Bkg	
S-4	6-8'	26-17-12-18	2.0/1.1	Dk olive clay, w/ tr silt Tr Fi to med sa, moderately plastic, Firm, damp (CL)	offset and auger down due to cobble layer and took sample on 1/23/89 ref	Bkg	
S-5	8-10'	22-58-94-100/.4	1.8/.2	Tan gr w/ some med sa, well graded, loose dry (GW)	rock clogged shoe ref ✓change @ 8.0'	Bkg	
S-6	10-12'	90-100/.3	.9/.7	Tan gr w/ some med to fi sa, well graded, dense, dry (GW)	Took Analytical Cobble zone ± 11' (Native)	Bkg	
S-7	12-14'	50-115-100/.3	1.3/.8	Tan med to Fi sa, Tr c, w/ little Fi gr, Tr c gr, poorly graded, very dense, dry (SP)	PB med ✓ CHANGE @ 11.0' Took Analytical	Bkg	
S-8	14-16'	100/.3	.3/.1	Tan c to fi gr w/ little med to fi sa, poorly graded, dense, damp (GP)	Ref - also Taken on 1/23 in offset boring	Bkg	

FIELD BORING LOG

BORING NO. PBB8501

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 2 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Rodney Parr | DATE STARTED 1/22/89 COMPLETED 1/23/89

METHOD: HSA | CASING SIZE: 4.25" ID | TIP eV: # 10 | PROTECTION LEVEL: C Derma

GROUND ELEV.: 875.5 | SOIL DRILLED: 102' | WATER LEVEL: | TOTAL DEPTH: 102'

LOGGED BY: FLB | CHECKED BY: JSP. 2/27/89 | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-9	16-18'	32-100/0.4	0.9/0.6	As above	Took Analytical	Bkg	
S-10	18-20'	100/0.3	0.3/0.0	No recovery - rock clogged in shoe	Also taken on 1/23 in offset boring		
S-11	20-22'	100/0.4	0.4/0.1	Tan med to Fi sa, w/ some Fi gr, Tr c gr, poorly graded, dance, dry (SP)	Ref	Bkg	
S-12	25-27'	100/0.2	0.2/0.0	No recovery	Ref	Bkg	
S-13	30-32'	100/0.3	0.3/0.1	Rock clogged in shoe (sandstone)			
S-14	31-33'	24-39-44-90	2.0/1.8	Tan gravelly sa, med to fi sa, w/ little fi gr and some c gr, compact, poorly graded, moist (SP)	Took Analytical spoon appeared to be a good representation of the actual lithology	Bkg	
S-15	40-42'	15-33-34-52	2.0/1.7	Tan, med to Fi sa, Tr c, Tr Fi gr and Tr c gr, poorly graded, compact, moist, some stratification (SP)	Took Analytical	Bkg	
S-16	50-52'	15-33-48-58	2.0/1.7	Tan med to Fi sa, poorly graded, compact, moist .5' coarse sa lens	Took Analytical	Bkg	

FIELD BORING LOG

BORING NO. PBB8401

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Rodney Parr | DATE STARTED 1/22/89 COMPLETED 1/23/89

METHOD: HSA | CASING SIZE: 4.25" ID | TIP eV: # 10 | PROTECTION LEVEL: C Dermal

GROUND ELEV.: 875.5' | SOIL DRILLED: 102' | WATER LEVEL: | TOTAL DEPTH: 102'

LOGGED BY: RLB | CHECKED BY: JSP 2/27/89 | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-17	60-62'	24-36-36-41	2.0 / 1.8	Tan med to Fi sa, Tr c, Tr Fi gr, poorly graded, damp, compact 0.8 coarse sa lens SP	Took Analytical	BKG	
S-18	70.72'	13-75-100/.3	1.4 / 1.2	SAND, TAN, F TO TR M TO C, F TO C GRAVEL CONTACT AT 1.0', COMPACT TO DENSE, DAMP SP	ANALYTICAL; COBBLE ZONE FROM 72 TO 78 FEET.	BKG	
S-19	80-82'	33-77-91-88	2.0	Tan gravelly sa, Fi to med Sand w/ some little Fi gr and some c gr, very dense, damp, well graded (Till)(SW)	Took Analytical	BKG	
S-20	90-92'	19-75-95-100/.4	1.9 / 1.6	0-1.1 Tan Fi to med sa, s poorly graded, compact, damp (SP) 1.1-1.6 Dk tan gravelly sand, Fi to med sa, little c sa, w/ Fi To c gr, well graded, very dense, moist (SW)	~91' sand till contact; Took Analytical	BKG	
S-21	100-102'	24-39-28-21	2.0 / 1.4	Tan (varied colors) gravelly sa, Fi to med sa, Tr Fi, w/ little Fi gr and some c gr, compact, damp to saturated at bottom of spoon (SW)	Took Analytical; used 1700 gal of Grout	BKG	

FIELD BORING LOG

BORING NO. PBB8902

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/24/89	COMPLETED 1/25/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: ± 10	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 873.8	SOIL DRILLED: 105'	WATER LEVEL: 100' ±	TOTAL DEPTH: 105'
LOGGED BY: DLB	CHECKED BY: [illegible] 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2'	30-50-39-22	2.0 / 1.5	Clay 0-.85 - Dk br silty clay (Fill) mod plastic, stiff (Frozen) w/ organics- PB prairegrass and some charcoal pieces .85-1.5 - Dk olive clay, moderately plastic, stiff, some charcoal pieces (CH)	.85 - plastic liner Ref (Fill)	Bkg	
S-2	2-4'	20-20-15-15	2.0 / 2.0	0-1.0 - Clay - Dk olive, moderately plastic, stiff and some charcoal pieces (CH) (CL) 1.0-2.0 Silty/sand, olive + tan silt w/ very fi sa, Non plastic, soft, damp (SM)	(Wrong liner or clay ends at ≈3') Ref (fill)	Bkg	
S-3	4-6'	10-38-16-10	2.0 / 0.8	Silty clay - Bk clay w/ little silt, moderately plastic, stiff, damp - wood pieces at the shoe (CL)	Anal (Fill)	Bkg	
S-4	6-8'	10 PB 8-12-12-12	2.0 / 0.2	Sand → Bk F to med sa, PB little c, fr clay, well graded, loose, damp metal scrap in spoon, also some wood debris, slight sweet smell. (SW)	Anal - not much sample to work with (Fill)	4.8	
S-5	8-10	11-100/.3	0.8 / 0.2 AB	As above w/ increase d Hed nails in spoon	Anal ±8.5' Augers have lots of Chatter (Fill)	2.8	

FIELD BORING LOG

BORING NO. PBB5902

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/24/89	COMPLETED 1/25/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: *10	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 873.8	SOIL DRILLED: 105'	WATER LEVEL: 100'±	TOTAL DEPTH: 105'
LOGGED BY: PLB	CHECKED BY: JSF 2/24/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-6	10-12'	95-100/0.2	0.7/0.2	Sand Dk tan Fi to med sa, some c, well graded, compact, damp (SW)	Anal (Fill)	Bkg	
S-7	12-14'	48-100-100/0.5	1.4/0.6	Sand Dk tan med to Fi sa, Tr c, Tr Fi gr, tr c gr, poorly graded, dense, damp (SP)	Ref	Bkg	
S-8	14-16'	60-67-54-40	2.0/2.0	Sand Tan c + Fi sa, little Tr Fi gr to c gr, very Fi sa, poorly graded, dense, damp. (SP)	≈ 14.2 bottom of pit (Water) / change Anal 0-.2 Dk tan	Bkg ≈ 14.2'	
S-9	16-18'	23-39-38-50	2.0/2.0	Sand Tan Fi to very fi sa, Tr c, poorly graded, compact to dense, damp, silt partings 0.1-0.4 (SP)	Anal - BNA		
S-10	18-20	19-31-35-33	2.0/2.0	LAYERED SILT AND SAND TO [redacted] SILT, NONPLASTIC, LT BROWN SILT W/ FINE SAND, TR M-C TO A FIRM SILT, DAMP, CONTACT AT 1.5 SP/ML	ANALYTICAL NAM	3.0	
S-11	25-27	14-26-31-47	20/20	SAND, TAN P GRADED VERY FINE TO TR MED SA, 0.2 C SA - F GRV LAYER, OCCASSIONAL SILT PARTINGS COMPACT, DAMP SP	ANALYTICAL	0.8	

FIELD BORING LOG

BORING NO. PBB-8902

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 4

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Rodney Parr | DATE STARTED 1/24/89 | COMPLETED 1/25/89

METHOD: HSA | CASING SIZE: 4.25" ID | TIP eV: #10 | PROTECTION LEVEL: C Dermal

GROUND ELEV.: 873.8 | SOIL DRILLED: 105' | WATER LEVEL: | TOTAL DEPTH: 105'

LOGGED BY: PLB | CHECKED BY: JSP 2/27/89 | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	30-32'	25-36-~~50~~-69	2.0 / 1.7	Sand 0-.6 DK Tan med to Fi sa w/ some c well graded, dense to very dense damp (SW) .6-1.4 Tan med to fi sa, poorly graded, dense to very dense, damp 1.4-1.7 - as @ .6 (SP)	Took Anal	1.2	
S-13	40-42'	14-26-41-50	2.0 / 1.6	Sand Tan med to Fi sa Tr c sa, Tr Fi gr, poorly graded, dense, damp, well stratified w/ silt partings throughout (SP)	Took Anal	1.3 1.2	
S-14	50-52	21-48-66-94	2.0 / 1.7	Sand med to Fi sa, Trc, poorly graded, dense to very dense, damp, c sa lenses at 1.0, 1.3, 1.5, well stratified (SP)	Anal		
S-15	60-62'	20-48-77-~~50~~	2.0 / 1.9	Sand med to Fi sa, tr c, poorly graded, very dense, damp, well stratified, med sand lens at 1.5 (SP)	Anal	BKG	
S-16	70-72'	42-72-~~86~~ 100/.2	1.8 / 0.9	Gravelly Sand, DK Tan med to Fi sa, Tr c sa, w/ some fi to c gravel well ~~sorted~~ graded, very dense, damp (GP)	Anal change @ 70.0'	.8	

FIELD BORING LOG

BORING NO. PBB5402

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/24	COMPLETED 1/25/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 10	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 873.8	SOIL DRILLED: 105'	WATER LEVEL: 100'	TOTAL DEPTH: 105'
LOGGED BY: PLB	CHECKED BY: 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-17	80-82'	37-61-92-100/0.4	1.9/1.9	Gravelly Sand - Dk Tan lobr Fi to med sd w/ some c, very well graded, compact very dense, moist (GW)	Analytical	1.8	
S-18	90-92'	39-47-73-100/0.4	1.9/1.6	As above	Ref	BKS	
S-19	100-102	11-10-11-12	2.0/1.0	As above but saturated	Anal	BKS	
				BOB @ 105'			

FIELD BORING LOG

BORING NO. PBB8903

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/31/89	COMPLETED 2/1/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 868.2	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: PLB	CHECKED BY: JFP 2/27/89	DATE:	

BKground = 0.2 PID

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2'	14-33-12-15	2.0 / 1.5	Clay - Dk ~~to~~ olive to Bl clay w/ Tr silt and tr Fi sa, stiff, moist, some Charred layers, moderately Plastic (OL/CL Fill)	0.5 - Plastic liner Clay ~~10~~ cap Ref	Bkg	0.2
S-2	2-4'	18-20-22-26	2.0 / 1.4	~~Similar to 1PB [illegible]~~ Silty clay - Dk olive to black stiff, moist, moderately plastic, med to c sa lens at 0.8-1.0 (OL/CL Fill)	Ref	Bkg	0.2
S-3	4-6'	4-4-5-20	2.0 / 2.0	0-.9 as above .9-2.0 Tan clay, tr silt, plastic stiff, moist, (OL/CL Fill)	Took Analytical Change @ 4.9 from organic clay to clay	Bkg	0.2
S-4	6-8'	2-5-8-12	2.0 / 1.3	Tan clay, Tr silt, plastic, soft, moist (CL, Fill)	Ref	Bkg	0.2
S-5	8-10'	7-33-74 100/.2	1.6 / 1.2	0-.2 as above .2-1.2 Dk Tan gravelly sandy med to Fi sa, some Fi gr, some c gr, moist, poorly graded, loose (SP Fill)	Ref Change @ 8.2' to gravelly sa	Bkg	

FIELD BORING LOG

BORING NO. PBB8903

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- SAAP	PAGE 2 OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Pall	DATE STARTED 1/31/89	COMPLETED 2/1/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP ev: 15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 868.2'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: RLD	CHECKED BY: JSP 2/27/89	DATE:	

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SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-6	10-12'	46-92-98-100	2.0 / 2.0	similar to S-5' but well graded (SW Fill)	Took Analytical	Bkg	0.3
S-7	12-14'	25-40-30-33	2.0 / 2.0	0-.8 as above 0.8-2.0 Tan med to Fi sa, Tr very Fi sa, Tr c, poorly graded, damp, compact (SP ?)	Ref Fill	Bkg	0.2
S-8	14-16'	12-24-40-35	2.0 / 2.0	Tan med to Fi sa, Tr c, Tr c gr, poorly graded, compact to dense, damp, c sa lens at .9 (SP)	Analytical Native -A Q ≥19.5 BNA	1.2	0.3
S-9	16-18'	14-21-40-47	2.0 / 2.0	As above w/ some stratification	Analytical (Native) NAM	Bkg	0.2
S-10	18-20'	12-25-32-50	2.0	Tan med to Fi sa, Tr c sa, poorly graded, compact, damp, some stratification (SP)	Analytical	Bkg	0.2
S-11	20-22'	15-25-70-59	2.0 / 1.5	0-.5 Tan med to Fi sa, w/ some c, Well graded, compact, moist .5-1.0 - similar to S-10 1.0-1.5 Tan med to Fi sand, w/ some c, Tr c gr, dense (SP)	Analytical	Bkg	0.2

FIELD BORING LOG

BORING NO. PBB8903

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/31/89	COMPLETED 2/1/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: #15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 868.2'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: PLB	CHECKED BY: GFB 2/27/89	DATE:	

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SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	22-24'	16-30-51-49	2.0 / 1.4	Tan med to Fi sa, poorly graded, dense, damp, c gr lens at .9 (SP)	Ref	Bkg	0.2
S-13	24-26'	15-50-52 100/.4	1.9 / 1.9	OK tan med to Fi sa, inc Tr in c sa, well graded, Tr Fi gr, Tr c gr, compact to dense, moist (SW)	Analytical	Bkg	0.2
S-14	26-28'	20, 40-53-57	2.0 / 2.0	As above	Ref	Bkg	0.4
S-15	28-30'	15-33-40-51	2.0 / 2.0	Tan sandy, med to Fi, Tr c, tr c gr, poorly graded, compact, well stratified, moist (SP)	Ref	Bkg	0.2
2/2/89 S-16	30-32'	12-65-92-90	2.0 / 1.6	As above, but not as well stratified + dense	Analytical	Bkg	0.2
S-17	40-42'	30-57-66-80	2.0 / 2.0	Tan med to Fi sa, poorly graded dense, damp C sa lens @ .8 (SP)	Analytical	Bkg	0.2

FIELD BORING LOG

BORING NO. PBBS 203

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 4 OF 4

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Rodney Parr | DATE STARTED 1/31/89 COMPLETED 2/1/89

METHOD: HSA | CASING SIZE: 4.25 ID | TIP eV: # 15 | PROTECTION LEVEL: C Dermal

GROUND ELEV.: 868.2' | SOIL DRILLED: 100' | WATER LEVEL: | TOTAL DEPTH: 100'

LOGGED BY: PLB | CHECKED BY: [signature] 2/27/89 | DATE:

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SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-18	50-52'	21-14-13-15	2.0 / 2.0	Tan med to Fi sa, poorly graded, dense, damp, c sa lens at .8-.9 (SP)	change @ ≈ 46' to beach sand Took Analytical	Bkg	0.2
S-19	60-62'	27-31-34-60	2.0 / 2.0	As above, but well stratified	Took Analytical	Bkg	0.2
S-20	70-72'	23-32-52-49	2.6 / 1.3	0-.7 Dk brown sandy; gravel, med to Fi sa, Tr c; Fi to c gr poorly graded, dense, damp (GP) .7-1.3 lt tan to lt gray, Fi to med sa, tr c sa, tr Fi gr, well graded, weather rock dust, dense, dry (SW)	Analytical Change @ ≈ 78' from beach sand to S-21	Bkg	0.4
S-21	80-82'	33-50-55-73	2.0 / 2.0	Dk tan to brown, med to fi sa, some c, very well graded, dense damp (SW)	Analytical PB Change	Bkg	0.5
S-22	90-92'	35-75-100/.5	1.5 / 1.0	0-.5 as above .5-1.0 inc in c, well graded, dense to very dense, saturated BOB @ 100'	Analytical	Bkg	0.3

FIELD BORING LOG

BORING NO. PBB-8904

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: RODNEY PARR	DATE STARTED 2-2-89	COMPLETED 2-6-89
METHOD: HSA	CASING SIZE: 4.5" I.D.	TIP eV: #15	PROTECTION LEVEL: C-Dermal
GROUND ELEV.: 822.6	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: P. KAY/PLB	CHECKED BY: [illegible] 2/27/89	DATE:	

Background @ 2 PID

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING ~~CGI~~
S-1	0'-2'	25-60-50-24	2.0 / 1.3	0-1.3 Dk brown silty clay w/ some trace f. sand, trace c. sand, stiff, non-plastic damp (CL) (frozen) FILL	Ref. probable clay cap	Bkg	0.2
S-2	2'-4'	13-13-12-9	2.0 / 1.3	0-1.3 Lt Brown - Olive Silty Clay mod. plastic, ~~soft~~ stiff, damp -FILL- (CL)	0-.1 frozen reference	Bkg	0.2
S-3	4'-6'	5-6-15-30	2.0 / 2.0	0-1.3 Same as above (CL) - fill 1.3-1.5 Dk brown med-coarse sand, loose, damp (channel layer) 1.5-2.0 brown coarse sand trace fine gravel, loose, damp (SP)	Analytical change from clay cap to sand @ 5.3'	Bkg	0.2
S-4	6'-8'	42-84-100 for .4	1.9 / 1.2	0-1.2 Lt. Brown gravelly sand well graded, w/ little coarse (rounded) gravel Dense, damp (SP)(GW) fill?	reference	Bkg	0.2
S-5	8'-10'	68-98-75-100 .4'	1.9 / 1.9	0-1.9 Lt. Brown gravelly Sa v. fine well graded w/ tr c-sand Fine Sand Lens encountered at 1.3-1.5' (tan) Dense, damp (GW)-(SP) NATIVE	Reference	Bkg	0.2
S-6	10'-12'	56-32-45-37	2.0 / 2.0	0-2.0 Same as Above Fine-V. Fine Sd. lens @ 1.9-2.0	Analytical	Bkg	0.2
S-7	12'-14'	13-20-22-30	2.0 / 1.9	0-1.9 Dk. tan f-med coarse sand w/ trace coarse sand, poorly graded stratified throughout spoon, med dense, damp (SP) Native	change to fine sands @ 12'		0.0

FIELD BORING LOG

BORING NO. PBB-SB01

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parry	DATE STARTED 2/2/89	COMPLETED 2-6-89
METHOD: HSA	CASING SIZE: 4.25 10"	TIP eV: ± 15	PROTECTION LEVEL: C - Dermal
GROUND ELEV.: 822.6'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: Parry / DLB	CHECKED BY: [signature] 2/27/89	DATE:	

PI Headspace

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING [illegible]
S-8	14'-16'	12-22-27-31	2.0 / 1.8	Same as S-7 (w/ Coarse Sand and trace of gravel) less encountered @ ± 1.1' NATIVE	Analytical	Bkg	0.2
S-9	16'-18'	19-48-33-21	2.0 / 1.0	0-0.3 Same as S-7 0.3-1.8 Lt Brown gravelly sand well graded w/trace c-sand w/ little c-gravel Medium Dense, Damp (GW) well graded	reference change to gravelly sand @ 16.3'	Bkg	0.2
S-10	18'-20'	23-78-52-47	2.0 / 1.8	0-1.4 Lt. Brown gravelly Sand, med-fine sand w/trace C-Sand, w/trace c-gravel, w/trace fine gravel, well graded Dense, Damp, GW 1.4-1.8 - Tan sand f-med coarse, dense, damp (SP) w/trace, poorly graded	reference from 19.4-20.5 layer of tan beach sand	Bkg	0.2
S-11	20'-22'	17-58-60-100 / .4	1.9 / 1.6	0-0.5 Tan sand, f-m coarse dense, damp (SP) w/trace coarse poorly graded 0.5-1.6. Dk. Brown gravelly Sand med-f coarse, w/trace f-grav. and trace c-gravel, dense, damp well-graded (GW-GP) (Increase in coarse w/depth of spoon)	Analytical	Bkg	0.2
S-12	22-24'	27-40-47-55	2.0 / 2.0	0-2.0 Lt. tan f-med Sand w/little coarse, w/trace fine gravel, poorly graded, dense, damp (SW-SP) (Coarse Sand lens @ ± 1.4')	reference		0.2

FIELD BORING LOG

BORING NO. PBB-8704

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Paige	DATE STARTED 2-2-89	COMPLETED 2-6-89
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP eV: #13	PROTECTION LEVEL: C-D Equal
GROUND ELEV.: 822.6'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: P.Kay / Paul B.	CHECKED BY: JR 2/27/89	DATE:	

PI Head

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING BGL
S-13	24'-26'	25-56-83-100/.4	1.9/1.9	0-1.2 Same as S-12 (SW-SP) (coarse sand w/trace f-gravel, w f-gravel lens @ ≈ 1.2' (25.6') 1.2-1.9 (Same as S-12, increase coarse sand	ANALYTICAL	Bkg	0.4
S-14	26'-28'	30-45-52-60	2.0/1.6	Same S-12 coarse sand Lens @ 26.4'	Reference	Bkg	0.2
S-15	28-30'	21-70-100/.4	1.4/1.6	0-0.9 Same as S-12 0.9-1.6 Brown gravelly sand f-med sand w/little coarse sand w/trace fine gravel, w/trace coarse gravel, well graded, dense, damp (GW?)	REFERENCE	Bkg	0.2
S-16	30'-32'	21-62-70-65	2.0/1.9	Same as S-12 w/Coarse sand lens @ ≈ 31'	ANALYT.	Bkg	0.2
S-17	40'-42'	22-44-70-82	2.0/2.0	Lt. tan f-m sand w/little Coarse & trace fine gravel, trace Coarse gravel, poorly graded, dense sl. damp (SP)	Analytical	Bkg	0.5
S-18	50'-52'	15-24-41-65	2.0/2.0	0-1.0 Same as S-17 1.0-2.0 Lt. tan f-m sand w/trace fine gravel, damp dense, poorly graded (SP)	Analyzed	Bkg	0.5

FIELD BORING LOG

BORING NO. RBB-8904

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Forrest Parr	DATE STARTED 2-2-89	COMPLETED 2-6-89
METHOD: HSA	CASING SIZE: 4.25 "I.D."	TIP eV: #15	PROTECTION LEVEL: C-DERMAL
GROUND ELEV.: 872.6'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: R. Fay / Paul B	CHECKED BY: JSP 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP (DI Head)	MONITORING VOC
S-19	60'-62'	10-19-20-23	2.0 / 2.0	Lt tan f-m sand w/ trace coarse, p.graded, damp, mod. dense (SP) 0-.4 sand is stained with green liquid waste	Encounter waste @ 60.0'	18ppm	2.9
S-20	70'-72'	19-~~28~~-75-100	2.0 / 2.0	0-1.0 SAME AS S-19 W/ Statification due to green waste staining 1.0-2.0 Brown f-m gravelly Sand w/ trace coarse sand, w/ little fine ~~Sand~~ gravel, w/ trace coarse-gravel, well graded damp, V. dense, gravel stained w/ green waste liquid	WASTE Change to gravelly Sand @ 71' Analytical	29ppm	28.0
S-21	94'-96'	19-40-46-35	2.0 / 1.0	0-1.0 Brown Sandy red Gravel w/ m-f sand, w/ little coarse gravel (1"-2"), well graded medium dense, damp (GW) Green stained gravel through out spoon (Waste)	Change to Sandy Gravel @ 94' Analytical	3ppm	.3

FIELD BORING LOG

BORING NO. FBB-89

PROJECT NO.: 5753-09 | PROJECT NAME: USATHAMA- BAAP | PAGE 5 OF 5

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Rocky PARR | DATE STARTED 2-6-89 COMPLETED 2-6-89

METHOD: HSA | CASING SIZE: 4.25" I.D | TIP eV: 11.7 | PROTECTION LEVEL: GENERAL

GROUND ELEV.: 872.6' | SOIL DRILLED: 99.8' | WATER LEVEL: | TOTAL DEPTH: 100'

LOGGED BY: P.C. KAY | CHECKED BY: JSP 2/27/89 | DATE:

Headspace Bkg 0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-22	80'-82'	34-31-42-68	2.0 / 1.9	0-.8 - Same as S-21 pk damp, green liquid waste observed staining gravel - sweet smelling (GW) .8-1.9 Brown gravelly sand f-m sand, w/ trace coarse sand, w/ little fine gravel w/ little trace coarse gravel, well-graded, Green, V. damp, dense - Waste stratified throughout sand	Analytical Waste Encountered Change to gravelly sand from sandy gravel @ 80.8'	2-3 ppm	1.0
S-23	90'-92'	25-27-36-55	2.0 / 2.0	0-1.0 Lt. Brown m-sand w/ little dark brown coarse sand w/ trace fine gravel, poor-graded damp, dense (GP) 1.0-2.0 Lt. tan f-m sand w/ trace coarse sand, v. uniform Poorly-graded, damp, dense (SP)	Analytical taken Change to f-m sand @ 91 NO WASTE	0 ppm	.3
S-24	100'-102'	5-10-8-15	2.0 / 1.3	0-1.3 Brown gravelly sand w/ little f-m sand, w/ trace coarse gravel, w/ little fine gravel, well-graded, wet, med. dense (GW) Groundwater	Change to pk gravelly sand for Analytical	1 ppm	.2

No visible waste. BAC

FIELD BORING LOG

BORING NO. PBB8905

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 6
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Park	DATE STARTED 2-7-89	COMPLETED 2-13-89
METHOD: HSA	CASING SIZE: 4.25" ID.	TIP eV: #10	PROTECTION LEVEL: C-DERMAL
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH:
LOGGED BY: P. Kay / C. Hoppe	CHECKED BY:	DATE: Jan	

Head Space Bkg = 0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING ~~BZO~~
S-1	0'-2'	9-11-5-5-3-3	~~1.5~~ 2.0 / 1.3	Dr. Br. silty clay - frozen. plastic, stiff, dense, hard. Fill OL	1st 5t frozen Ref. S-1	0	0
S-2	2'-4'	16-24-16-14	2.0 / 0.8	Br silty clay, moist, plastic, very stiff, trace fine sand. CL-OL Fill Top 0.1" Frozen	Ref.	0	0
S-3	4'-6'	22-45-43-5~~2~~	2.0 / 1.9	4.0-4.5- same as above 4.5-5.0 Dark Brown sandy silt, fine to med sand, loose, dry 5.0-6.0 lt. brown gravelly sand, little fine to med gravel, med. dense w/ dark brown silty sand lense at 5.6-5.8	Anal. cobbles at ~5	1	.1
S-4	6-8'	40-74-78-100 for 5"	2.0 / 1.3	Br. gravelly ~~silty~~ sand trace fine gravel, little coarse gravel. med to coarse sand. poorly graded. Native? SW angular gravel	Ref. Cobbley	0	.2

FIELD BORING LOG

BORING NO. PBB-8905

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 6	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. Pam	DATE STARTED 2/7/89	COMPLETED 2/13/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: #10	PROTECTION LEVEL: * Demand
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH:
LOGGED BY: E. Moore / P. Kay	CHECKED BY:	DATE: Jan	

Head Space Blk 0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING ~~BZE~~
S-5	8-10'	100 for .4ft	0.4 / 1.4	Same as above Shift in location ~4's	On boulder will have 2 more Ref.	0	3.8
S-6	10'-12'	19-130-40 for 2"	1.2 / 1.0	Blow in — boulder fragment in shoe Brown gravelly sand	No Anal. Ref.	0	.3
S-7	12'-14'	83-95-98-86	2.0 / 2.0	Br. Gravelly Sand well graded, some fine to med gravel, trace coarse gr. damp, very dense Some black coarse sand	Anal and Ref.	0	.2
S-8	14'-16'	51-85-111 for 4"	1.3 / 1.0	Same as above	Ref.	0	.2
S-9	16'-18'	31-41-41-45	2.0 / 2.0	16-16.8 Same as above 16.8-18 Lt brown sand, trace gravel poorly graded (uniform), dense	anal @ 16.8' Change Fill → Native Sampled native sand	0	0
S-10	18'-20'	15-29-38-43	2.0 / 2.0	Top Fine to med coarse sand, traces fine gravel poorly graded, darker sand lenses (clear stratification Waste observed at 19.8 - Olive green striations, sweet odor (similar to waste in PBB8904)	Anal. and Ref.	0	0

FIELD BORING LOG

BORING NO. PBB8905

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: R. Parr | DATE STARTED 2/7/89 COMPLETED 2/13/89

METHOD: HSA | CASING SIZE: 4.25" ID | TIP eV: #10 | PROTECTION LEVEL: Dermal-Level D

GROUND ELEV.: 879.9' | SOIL DRILLED: | WATER LEVEL: | TOTAL DEPTH:

LOGGED BY: C. Moore/P. Kay | CHECKED BY: | DATE: Jan

Head Space Bkg=0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING
S-11	20-22'	15-29-43-67	2.0 / 2.0	20-21.6 Same as above 20.5-20.6 Observed waste saturation - greenish, moist layer (PI = 1). 21.6-22 Brown gravelly sand, very dense, some fine to med gravel, dryer than waste layer.	Anal. & Ref. Change at 21.6 Sand → Gravelly sand	1	[redacted] pd
S-12	22-24	48-56-73-99	2.0 / 2.0	22-22.8 Brown gravelly sand (as above) 22.8-23.4 Tan sand - poorly graded (uniform) 23.4-24 Lt. Brown gravelly sand, very dense, some fine gravel (less gravel than above and mostly fine as opposed to med.)	Change at 22.8 Anal & Ref.		
S-13	24'-26'	31-45-40-60	2.0 / 1.9	Same as above, with a lense of fine tan sand at 25-25.3'. Gravelly sand has some coarse sand. Tan w/ black flecks. Gravel varies in color from grey to mustard to red. Waste observed at 24.6-24.8' sampled.	Anal & Ref	1.5	

FIELD BORING LOG

BORING NO. PBB8905

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 6
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. Pare	DATE STARTED 2/7/89 and 2/8	COMPLETED
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 10	PROTECTION LEVEL: Level D
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH:
LOGGED BY: C Moore/P. Kay	CHECKED BY:	DATE:	

For Head Space Bkg =

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING ~~OVA~~
S-14	26'-28'	76-107-50-56	2.0 / 1.6	Same as above to 27.8' Dark brown sand dense at 27.2-27.4 27.8-28 Light brown medium sand - poorly graded	Ref. ~~Change~~ at 27.8 gr. sand-sand.	0	
S-15	28'-30'	31-72-83-96	2.0 / 2.0	Same as above Light brown gravelly sand, very dense, some fine to med gravel. Lenses of poorly graded med light brown sand.	Ref.	0	
S-16	30-32	25-40-42-85	2.0 / 2.0	Light brown gravelly sand, dense, Traces of fine to med gravel Lense of darker sand at 30.5-30.8.	Anal & Ref (2/8)89)	0	

FIELD BORING LOG				BORING NO. PBB-89-05
PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP			PAGE 5 OF 6
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. PARR		DATE STARTED 2-7-89	COMPLETED 2-13-89
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP eV: #10	PROTECTION LEVEL: Level D	
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH:	
LOGGED BY: P. Kay	CHECKED BY:	DATE:		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING (Head Space ppm) TIP	MONITORING LEL
S17	40'-42'	36-40-53-68	2.0 / 2.0	Same as 30-32' (S16) Above c-sand lens @ 0.8' (40.8')	Analysis Ref (2/13/89)	0	
S18	50'-52'	5-18-25-32	2.0 / 1.9	tan f-m sand. w/trace f-m gravel w/trace course gravel w/tr c sand, mod. dense, damp, (SP) stratified olive waste @ 50.8'	Analytical & Reference waste @ 50.6	.9	
S19	60'-62'	24-69-55-70	2.0 / 1.8	Same as above (SP) c-sand lense @ ≈ 60.5' waste (olive-green) stratified @ 61.7' - very sweet smell	Analytical & Reference	8.8	
S20	70'-72'	25-32-37-55	2.0 / 1.9	Same as S18, dark (SP) & waste stratifications throughout spoon ~~[illegible]~~ pck WASTE	Analytical & Reference	28	
S21	80'-82'	100 for .4"	.4 / 0	No Recovery A few m-coarse gravel pieces w/ trace c-sand No Analytical	Reference	0	

FIELD BORING LOG

BORING NO. PBB-89-05

PROJECT NO.: 5753- | PROJECT NAME: USATHAMA- BAAP | PAGE 6 OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: R. PARE | DATE STARTED 2-9-89 COMPLETED 2/13/89

METHOD: HSA | CASING SIZE: 9.25" I.D | TIP eV: #10 | PROTECTION LEVEL: D

GROUND ELEV.: 879.9' | SOIL DRILLED: | WATER LEVEL: | TOTAL DEPTH:

LOGGED BY: PKM | CHECKED BY: | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S22	90-92'	16-126-34-50	2.0 / 1.6	0-1.6 Brown Sandy f-m Gravel w/trace c-gravel, little c-sand, dense, damp, p-graded W V-damp @ 91.7'	Analy's Reference change to Gravel @ 90'	.8	
S23	100'-102'	36-58-73-92	2.0 / 1.8	Lt. Brown Sand w/trace C-sand w/trace f-m gravel w/ trace C-Gravel, dense (100-100.7 damp) (100.7-102' Wet p-graded	Analytical Refer change to Sand @ 100'	0	
S24	110'-112'	19-23-41-75	2.0 / 0	NO RECOVERY Bot 110'	No Reference	0	

FIELD BORING LOG

BORING NO. PBB-8706

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. FARR	DATE STARTED 2-14-89	COMPLETED
METHOD: HSA	CASING SIZE: 4.25" I.D	TIP eV: #1	PROTECTION LEVEL: D
GROUND ELEV.: 881.9'	SOIL DRILLED: 112'	WATER LEVEL: 110'	TOTAL DEPTH: 112'
LOGGED BY: D. Kay	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S1	0'-2'	40-10-7-37	2.0 / 1.6	DK. Brown Silty Clayey w/trace f-m sand, w/tr c-sand, stiff, non-plastic damp, All Frozen (CL) (Fill)	Reference All frozen	0	C
S2	2'-4'	15-15-12-10	2.0 / 1.0	0-.3 SAME AS ABOVE FROZEN .3-1.0 DK. Brown Silty Clay w/trace f-m sand, stiff, mod. plst damp (CL)	Ref .3-1.0 Not frozen Fill	0	0
S3	4'-6'	5-6-5-6	2.0 / 1.5	Dk Brown Silty Clay w/tr. f-m sand, w/trace m-c grad sl. plastic, soft, damp (CL) -Fill-	Analytical & Ref. Fill	0	0
S-4	6'-8	5.5.5.5	2.0 / 1.8	DK Brown Sandy Clay f-m sand, sl. plastic, soft, damp, w/dk. black stratification (silty) Brown wood staining @ 6.3 (CL) -Fill-	Reference	0	0
S-5	8'-10'	1-2-3-5	2.0 / 1.9	0-.7 Same as S-3 .7-1.9 Br. Silty Clay, w/trace m-sand, v-plastic V-damp, v-soft, w-some burnt wood piece throughout spoon (CL) -Fill-	Reference	0	0
S-6	10'-12'	1-2-3-7	2.0 / 1.4	Dr Brown clayey si w/apparent wood fibers & some m-sa, firm to stiff, moist, mod. plastic Fill *mod. to strong odor	Analytical taken	588	0
S7	12-14	2-12-14-58	2.0 / 1.0	Brown Sand w/ Dr Brown-Black Silty staining, damp, loose strong Odor	Analytical Ref.	1166	

FIELD BORING LOG

BORING NO. PBB-8906

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Tapp	DATE STARTED 2-14-89	COMPLETED
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP ID: #1	PROTECTION LEVEL: Level D / Level C
GROUND ELEV.: 881.9'	SOIL DRILLED: 112'	WATER LEVEL: 110'	TOTAL DEPTH: 112'
LOGGED BY: J. Kay	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-8	14-16	100-100 for .1	.6 / .5	Same as Above Strong odor (Waste)	ANAL. & Ref.	800	
S-9	16'-18'	100-100 for 2	.7 / .7	Gravelly Sand (Lt. Brown) tr/c-gravel, tr-m-gravel v. dense, damp, p. graded stained w/olive Waste very strong odor (SP) Native	Ref. Change to Sand gravelly @16.0' change to Native @16'	450	
S-10	18'-20'	13-17-17-17	2.0 / 1.5	SAME AS S-9. Stained w/olive waste Strong Odor Native?	Refer.	1020	
S-11	20'-22'	8-15-14-10	2.0 / 1.8	SAME AS S-9 Spoon stained w/waste (SP)	Analytical & Ref	550	
S-12	25'-27'	2-4-5-6	2.0 / 1.0	0.8' Green sandy, pasty clay (Waste) W/trace c-sand, loose v. damp. -Native	Analytical & Ref.	900	
S-13	30'-32'	1-1-1-2	2.0 / 1.2	Lt. Brown gravelly Sand sand as S-9	A & R	300	
S-14	40'-42'	7-9-9-7	2.0 / 1.5	Brown f-m Gravelly Sand m-f sand w/trace Coarse Gravel w/tr f-gravel w/tr-c-sand, v damp, well-graded loose - sat w/ waste Native (SP)	A & R	45	

FIELD BORING LOG — **BORING NO.** C33-8906

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Farr	DATE STARTED 2-14-89	COMPLETED
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP #: 1	PROTECTION LEVEL: Level C
GROUND ELEV.: ~~8619~~	SOIL DRILLED: 112'	WATER LEVEL: 110'	TOTAL DEPTH: 112'
LOGGED BY: C. Day	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-15	50'-52'	15-23-28-~~38~~	2.0 / 2.0	SAME AS S-14 But Spoon is NOT SAT w/waste WASTE IS STRATIFIED THROUGHOUT SPOON — GREEN IN COLOR	Analytical & Reference	9'	
S-16	60'-62'	17-26-40-~~72~~	2.0 / 2.0	tan Sand fine w/trace C-sand, w/tr f-m gravel, mod. dense, damp pr. graded Coarse sand lense @ 61.5' A few stratifications of waste throughout the Spoon (SP) Native	ANALYTICAL & REFERENCE change from gravelly sand to f-m sand @ 60'	9	
S-17	70'-72'	19-29-45-76	2.0 / 2.0	SAME AS S-16 silty sand lense @ 70.6' waste stratified throughout Spoon	Anal.	5	
S-18	80'-82'	80-111-90 -100 for .3'	1.8 / 1.8	Lt. Brown Sandy Gravel (m-c) ~~w/trace C sand, little f gravel, PCK~~ m-c brown sand w/trace f sand, w/ little m-gravel, w/trace coarse gravel, damp, V-dense, m-gd. No waste present (GW)	Analytical & Referen No waste	0	

FIELD BORING LOG

BORING NO. PBB-89-4

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. Parr	DATE STARTED 2-14-89	COMPLETED
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP eV: #1	PROTECTION LEVEL: D
GROUND ELEV.: 881.9'	SOIL DRILLED: 112'	WATER LEVEL: 110'	TOTAL DEPTH: 112'
LOGGED BY: P. Kay	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-19	90'-92'	45-40-30-36	2.0 / 1.7	Brown Gravelly Sand, m-c-sand w/some fine gravel, w/trace c-gravel, dense, v.damp pr-gd. No waste (SP)	Analyt. & Refer	0	
S-20	100'-102'	29-45-67-83/4"	2.0 / 2.0	Tan sand, f-m, pr.grd v.damp, dense [redacted] pch (SP)	Analy & Ref	0	
S-21	110'-112'	25-38-20-25	2.0 / 1.2	Brown c-sand w/some f-gravel, w/trace m-sand, dense, pr.grad saturated (SP)	Anal. & Ref.		
				BOB 110'			

FIELD BORING LOG				BORING NO. PBB-8907
PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. PARR		DATE STARTED 2/16/89	COMPLETED 2/17/89
METHOD: HSA	CASING SIZE: 4.25"	TIP eV: 10.0	PROTECTION LEVEL: C DERMAL	
GROUND ELEV.: 878.6'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH: 80 FEET	
LOGGED BY: JS, BLM	CHECKED BY:	DATE:		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2	250 for .5	~~2.0~~ ~~.5~~ / .5 / .5	Br si m-f sa w/some m-sa, frozen Fill	Ref.	0	
S-2	2'-4'	9/11/11/22	2.0 / 2.0	Br si clay, w some to little msa, stiff, dry; mod. plastic Fill	~~Analytical~~ ~~Taken~~ REF	0	
S-3	4'-6'	24/50/95/92	2.0 / 1.4	Br GR SA, F-MC SA w/ F-C GR, TR SI CL, DENSE DRY W GRD FILL	COBBLES ANALYTICAL	0	
S-4	6-8'	40/60/~~80/100~~ for .5	1.5 / ~~2.0~~ ~~1.9~~ / 1.5	Br si sandy gvl, dry, med dense, p. graded, nonpl. Fill	Ref. Dr gray change @ ~ 7.5'	0	
S-5	8'-10'	63/100/~~100~~ for .5	1.5 / 1.2	similar to S-4	Ref.	0	
S-6	10'-12'	40/79/80/100	2.0 / 1.7	similar to S-4, gvl % < at the bottom of the sample 11.5'	Analytical Taken (BNA, NAM)	0	
S-7	12'-14'	50/58/48/56	2.0 / 1.8	similar to S-4 w/ a change to m-f sa w/ trace gvl (apparent native?)	change @ 13.0' to Native Soil	0	
S-8	14'-16'	20/38/36/38	2.0 / 1.6	Lt Br si m-f sa w/ some med. rounded gvl, sl. moist, loose, poorly sor graded, nonpl. SP	Analytical Taken	0	
S-9	16'-18'	17/26/33/41	2.0 / 2.0	similar to S-8. w/ < 5% of gvl, slight stratification	Ref. Taken	0	
S-10	18-20'	16/32/41/55	2.0 / 2.0	TAN F-M SA w/ TR C SA GRADING TO A MOSTLY VF-F SA w/ TR SILTY SAND LAYERING, P GRD LOOSE, DAMP SP	REF	0	

FIELD BORING LOG

BORING NO. PBB-8907

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 2 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: R PARR | DATE STARTED 2/16/89 COMPLETED

METHOD: HSA | CASING SIZE: 4.25" | TIP eV: 10.0 | PROTECTION LEVEL: C DELMAL

GROUND ELEV.: 878.6' | SOIL DRILLED: | WATER LEVEL: | TOTAL DEPTH: 80 FEET

LOGGED BY: JS, BM | CHECKED BY: | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-11	20-22	30/36/50/45	2.0/2.0	similar to S-10, w/ weathered rock frag.	Analytical Taken (BNA)	0	
S-12	22'-24'	45/50/71/60	2.0/1.7	similar to S-10 w/ > f gvl	Ref.	0	
S-13	24-26'	20/56/98/74	2.0/2.0	similar to S-10	Analytical Taken	0	
S-14	26'-28'	25/45/50/76	2.0/2.0	similar to S-10	Ref.	0	
S-15	28'-30'	15/33/50/100	2.0/2.0	similar to S-10	Ref.	0	
S-16	30'-32'	33/65/100 for 0.45	~~2.0~~ 2.0 / 1.5/1.5	Lt Br m sa w/ some trace si, little rounded m gvl, sl. moist, loose, poorly graded, nonplastic SW SP	Analytical Taken	0	
S-17	40'-42'	42/50/60/66	2.0/2.0	~~Lt Br~~ 40'-41' similar to S-16 41'-42 Lt Br m-f sa w/ little f rounded gvl, sl. moist, loose, poorly graded, nonplastic SW-SP	Analytical Taken Change @ 41'	0	
S-18	50'-52'	26/50/67/73	2.0/2.0	50-51.7 LT BR PEBD F-M SA, LOOSE, DAMP 51.7-52 LT BR UNIFORM F SAND SP	ANALYTICAL	0	

FIELD BORING LOG

BORING NO. PBB-8907

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: R. PARR	DATE STARTED 2/16/89	COMPLETED 2/17/89
METHOD: HSA	CASING SIZE: 4.25"	TIP eV: 10.0	PROTECTION LEVEL: C DERMAL
GROUND ELEV.: 8786'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH: 80 FEET
LOGGED BY: JS, BCM	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-19	60-62'	30/60/78/ 100 for 4 INCHES		FSA LT BR SAND, P GRD, ALTERNATING LAYERS (~0.4-0.6') OF F-M w/ TR C SAND AND F SA LOOSE, DAMP SP	ANALYTICAL	0	
S-20	70-72'	42/60/65/ 100 for 4 INCHES		SPOON, 15' AUGER, AND 10' OF A ROD LOST DOWN HOLE. S-20 COULD NOT BE RETRIEVED.	COBBLE ZONE - STARTED AT 73'		
				BOB = 80 FEET			

MAP coding Five Complete ✓

FIELD BORING LOG

BORING NO. PBB-89-10

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Jeff Seager	DATE STARTED 1-6-89	COMPLETED 1-19-89
METHOD: Mud Rotary	CASING SIZE: 0.9' od to 10'	TIP @: # 10	PROTECTION LEVEL: D
GROUND ELEV.: 878.1'	SOIL DRILLED: 260.5'	WATER LEVEL: ± 120	TOTAL DEPTH: 260.5'
LOGGED BY: Frederick Brayden	CHECKED BY:	DATE: 1-6-89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
	0-4'			Dark brown SILT (Loess)		Background	
S-1	9-11	—	1.2'	Brown Med. to Lo Gravel with Matrix of Lt & med dk brown SILT and sand. (S-1)	See field note Book Pages 1 to Note Book #3 (Deep Borings/monitoring wells		
S-2	20-22'		1.5'	Brown Sandy Gravel over rotten gabbro cobble (.4') over well stratified med to co SAND w/ trace of gravel (S-2)			
S-3	30-32	35/12"	1.1	Brown faintly Stratified med to Lo. Sand w/ tr of fine gravel (S-3)			
S-4	47			wash 5' up hole. Needs new bentonite (SP)			
S-5	47-49	30/12"	1.1	Brown fine sand (S-5) w/ 3 thin well defined Co SA with fine gravel layers			
S-6	57-59	38/12"	1.2	Br med to Lo. Sand w/ fine gravel (S-6) grading to brown sand (i.e. fine to med SAND) (SP)			
S-7	67-69	48/12"	1.2	Brown faintly Stratified uniform fine to med SA (S-7) w/ one thin SA fine gravel layer (SP)			
S-8	77-78.5	7100/12"	.9	Br med to Lo. SAND and layers of sandy gravel (SP)	To (GW)		

FIELD BORING LOG

BORING NO. FBB-89-10

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Jeff Seager	DATE STARTED 1-6-89	COMPLETED 1-19-89
METHOD: Mud	CASING SIZE: 0.9'	TIP eV: ± 10	PROTECTION LEVEL: D
GROUND ELEV.: 878.1'	SOIL DRILLED: 260.5'	WATER LEVEL: ± 120'	TOTAL DEPTH: 260.5'
LOGGED BY: Fred Bragdon	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-9	87-87.5		.4				
S-10	97-99	76/12"	1.2	Br-SANDY Gravel to Gravel (high porosity?) (GW)			
S-11	106-108	50/12"	1.3	Brown SA Gravel w/ some "pea gravel" (GP)			
	121-123	100/12"	.8	Brown fine to med SAND w/ trace of Co SAND in Layers (SP)	✓ change @ 120'		
S-13	131-133	42/12"	1.4	Brown Med SAND w/ some Co. SAND and few pebbles (SP)			
S-14	141-142	>100/12	1.3	Brown Med SAND w/ + of Co SAND and few pebbles over Co. SANDY gravel (S-14) GW	✓ Change @ 140'		
S-15	149-151	78/12"	1.1	Co SANDY Gravel (GW)			
S-16	159-161	100/12" + 30/12"	1.4	Co SANDY Gravel (GW)			
S-17	169-171	45/12"	0.8	Co SANDY Gravel w/ larger cobbles (GW)	✓ change @ 170'		
S-18	179-181	84/12"	1.4	Reddish brown fi to Med SAND MOSTLY NO strata uniform (SP)			
S-19	189-191	7100/12"	.7	SAME uniform (SP)			
S-20	199-201	49/12"	1.4	Red brown fi to Med SA uniform (SP)			
S-21	209-210.5	>100/12"	1.2	Brown Fine SAND uniform (SP)			

FIELD BORING LOG

BORING NO. FBS-89-10

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Jeff Seeger | DATE STARTED 1-6-89 COMPLETED 1/19/89

METHOD: MUD Rotary | CASING SIZE: 0.9' | TIP ø: #10 | PROTECTION LEVEL: D

GROUND ELEV.: ± 878.1' | SOIL DRILLED: | WATER LEVEL: | TOTAL DEPTH:

LOGGED BY: J. Pickett | CHECKED BY: | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-22	219-220.5'	——	1.5 / 1.5	Reddish Brown fine to med Sand w/ TRACE of GRAVEL Dense, wet, non PLASTIC (SP)			
S-23	229-231	——	2.0 / 1.5	SIMILAR TO S-22 but w/ INCREASE in Silt. (SP)	few cobbles drilling from 229 to 239		
end of 1st	10 DAY	SHIFT.					
S-24	239-241	175 for Total	2.0 / 1.5	Reddish Brown to GRAY uniform fine to medium Sand w/ TRACE of Silt thin Silt LAYER, non PLASTIC wet, Dense (SP)	few cobbles drilling from 239 to 249		
S-25	249-251	140 for 2.0' overdriving	2.0 / 1.0	SIMILAR TO S-24 but w/ few STRATIFIED medium Sand LAYERS	few cobbles from 249 to 259		
S-26	259-260.5'	300 for 1.0' 150 for 0.5' VERY HARD Driving	1.5 / 1.5	Top 1.0' is Reddish Brown to GRAY Sand w/ GRAVEL & QUARTZITE COBBLE @ 260' Change to White & Light Brown fine to med Sand/ Sandstone. Very dense non PLASTIC not CEMENTED	Bottom of Boring @ 260.5' in white/ Brown weathered Sandstone.		

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-01
Surface Elevation 876.8
Job No. C-10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						3" GRAVEL & CINDERS, 12" TOPSOIL					
1	SS	15"	M	28		Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)					
2	3"ST	18"	M	-	5	** Occasional Sand & Gravel at 4'	(2.5)				
3	SS	12"	M	51		Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM)					
4	SS	8"	M	61	10						
5	SS	12"	M	28	15						
6	SS	7"	M	20	20						
7	SS	12"	M	26	25	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)					
8	SS	15"	M	65	30						
					35						
					40						
					45						

( ) Pocket Penetrometer Reading, TSF

* 2.5' of Frost Present

**Shelby Tube Hydraulically Pushed at 1100 PSI from 3' - 5'

(Continued)

W-1

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-01
Surface Elevation 876.8
Job No. C-10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)					
9	SS	15"	M	38	50	Less Silt at 49'					
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: None
Upon Completion of Drilling:
Time After Drilling: ½ hour
Depth to Water: 10.0'
Depth to Cave In:

GENERAL NOTES

Start 2/18/82 Complete 2/18/82
Crew Chief JWG/MG Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBB-82-02
Surface Elevation: 883.9
Job No.: C-10313
Sheet: 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						12" TOPSOIL					
1	SS	14"	M	11		Stiff, Brown to Dark Brown (10YR 4/3) Silty CLAY, Trace of Fine Sand (CL)	(1.5)				
2	3"ST	6"	M	-	5	*	(1.4)				
3	SS	18"	M	16		Loose to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)					
4	SS	18"	M	10	10						
5	SS	18"	M	35	15	Color Change to Light Yellowish Brown (2.5Y 6/4) at 14'					
6	SS	18"	M	42	20						
7	SS	12"	M	72	25	Trace to Little Gravel from 14' to 29'					
8	SS	12"	M	24	30		( ) Pocket Penetrometer Reading, TSF				
					35	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
					40	* Shelby Tube Pushed Hydraulically at 600 PSI from 3'-5'					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-02
Surface Elevation 883.9
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						Medium Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
9	SS	17"	M	26	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: None
Upon Completion of Drilling:
Time After Drilling: ½ hour
Depth to Water: 10.0'
Depth to Cave In:

GENERAL NOTES

Start 2/22/82 Complete 2/22/82
Crew Chief JWG/JS Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

W-5

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-03
Surface Elevation 877.4
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dark Brown (10YR 3/3) Silt TOPSOIL					
1	SS	24"	M	22		Stiff, Dark Brown (10YR 3/3)	(1.5)				
2	3"ST	12"	M	-	5	* Silty CLAY (CL)					
						**					
3	SS	21"	M	30		Medium Dense to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Trace of Silt, Occasional Cobbles (GW)					
4	SS	24"	M	71	10						
5	SS	15"	W	38	15	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel, Occasional Cobbles (SP)					
6	SS	15"	W	39	20						
7	SS	18"	W	101	25	Little to Some Coarse Sand & Gravel Encountered at Samples 7 and 8.					
8	SS	18"	W	151	30						
					35	* Shelby Tube Pushed Hydraulically at 1400 PSI from 3' - 5'	( )	Pocket Penetrometer Reading, TSF			
					40	**Dark Brown (10YR 3/3) Fine to Medium Silty SAND (SM)					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-03
Surface Elevation 877.4
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel, Occasional Cobbles (SP)					
9	SS	18"	W	32	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling —
Upon Completion of Drilling —
Time After Drilling ½ hour
Depth to Water 8' DM
Depth to Cave In

GENERAL NOTES

Start 2/18/82 Complete 2/18/82
Crew Chief LS Rig 55-2
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

W-5

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-04
Surface Elevation 881.0
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						*					
1	SS	24"	M	19	**						
2	SS	18"	M	51	5	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
3	SS	15"	M	66							
4	SS	18"	M	101	10						
5	SS	18"	W	86	15						
6	SS	18"	W	38	20	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Trace Silt, Some Gravel (SP)					
7	SS	17"	W	140	25						
8	SS	18"	W	101	30						
					35						
					40	* Medium Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse Clayey SAND, Trace Gravel (SC) ** 2' of Frost Present					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-04
Surface Elevation 881.0
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 8538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Trace Silt, Some Gravel (SP) ***					
9	SS	X	W	111	50						
						End Boring at 50'					
					55						
						*** Less Coarse Sand & Gravel at 49'					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water 8' DM
Depth to Cave In

GENERAL NOTES

Start 2/22/82 Complete 2/22/82
Crew Chief LS Rig 55-2
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-05
Surface Elevation 872.9
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						10" Dark Silt TOPSOIL					
1	SS	18"	M	16		Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)					
2	3"ST	12"	M	-	5	Shelby Tube Pushed Hydraulically at 800 PSI from 3' - 5'	(1.7)		49.9	26.2	
3	SS	24"	M	7		*					
4	SS	30"	M	33	10	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
5	SS	18"	W	105	15						
6	SS	9"	W	81	20						
7	SS	12"	W	67	25	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel (SP)	( )	Pocket Penetrometer Reading, TSF			
8	SS	15"	W	100	30						
					35	* Loose, Dark Yellowish Brown (10YR 4/4) Fine to Medium SAND, Some Silt & Clay, Trace Gravel (SM)					
					40						
					45	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt (SP-SM)					

(Continued)

W-3

WARZYN
ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBB-82-05
Surface Elevation: 872.9
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt (SP-SM)					
9	SS	17"	W	83	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: —
Upon Completion of Drilling: —
Time After Drilling: ½ hour
Depth to Water: 6' DM
Depth to Cave In: —

GENERAL NOTES

Start: 2/16/82 Complete: 2/16/82
Crew Chief: LS Rig: 55-2
Drilling Method: CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-06
Surface Elevation 866.8
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						FILL: Black (5Y 2.5/1) Clayey Silt & Cinders					
1	SS	24"	M	19		18" TOPSOIL					
2	SS	30"	M	9	5	Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL) *	(1.3)				
3	3"ST	24"	M	-		Dark Brown (10YR 3/3) Fine to Medium Silty SAND (SM)					
4	SS	30"	M	58	10	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
5	SS	18"	W	49	15	Less Gravel at 15'					
6	SS	18"	W	44	20						
7	SS	18"	W	92	25	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Trace to Little Gravel (SP)	( ) Pocket Penetrometer Reading, TSF				
8	SS	16"	W	37	30						
					35	* Shelby Tube Pushed Hydraulically at 1200 PSI from 5' - 7'					
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-06
Surface Elevation 866.8
Job No. C-10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Trace to Little Gravel (SP)					
9	SS	16"	W	88	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ¼ hour
Depth to Water 8'DM
Depth to Cave In

GENERAL NOTES

Start 2/16/82 Complete 2/16/82
Crew Chief LS Rig 55-2
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-07
Surface Elevation 865.4
Job No. C-10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES Qu	W	LL	PL	D
						12" TOPSOIL					
1	SS	18"	M	13		Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL) *	(1.5)				
2	3"ST	18"	M	-	5	**					
3	SS	18"	M	33							
4	SS	24"	M	55	10	Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt, Trace to Little Gravel, Occasional Cobbles (SP-SM)					
5	SS	18"	W	44	15						
6	SS	18"	W	56	20	More Coarse Sand & Gravel Encountered from 17' - 20'					
7	SS	18"	W	96	25	* Shelby Tube Pushed Hydraulically from 3' - 5' at 1100 PSI					
8	SS	18"	W	83	30	**Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Little Silt and Clay, Little Gravel (SP-SM)	( ) Pocket Penetrometer Reading, TSF				
					35						
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBB-82-07
Surface Elevation: 865.4
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt, Trace to Little Gravel, Occasional Cobbles (SP-SM)					
9	SS	15"	W	98	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling: ¼ hour
Depth to Water: 6' DM
Depth to Cave In

GENERAL NOTES

Start: 2/16/82 Complete: 2/16/82
Crew Chief: LS Rig: 55-2
Drilling Method: CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-08
Surface Elevation 871.9
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dense, Dark Brown (10YR 3/3) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
1	SS	12"	M	41							
2	SS	12"	M	42	5	Medium Dense to Dense Light Olive Brown (2.5Y 5/4) Fine SAND, Little Silt, Little Gravel, Occasional Cobbles (SP-SM)					
3	SS	12"	M	14							
4	SS	18	M	22	10						
5	SS	12"	M	20	15						
6	SS	12"	M	34	20	Dense to Very Dense, Olive Brown (2.5Y 4/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP)					
7	SS	8"	M	63	25						
8	SS	12"	M	60	30	More Gravel Encountered at 30'					
					35						
					40						
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBB-82-08
Surface Elevation 871.9
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Dense to Very Dense, Olive Brown (2.5Y 4/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP) *					
9	SS	12"	M	65	50						
						End Boring at 50'					
						* Some Silt at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling —
Upon Completion of Drilling —
Time After Drilling ½ hour
Depth to Water 20'
Depth to Cave In —

GENERAL NOTES

Start 2/17/82 Complete 2/17/82
Crew Chief JWG/MG Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

W-5

FIELD BORING LOG

Boring No. PBP-91-01

Project No. 06553-03	Project Name BADGER AAP		Page 1 of 4
Contractor LAYNE	Driller G. BOEHLKE	Date started 10-12-91	completed 10-13-91
Method DUAL WALL	Casing Size 9" OD.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 253.5'	∑ below ground 95'	Total Depth 253.5'
Logged by RRR	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
	0-10'			BROWN SILT, SOME CLAY, TR. F SAND, PGD. (ML)	DID NOT HAVE FUNCTIONING TIP OR HNU			0
	10-20'			LT BROWN SAND, PGD, F, LITTLE M SAND, TR SILT, TR COBBLES (SP)				0
	20-30'			LT BROWN SAND, F-M, PGD, LITTLE C SAND, TR F GRAV., TR SILT, TR COBBLES (SP)				0
	30-40'			LT BROWN SAND, PGD, F, SOME M SAND, LITTLE SILT, LITTLE C SAND, TR F GRAVEL. (SP)				0
	40-50'			40-43': LT BROWN SAND PGD, M, SOME F SAND, LITTLE C SAND, TR GRAV, TR SILT. (SP)	✓ CHANGE			0
				43-50: LT BROWN SANDY GRAVEL, WGD, F GRAVEL, LITTLE C GRAVEL, M-C SAND, LITTLE F SAND. (GW)				
	50-60'			50-53': SAME AS ABOVE				
				53-55: BROWN GRAVELLY SAND, WGD, C, GRAVEL = F (SW)				0
				55-60: LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE M SAND, TR F SAND, TR COBBLES (SW)				

FIELD BORING LOG

Boring No. PBP-91-01

Project No 06853-03	Project Name BADGER AAP		Page 2 of 4
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-12-91	completed 10-13-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 253.5	∑ below ground 95'	Total Depth 253.5'
Logged by RRR	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
	60-70'			LT BROWN GRAVELLY SAND, WELL, C, F GRAVEL, LITTLE M SAND, TR C SAND & GRAVEL TR. COBBLES.	(SW)	BAR AIR	0
	70-80'			70-73' SAME AS ABOVE 73-80 LT BROWN SAND, WELL, C, LITTLE M SAND, LITTLE, F GRAVEL, LITTLE ~~F GRAVEL~~ COBBLES, TR F SAND. INTERBEDS OF LARGE COBBLES (4"-6" IN DIAM)	(SW) ✓ CHANGE		0
	80-90'			80-83': SAME AS ABOVE 83-90': LT BROWN SAND PGD, F, SOME SILT, TR M SAND, TR F GRAVEL	(SP)		
	90-100'			SAME AS ABOVE	(SP) ▼ 92.8		0
	100-110			SAME AS ABOVE	(SP)		0
	110-120			LT BROWN SAND, PGD, M, SOME F SAND, TR C SAND, TR F GRAVEL, TR SILT	(SP)		
	120-130'			120-129' LT BROWN SAND WGD, M, SOME C, LITTLE F SAND, TR F GRAVEL. 129-130: LT BROWN SAND, WGD, M, SOME C, LITTLE F SAND, LITTLE F GRAV. TR GRAVEL COBBLES	(SW) (SW) 10-12-91		0
	130-140			130-138 SAME AS 129-130	10-13-91		

FIELD BORING LOG

Boring No. PBP-91-01

Project N00683-03	Project Name BADGER AAP		Page 3 of 4
Contractor LAWL	Driller G RODRIGUEZ	Date started 10-12-91	completed 10-13-91
Method DUAL WALL	Casing Size 9" OD	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 253.5	∑ below ground 95'	Total Depth 253.5'
Logged by TCRR	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
	138-140			138-140: LT BR SAND, PGD M-C, LITTLE F, TR F GRV, TR SILT	(SP)		0	0
	140-150			140-146: LT BROWN SAND, PGD, F, SOME M, TR C, TR SILT	(SP)		0	0
				146-150: LT BROWN SAND, F WGD, SOME M, LITTLE C, TR F GRAVEL, TR SILT	(SW)			
	150-160			LT BROWN SAND, WGD, M, SOME C, LITTLE F GRAV, LITTLE F SAND, TR SILT	(SW) NOTE: IT IS A DIFFICULT DISTINCTION BTWN PGD AND WGD IN THESE SEDIMENTS		0	0
	160-170			SAME AS ABOVE	(SW)		0	0
	170-180			SAME AS ABOVE	(SW)		0	0
	180-190			180-185: SAME AS ABOVE	(SW)		0	0
				185-190: LT BROWN SAND, WGD, M-C, SOME F GRAVEL, TR C GRAVEL, TR COBBLES, TR SILT, TR F SAND.	(SW)			
	190-200			190-193: SAME AS ABOVE	(SW)		0	0
				193-198: LT BROWN GRAVELLY SAND, WGD, SAND: M-C, GRAVEL: C,				
				198-200: LT BROWN SANDY GRAVEL, WGD, F-M, SAND: M-C, TR COBBLES, TR F SAND, TR SILT	(GW)			

FIELD BORING LOG

Boring No. P3P-91-SW

Project No. 06353-03	Project Name BADGER AAP		Page 4 of 4
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-12-91	completed 10.13.91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 253.5	∑ below ground 95'	Total Depth 253.5'
Logged by TCTC	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATR	LEL
	200-210			200-205: LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F SAND, TR SILT GRAVEL F-M, TR COBBLES	(SW)		0	0
	210-220			210-216: LT BROWN GRAVELLY SAND, WGD. SAME AS ABOVE	(SW)		0	0
				216-220: LT BROWN SANDY GRAVEL, WGD, F-M, SOME C GRAVEL, SAND: M-C, TR COBBLES, TR F SAND, TR SILT.	(GW)			
	220-230			220-223 LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F SAND, TR SILT, TR COBBLES, GRAVEL F-M.	(SW) ✓ CHANGE		0	0
				223-[illegible] LT BROWN, PGD SAND, M, LITTLE C, LITTLE F, TR F GRAVEL TR SILT	(SP)			
	230-240			SAME AS ABOVE	(SP)		0	0
	240-250			240-247: LT BROWN SAND, PGD, M, LITTLE C, TR F GRAVEL	(SP) ✓ CHANGE		0	0
				247-250, LT BROWN SANDY GRAVEL, WGD, F-M, SAND: C-M, TR FINE, LITTLE COBBLES	(GW)			
				B.O.B. - 253.5'				

FIELD BORING LOG

Boring No. PBP-91-02

Project No 06853-03	Project Name BADGER AAP			Page 1 of 4
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-13-91	completed 10-14-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2		Protection Level D
Ground El	Soil Drilled 253.5'	∇ below ground 95'		Total Depth 253.5'
Logged by RRR	Checked by DRP	Date 10/16/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU AIR	Monitoring LEL
	0-10'			BROWN CLAYEY SILT, PLD LITTLE F SAND.	(ML) DONT HAVE FUNCTIONING HNU			0
	10-20'			LT BROWN SAND, PLD, F, LITTLE SILT, LITTLE M, TR COARSE, TR F GRAVEL. GRADUALLY CHANGING TO LT BROWN SAND, PLD, M, LITTLE F, TR C, TR GRAVEL	(SP)			0
	20-30'			COARSE GRAVEL - COBBLE ZONE, WLD, AT 12-13' 20-24': LT BROWN SAND, M, PLD, AS ABOVE	(SP) ✓ CHANGE			0
				24-30': LT BROWN SAND, WLD, M, LITTLE C, LITTLE F SAND, TR F GRAVEL, TR SILT	(SW)			
	30-40'			LT BROWN SAND, WLD, M, SOME C, LITTLE F, TR F GRAVEL, TR C GRAVEL, TR SILT	(SW)			0
	40-50'			40-46': LT BROWN SAND, WLD, M-C, SOME F GRAVEL, LITTLE F SAND, TR SILT	(SW)			0
				46-50': LT BROWN GRAVELLY SAND, WLD, C, SOME M, GRAVEL: F, TR C, TR COBBLES.				
	50-60			50-55': BROWN SANDY GRAVEL, WLD, F, LITTLE C, SAND: C, LITTLE M, TR F, TR SILT	(GW)			0
				55-60': BROWN SANDY GRAVEL, WLD, C, SOME F, SAND: C SOME M, TR F.				

FIELD BORING LOG

Boring No. PBP-91 B.C.

Project No 06853303	Project Name BADGER AAP		Page 2 of 4
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-14-91	completed 10-15-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 253.5'	▼ below ground 95'	Total Depth 253.5'
Logged by RKR	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATK	Monitoring LEL
	60-70			60-67': LT BROWN SAND WGD, C, SOME M, SOME F GRAVEL, TR C GRAVEL	(SW)			0
				67-70': LT BROWN SAND WGD TO PGD, M-C, TR F SAND, TR SILT, TR F GRAVEL, TR COBBLES.	TRIP OUT TO CHANGE FROM A CROWD-OUT TO A CROWD-IN BIT.			
	70-80			LT BROWN SAND, WGD, C, SOME M SAND, LITTLE F SAND, LITTLE F GRAVEL, TR COBBLES (RR)	(SW)			0
	80-90'			LT BROWN SAND ~~SI~~ PGD, M, LITTLE C, LITTLE F, TR F GRAVEL, TR COBBLES, TR SILT	(SP)			
	90-100'			LT BROWN SAND, PGD, F-M, LITTLE SILT, TR C SAND.	(SP)			0
	100-110			SAME AS 90-100'	(SP)			0
	110-120			LT BROWN SAND, PGD, M, LITTLE C, LITTLE F, TR F GRAVEL. (SP)	STARTED USING WATER DOWN CASING AT THIS POINT.			
	120-130			120-122: SAME AS 110-120'				
				122-127': LT BROWN SAND WGD, M, SOME C, LITTLE F, LITTLE F GRAVEL, TR COBBLES.	← CHANGE (SW)			
				127-128': COBBLE-BOULDER ZONE.				
				128-130': LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F, GRAVEL: F-M, LITTLE COBBLES				

FIELD BORING LOG

Boring No. PBP-91-02 B, C, D

Project No. 006853.03	Project Name BADGER AAP		Page 3 of 4
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-14-91	completed 10-15-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 253.5	∇ below ground 95'	Total Depth 253.5
Logged by DRR	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU ATR	Monitoring LEL
	130-140			130-136': LT BROWN GRAVELLY SAND AS ABOVE	(SW)		0	0
				136-140: LT BROWN SAND, WGD, M-C, SOME F GRAVEL, LITTLE C GRAVEL, TR F SAND, TR SILT TR COBBLES				
	140-150			LT BROWN SAND, WGD, M, SOME C, LITTLE F, LITTLE F GRAVEL, TR C GRAVEL, TR SILT.	(SW)			0
	150-160	150-156		SANDY GRAVEL, WGD, BROWN, F, SOME C GRAVEL, SAND: M-C, TR FINE, TR SILT	(GW)			0
				156-160': LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F, GRAVEL: F, TR COBBLES	(SW) ← CHANGE			
	160-170			LT BROWN SAND, PGD, M, SOME F, TR C, TR SILT	(SP)			0
	170-180			SAME AS 160-170	(SP)			0
	180-190			180-184': LT BROWN SAND, PGD, M, SOME C, TR F GRAV TR F SAND.	(SP) ← CHANGE			
				184-190': LT BROWN SAND, WGD, M-C, LITTLE F GRAVEL TR F SAND, TR SILT.	(SW)			
	190-200			190-197': SAND, WGD AS ABOVE.	← PROBLEM W/ HEAVING SANDS AT THIS POINT			
				197-200': LT BROWN SAND WGD, C, SOME M, SOME F GRAVEL, TR C GRAVEL, TR COBBLES, TR F SAND, TR SILT	(SW)			
	200-210			SAME AS 197-200	(SW)			

FIELD BORING LOG

Boring No. PBP-91-02 B.C.

Project No. 06853-03	Project Name BADGER AAP		Page 4 of 4
Contractor LAYNE	Driller GT BORING	Date started 10-14-91	completed 10-15-91
Method HOLLOW AU	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 253.5	∇ below ground 95	Total Depth 253.5
Logged by RLC	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU AIR	Monitoring LEL
	210-220			210-215: LT BROWN GRAVELLY SAND, WGD, C. SOME M, LITTLE F, TR SILT, LITTLE COBBLES GRAVEL F, LITTLE C. 215-220: LT BROWN SAND WGD, C, SOME M, SOME F GRAVEL, LITTLE F SAND TR SILT. TR COBBLES.	(SW)			0
	220-230			SAME AS 215-220	(SW) ✓ CHANGE			0
	230-240			LT BROWN SAND, PGD, M, SOME C, LITTLE F SAND, TR F GRAVEL, TR SILT.	(SP)			0
	240-250			240-248: SAME AS 230-240.	(SP) ✓ CHANGE			
				248-253: COBBLE-GRAVEL ZONE.	(GW)			
				TBOB = 253.5				

FIELD BORING LOG

Boring No. PBN-91-06C

Project No. 06453-05	Project Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-16-91	completed 10-22-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 220'	∇ below ground 90'	Total Depth 220'
Logged by RRR	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
	0-10'			BROWN CLAYEY SILT, PLD, TR F SAND, COHESIVE	(ML)		0	0
	10-20'			LT BROWN SAND, WGD, M, SOME F, SOME C, LITTLE F GRAVEL, TR SILT	(SW)		0	0
	20-30'			INTERBEDDED LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR SILT, TR C GRAVEL, TR F SAND; AND, LT BROWN SAND, PLD M, LITTLE C, LITTLE F, TR SILT.	(SW) (SP)		0	0
	30-40			SIMILAR TO 30-40'	(SW)/(SP)		0	0
	40-50	40-44		LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE C GRAVEL, LITTLE M SAND, TR F, TR SILT.	(SW)		0	0
		44-50		BROWN GRAVELLY SAND, WGD, C, SOME M, TR F, TR SILT GRAVEL: F, LITTLE C, TR COBBLES				
	50-60	50-54		SAME AS 44-50'	(SW)		0	0
		54-58		LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE M SAND, TR C GRAVEL, TR F SAND, TR SILT				
		58-60		GRAVELLY SAND AS 54-58'				
	60-70'			INTERBEDS OF LT BROWN SAND, WGD, C, SOME M, SOME F GRAVEL, LITTLE C GRAVEL AND; COBBLE ZONES	(SW)		0	0

FIELD BORING LOG

Boring No. PBW-91-060

Project No. 06853-03	Project Name BADGER AAP		Page 2 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-16-91	completed 10-22-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 220'	∇ below ground 90'	Total Depth 220'
Logged by RRR	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
	70-80			LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR F SAND, TR SILT TR COBBLES	(SW)		0	0
	80-90	80-88		SAME AS 70-80	(SW)		0	0
		88-90		LT TBROWN SAND, PGD, M, LITTLE C, LITTLE F, TR SILT	(SP) ▼ 90'		0	0
	90-100			SAME AS 88-90	(SP)		0	0
	100-110			" " "	(SP)		0	0
	110-120			LT BR SAND, WGD, M, SOME C, SOME F, TR F GRAVEL TR SILT TR COBBLES	(SW)		0	0
	120-130			BROWN SAND, WGD, C, SOME F GRAVEL, SOME M SAND, LITTLE C GRAVEL, TR COBBLES TR F SAND	(SW)		0	0
	130-140			SAME AS 120-130	(SW)		0	0
	140-150			TBROWN GRAVELLY SAND, WGD, C, SOME M, LITTLE F, GRAVEL; F, LITTLE C, TR COBBLES, TR SILT	(SW)		0	0
	150-160			LT TBROWN SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAVEL, TR SILT	(SW) WATER BECOMES DARK BROWN		0	0
	160-170			SAME AS 150-160	(SW)		0	0
	170-180	170-176		SAME AS ABOVE	(SW)		0	0
		176-180		LT TBROWN SAND WGD, C, SOME F GRAVEL, SOME M SAND, LITTLE F SAND, LITTLE C GRAVEL, TR COBBLES, TR SILT				
	180-190			SAME AS 176-180	(SW)		0	0
	190-200			SAME AS ABOVE	(SW)		0	0
	200-210			BROWN GRAVELLY SAND, WGD, C SOME M, LITTLE F, TR COBBLES. GRAVEL: F, LITTLE C	(SW)		0	0
	210-220			NO SAMPLE				

BOE = 220

FIELD BORING LOG

Boring No. PRW-91-06

Project No. 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-12-91	completed 10-12-91
Method DUAL WALL	Casing Size 9" OD	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 251'	▼ below ground 83'	Total Depth 251'
Logged by RRR	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	HNU ATR	LEL
S-1	0-10'			BROWN CLAYEY SILT, WGD, SOFT, MODERATE PLASTICITY	(ML)	0	0	0
S-2	10-20			10-12': SAME AS S-1 12-20': LT BROWN SAND PGD, F, LITTLE M SAND, TR COARSE SAND, TR SILT. INTERBEDS OF SILT LENSES	(SP)	0	0	0
S-3	20-30'			LT BROWN SAND, PGD, F, LITTLE M SAND, TR COARSE, TR F GRAVEL, TR SILT	(SP)	0	0	0
S-4	30-40'			SAME AS S-3	(SP)	0	0	0
S-5	40-50'			LT BROWN GRAVELLY SAND WGD, M-C SAND, F-M GRAVEL, TR FINE SAND TR SILT.	(SW)	0	0	0
S-6	50-60			LT BROWN SAND, WGD, M-C, SOME FINE GRAVEL, TR F SAND	(SW)	0	0	0
S-7	60-70			SAME AS S-6	(SW)	0	0	0
S-8	70-80'		RP	70-73': SAME AS S-6 73-76: COBBLE + BOULDER ZONE, 2"-6" DIAMETER, SOME FINE SAND		0	0	0
				76-80: LT BROWN SAND PGD, F, TR M SAND, TR SILT.	(SP)			
S-9	80-90'			LT BROWN SAND, PGD, F, LITTLE M, TR COARSE SAND, TR F-M GRAVEL, TR SILT	(SP) ▼ 83'	0	0	0

FIELD BORING LOG

Boring No. PISN-9D

Project No. 0685'3-03	Project Name BADGER AAP		Page 2 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-11-91	completed 10-11-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 251'	∇ below ground 83'	Total Depth 251'
Logged by TRR	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-10	90-100'			SAME AS S-9	(SP)	0	0	0
S-11	100-110'			LT BROWN SAND, PGD, F, LITTLE M, LITTLE SILT	(SP)	0	0	0
S-12	110-120			110-117 • SAME AS S-9		0	0	0
				117-120 • LT BROWN SAND PGD, F-M, TR COARSE, TR F-M GRAVEL, TR COBBLES,	(SP)			
S-13	120-130			120-122: SAME AS S-12		0	0	0
				122-130: LT BROWN SANDY GRAVEL, WGD, F-M GRAVEL, M-C SAND, TRACE SILT LITTLE COBBLES.	(GW)			
S-14	130-140			130-137: LT BROWN SAND, PGD, F-M, LITTLE SILT.	(SP)	0	0	0
~~S-15~~				137-140: LT BROWN SAND PGD, F-M, LITTLE COARSE, LITTLE F GRAVEL, TR COBBLES TR SILT	(SP)			
S-15	140-150			LT BROWN SAND, WGD, M, SOME FINE, LITTLE C, LITTLE F GRAVEL, TR COBBLES, TR SILT.	(SW)	0	0	0
S-16	150-160			LT BROWN SAND, PGD, F-M, SOME C, TR F GRAVEL, TR SILT.	(SP)	0	0	0
S-17	160-170			SAME AS S-16	(SP) 170' SANDS HEAVING CHANGE TO CROWD-IN BIT	0	0	0
S-18	170-180			LT BROWN SAND, WGD, M-C, SOME F SAND, LITTLE F GRAVEL, TR SILT.	(SW)			

FIELD BORING LOG

Boring No. PBN-91-06D

Project No 06853.03	Project Name BADGER AAP			Page 3 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-11-91	completed 10-11-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2		Protection Level D
Ground El	Soil Drilled 251'	∑ below ground 83'		Total Depth 251'
Logged by TRR	Checked by DRP	Date 10/14/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZR	Monitoring HNU AIR	Monitoring LEL
S-19	180-190			SAME AS S-18 (SW)	WATER IS DARK BROWN DUE TO SILT CONTENT	0	0	0
S-20	190-200			SAME AS S-18 (SW)		0	0	0
S-21	200-210			200-206': LT BROWN SAND (SP) PGD, M, SOME F, LITTLE C SAND, TR GRAVEL, TR SILT		0	0	0
				206-210': LT BROWN SAND WGD, M-C, SOME F GRAVEL TR F SAND, TR SILT (SW)		0	0	0
S-22	210-220			LT BROWN SAND, PGD, F-M LITTLE COARSE SAND, TR F GRAVEL, TR SILT (SP)		0	0	0
S-23	220-230			LT BROWN SAND, PGD, M SOME C SAND, LITTLE F SAND, TR SILT, TR GRAVEL (SP)		0	0	0
S-24	230-240			LT BROWN SAND, PGD, F, LITTLE M SAND, TR COARSE SAND, LITTLE SILT. (SP)		0	0	0
S-25	240-250			240-245': SAME AS S-24 (SP)		0	0	0
				245-250: LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F SAND, GRAVEL IS F-C, TR LARGE COBBLES, TR SILT. (SW)				
				BOE 250'				

FIELD BORING LOG

Boring No. PBN-91-12C

Project No. 06853-03	Project Name BADGER AAP		Page 1 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-23-91	completed 10-23-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 200'	∇ below ground 104'	Total Depth 200'
Logged by DRP	Checked by DRP	Date 10/26/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	HNU /ar	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
0-10'		0-9'		BROWN CLAYEY SILT PLD, TR F SAND, COHESIVE.		ML	0	0
		9-10'		LT BROWN SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAVEL, TR SILT. THIN INTERBED OF C GRAVEL AND COBBLES		SW		
10-20				SAME AS ABOVE W/ THE THIN INTERBEDS OF COBBLES ENDING AT 14'		SW	0	0
20-30				LT BROWN SAND, PLD C, SOME M, SOME F, TR SILT, LITTLE F GRAVEL		SP ✓		
30-40				30-32' - LT BROWN SAND, WGD, C, SOME M, SOME F GRAVEL, LITTLE M SAND.		SW	0	0
				32-40 - LT BROWN SAND, PLD, M, SOME C, TR F GRAVEL, TR F SAND, TR SILT		SP		
40-50		40-44		SAME AS 32-40'		RR SP ✓	0	0
		44-50		LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR C GRAV, TR F SAND, TR SILT		SW		
50-60				LT DARK BROWN SANDY GRAVEL; WGD, F, LITTLE C, SAND: C, SOME M, TR F. CHANGING TO GRAVELLY SAND		GW SW	0	0

FIELD BORING LOG

Boring No. BBV-91-12C

Project No 06853-03	Project Name BADGER AAP	Page 2 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-23-91 completed 10-23-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 200'	∇ below ground 101'	Total Depth 200'
Logged by RCR	Checked by DRP	Date 10/26/91

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	HNU jar	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
60-70				LT BROWN SAND, WGD M-C, LITTLE F GRAVEL TR F SAND.		(SW)	0	0
70-80		70-75 75-80		LT BROWN SAND, PGD, M, LITTLE C, TR F, LT BROWN SAND, WGD, C, SOME M, LITTLE TO SOME F GRAVEL, TR COBBLES, TR C GRAV		(SP) ✓ (SW)	0	0
80-90		80-84 84-90		SAME AS 75-80 LT BROWN SAND, PGD M, SOME F, LITTLE C.		(SW) ✓ (SP)	0	0
90-100				LT BROWN SAND, PGD, F, SOME M LITTLE SILT		(SP)	0	0
100-110				SAME AS 90-100		(SP)	0	0
110-120				" " "		(SP)	0	0
120-130				" " "		(SP)	0	0
130-140				LT BROWN TO BROWN SANDY GRAVEL, AND GRAVELY SAND, WGD GRAVEL: F SOME TO LITTLE C, TR COBBLES SAND: M-C, LITTLE TO TR F, TR SILT		(GW) (SW)	0	0
140-150				LT BROWN SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAVEL.		(SW)	0	0
150-160				SAME AS ABOVE		(SW)	0	0
~~170-18~~ RR 160-170				" " "		(SW)	0	0

FIELD BORING LOG

Boring No. PBN-91-12C

Project No 06853-03	Project Name BADGER AAP		Page 3 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-23-91	completed 10-23-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 200	∇ below ground 101'	Total Depth 200'
Logged by DRR	Checked by DRP	Date 10/26/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	HNU .ar	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
	170-180			LT BROWN SAND, WGD, M-C, LITTLE F, LITTLE F GRAVEL, TR SILT	(SW)	WATER IS DARK BROWN DUE TO SILT CONTENT	0	0
	180-190			SAME AS ABOVE	(SW)		0	0
	190-200			SAME AS ABOVE CHANGING TO LT BROWN SAND, PGD, M-F, LITTLE C	(SP)		0	0
				BOE = 200' BGS				

FIELD BORING LOG

Boring No. PBN-91-12

Project No. 26853-03	Project Name BADGER AAP		Page 1 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-15-91	completed 10-16-91
Method DUALWALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 231'	& below ground 101	Total Depth 231.0
Logged by KRC	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-1	0-10'			0-5': BROWN SILT, PLD, LITTLE F SAND, TR COBBLES COHESIVE	(ML)	0		
				5-10': LT BROWN SAND, WGD, M, SOME F SAND, SOME C, LITTLE F GRAVEL, TR COBBLES	(SW)			
S-2	10-20'			LT BROWN SAND, WGD, M-C, SOME F, LITTLE F GRAVEL, TR COBBLES, TR SILT.	(SW)	0		
S-3	20-30'			LT BROWN SAND, M-C, PLD, LITTLE F, TR F GRAVEL	(SP)	0		
S-4	30-40'			LT BROWN SAND, POOR TO MOD GRADED, SIMILAR TO S-3. THIN INTERBEDS OF GRAVEL.	(SP)	0		
S-5	40-50'	40-47':		LT BROWN SAND, PLD, M, SOME C, LITTLE F, TR F GRAVEL.	(SP)	0		
		47-50':		BROWN SANDY GRAVEL WGD, F, LITTLE C SAND: ~~SOME C, M, SOME F~~, SOME M, LITTLE F	✓ (GW) (RR)			
S-6	50-60'	50-55':		SAME AS 47-50'		0		
		55-60'		LT BROWN GRAVELLY SAND, WGD, C, SOME M, LITTLE F, GRAVEL: FINE, TR C GRAV TR SILT.	(SW)			
S-7	60'-70'			LT BROWN SAND, WGD, C, SOME M, SOME F GRAV, LITTLE F SAND, TR SILT, TR COBBLES.	(SW)	0		

FIELD BORING LOG

Boring No. PSN-91-12A

Project No. 06853-03 | Project Name BADGER AAP | Page 2 of 3

Contractor LAYNE | Driller G. RODRIGUEZ | Date started 10-15-91 completed 10-16-91

Method DUAL WALL | Casing Size 9" o.d. | HNU 11.7/10.2 | Protection Level D

Ground El. | Soil Drilled 231' | ▼ below ground 101 | Total Depth 231'

Logged by RRR | Checked by DRP | Date 10/24/91

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-8	70'-80'	70-77'		LT BROWN SAND, PGD, C, SOME M, TR F SAND.	(SP)	0		
		77-80		LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE M SAND, TR COBBLE, TR F SAND, TR SILT.	(SW)			
S-9	80-90'			LT BROWN SAND, PGD, GRADING FROM M TO F W/ DEPTH, LITTLE TO TR C SAND TR COBBLES, LITTLE SILT	(SP) CHANGE BITS	•		
S-10	90-100'			LT BROWN SAND, PGD, F, LITTLE M, LITTLE SILT, TR C, WET	(SP) ▼ 101'	0		
S-11	100-110'			LT BROWN SAND, PGD, F, LITTLE SILT, LITTLE M SAND	(SP)	0		
S-12	110-120			SAME AS 100-110'	(SP)	0		
S-13	120-130			LT BROWN SAND, PGD, M, SOME F, LITTLE C, TR F GRAVEL	(SP) START PUMPING	•		
S-14	130-140			BROWN SANDY GRAVEL, WGD F, LITTLE C GRAVEL GRADING TO SOME C GRAVEL. SAND: C, LITTLE M, LITTLE SILT, TR COBBLES.	WATER DOWN HOLE TO SUPPRESS HEAVING SAND (SW) WATER HAS BROWN COLOR	0		
S-15	140-150			LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR F SAND, TR SILT	(SW)	0		
S-16	150-160	150-155		SAME AS 140-150	(SW)	0		
		155-160		LT BROWN SAND, WGD, C, LITTLE M, SOME F GRAVEL, TR F SAND, TR SILT				
S-17	160-170			SAME AS 155-160	(SW)	0		
S-18	170-180			LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR F SAND, TR SILT	(SW)	0		
S-19	180-190			SAME AS S-19	(SW)	0		

FIELD BORING LOG

Boring No. PBW-91-12D

Project No 06853-03	Project Name BADGER AAP		Page 3 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-15-91	completed 10-16-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 231'	∇ below ground 101'	Total Depth 231'
Logged by KRR	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
						JAR / AIR	
S-20	190-200			SAME AS S-18		0	
S-21	200-210			LT BROWN SAND, PGD, M-C TR F GRAVEL, TR F SAND TR SILT	(SP)	0	
S-22	210-220	210-216 210-220		SAME AS S-21 BROWN GRAVELLY SAND, WGD, C, SOME M, TR F, TR SILT TR COBBLES. GRAVEL: F, LITTLE C	(SP) (SW)	0	
S-23	220-230			LT BROWN SAND, WGD, M-C SOME F GRAVEL, TR SILT LITTLE F SAND, TRC GRAVEL BOE = 231'	PROBLEM WITH HEAVING SANDS (SW)	0	

GSP

FIELD BORING LOG

BORING NO. PBN-8901 E D

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/19/89	COMPLETED 1/20/89
METHOD: Dual Wall	CASING SIZE: inner ø 6" outer = 9 3/4"	TIP eV: 10.0 TE	PROTECTION LEVEL: D
GROUND ELEV.: 871.5	SOIL DRILLED: 240'	WATER LEVEL: — 102'	TOTAL DEPTH: 240'
LOGGED BY: J. Snowden	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-10'			Dr Br - Tan f si m-f sa w/ some med. gvl, moist, med. dense, well graded, nonplastic (SW)	0-5 Topsoil	0	
S-2	10'-20'			similar to S-1			
S-3	20'-30			Lt Br m-f sa w/ trace si & little med. rounded gvl, sl. moist, loose, p. graded, nonplastic, intermittent C gvl (SP)	Change @ 24'		
S-4	30'-40			similar to S-3		0	
S-5	40'-50			similar to S-3 w/ > gvl %		0	
S-6	50'-60'			Lt B m-f sa w/ trace to little si, & some rounded med. gvl, sl. moist, med. dense, poorly graded, non-plastic SP	Change to high gvl % @ 55'-57'		
S-7	60'-70'			similar to S-6 w/ > m sa % (SP)		0 1	
S-8	70'-80'			similar to S-6 (SP)		0	
S-9	80'-90'			similar to S-6 (SP)			
S-10	90'-100'			similar to S-6 w/ < in the med. to C gvl % (SP)			
S-11	100'-110'			similar to S-6 w/ & some C gvl & cobbles (SP)	▽ @ ~102'	0	
S-12	110'-120'			Lt Br m-f sa w/ trace si & little med. to f gvl, moist, loose, p. graded, nonplastic (SW)	Change @ 112'		
S-13	120'-130'			similar to S-12 w/ saturated moisture content			

FIELD BORING LOG

BORING NO. ~~PB6~~N8901E0 (8)

[illegible] NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/19/89	COMPLETED 1/20/89
METHOD: Dual Wall	CASING SIZE: inner = 6" outer = 9 3/4"	TIP eV: 10.0 TE #1	PROTECTION LEVEL: D
GROUND ELEV.: 871.5	SOIL DRILLED: 240'	WATER LEVEL: ~102'	TOTAL DEPTH: 240'
LOGGED BY: J. Snowden	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-14	130'-140'			similar to S-12,3 ~~S-12~~ S-13		0	
S-15	140'-150'			similar to S13 w/ > fine gvl %		0	
S-16	150'-160'			m. sandy gvl w/ some & cob, wet, loose, po. graded, nonplastic (GP)	> in water yield from boring change @ 154'	0	
S-17	160'-170'			Lt Br f-m sa w/ little to trace si + Trace med to f gvl, wet, loose, p. graded, nonplastic (SW)	change @ 162'	0	
[illegible]8	170'-180'			similar to S-17		0	
S-19	180'-190'			similar to S-17		0	
S-20	190'-200'			similar to S-17			
S-21	200'-210'			similar to S-17		0	
S-22	210'-220'			similar to S-17		0	
S-23	220'-230'			similar to S-17			
S-24	230'-240'			similar to S-17			
				BOB @ 240'			

FIELD BORING LOG

BORING NO. PBN-89-02C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 3/15/89	COMPLETED 3/19/89
METHOD: hammer rig	CASING SIZE: 9"	TIP eV: Tip-7	PROTECTION LEVEL: D
GROUND ELEV.: ~~894.5~~	SOIL DRILLED: 195'	WATER LEVEL: 120±	TOTAL DEPTH: 195'
LOGGED BY: JBiss	CHECKED BY: JBR.	DATE: ~~3/15/89~~ 3/24/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10 ft			Black to dark brown fine silt grading to sand wt/depth Topsoil - Loess + outwash	soil jammed in cyclone TOPSOIL 0-5.0 SM 5.0-10.0	0.0	
S-2	10-20ft			light brown to reddish brown fine SAND wt/ some silt and little crse Sand+gravel. dry. large gabbro boulder blown up at ~ 17 ft. gravel +cobbles to 20 ft. (SP)		0.6	
S-3	20-30ft			Brown fine SAND and Gravel wt/some cobbles. Dry (SP)		0.5	
S 4	30-40ft			similar to S3 (SP)		0.2	
S 5	40-50			Brown - light brown fn-med SAND wt/ some gravel + occasional cobbles Dry (SP)		0.5	
S6	50-60			light brown fn-med Sand wt/ coarse sand and well rounded gravel. ~~FLUVIAL~~ (SP) GLACIO-FLUVIAL		0.1	
S7	60-70ft			similar to S6 dry (SP)		0.3	
S-8	70-80ft			similar to S6 dry (SP) grading to fine to Crse Sand wt/ trace of fine gravel at 80 ft.	3/19/89 ↓	0.8	

[redacted] BORING LOG

BORING NO. PBN-89-02C

PROJECT NO.: 5753-06	PROJECT NAME: USATHANA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 3/18/89	COMPLETED 3/19/89
METHOD: Hammer	CASING SIZE: 9 in	TIP NO: TIP-7	PROTECTION LEVEL: D
GROUND ELEV.: 894.5	SOIL DRILLED: 195'	WATER LEVEL: 120±	TOTAL DEPTH: 195'
LOGGED BY: J. Buss	CHECKED BY: [redacted]	DATE: ~~3/19/89~~ 3/29/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-9	80-90			light brown fine SAND wt little fine Gravel + Crse SAND dry - moist. fine - Med gravel at 90 ft.	(SP)	0.0	
S-10	90-100			Brown fine - Crse SAND and Med - Crse Gravel, subangular Till. Dry	(SP) ✓ change @ 100'	0.8	
S-[redacted]	100-110			Crse Sand and fine to Crse Gravel. Dry	(SP)	0.7	
S-12	110-120			similar to S-11 wt trace f fn - Med Sand. Dry	(SP)		
				fn - med Sand wt gravel at 118 ft.	✓ change @ 118'		
S-13	120-130			fn - med Sand wt/ trace of - gravel moist - wet	(SP)	~~0.5~~ 0.3	
S-14	130-140			brown fine - Med Sand wet.	(SP)	0.4	
S-15	140-150			similar to S-14 more medium Sand	(SP)	0.4	
S-16	150-160			brown fine - medium SAND with occasional med - crse gravel. wet.	(SP)	0.2	
S-17	160-170			similar to S-17	(SP)	0.4	
[redacted]							

FIELD BORING LOG

BORING NO. PBN-89-02

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
RILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 3/18/8	COMPLETED 3/19/89
..ETHOD: hammer	CASING SIZE: 9" dual wall	TIP-dv: TIP-7	PROTECTION LEVEL: D
GROUND ELEV.: 894.5	SOIL DRILLED: 195'	WATER LEVEL: 120±	TOTAL DEPTH: 195'
OGGED BY: J Buss	CHECKED BY: JRP.	DATE: ~~3/19/89~~ 3/24/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-18	170-180			Brown fine-med SAND wt occasional Gravel wet	(SP)	0.5	
S-19	180-190			Brown fine-med SAND wt little crse SAND + trce gravel. wet	(SP)	0.4	
S-20	190-200			Brown fine-med. SAND wt/ little crse sand and gravel. wet	(SP)	0.5	
				195 ft. EOB. Overdrilled to 210 -- after three try @ 195-200			

FIELD BORING LOG

BORING NO. PBN-89-04C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE	OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 4/15/89	COMPLETED 4/16/89
METHOD: AP-1000 Dual wall	CASING SIZE: 9.0"	TIP eV: TE 10.6eV	PROTECTION LEVEL: D
GROUND ELEV.: 857.7	SOIL DRILLED: 190'	WATER LEVEL: ± 87'	TOTAL DEPTH: 190'
LOGGED BY: Buss	CHECKED BY: JSP.	DATE: 4/26/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10			Black organic silty topsoil and Brown Silt (loess) to 5 ft, Tan fn Sand wt/ occ gravel to 10 ft moist	TIP Bkgd= 0.0-0.5	0.1	
S#2	10-20			fn-med SAND wt/ some crse Sand + fn-med gravel dry-moist (SP)		0.0	
S#3	20-30			Tan fn-med SAND wt occasional gravel (well rounded) dry-moist. (SP)		0.2	
S#4	30-40			same as S#3 (SP)		0.0	
S#5	40-50			same as S#3 (SP)		0.1	
S#6	50-60			light brown fn-Crse Sand wt/ Trce fine gravel dry-moist (SP)	coarsening downward	0.3	
S#7	60-70			brown Med to Crse SAND wt/ some fn Sand + Trce fine gravel (SP)		0.1	
S#8	70-80			brown Med-Crse Sand and Med to Crse Gravel well rounded dry-moist	(SP)	0.0	
S#9	80-90			brown Med Sand wt some Crse Sand + occ. gravel + fine Sand	(SP)	0.0	

FIELD BORING LOG

BORING NO. PBW-89-04

PROJECT NO.: 5753-06 | PROJECT NAME: USATHAMA- BAAP | PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: G. Rodriguez | DATE STARTED 4/15/89 COMPLETED 4/15/89

METHOD: AP-1000 | CASING SIZE: 9" | TIP eV: TE 10.6 eV | PROTECTION LEVEL: D

GROUND ELEV.: 857.7 | SOIL DRILLED: 190' | WATER LEVEL: ~87 ft | TOTAL DEPTH: 190'

LOGGED BY: Buss | CHECKED BY: SP 4/26/89 | DATE: 4/15/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S 10	90-100			Same as S#9 wet (SP)		0.0	
S 11	100-110			Brown fn-med SAND Tree silt. (SP)		0.0	
S# 12	110-120			same as S#11 (SP)		0.0	
S#13	120-130			same as S#11 (SP)		0.0	
S#14	130-140			brown fn-med SAND wt occasional angular gravel cobbles at 140 ft	v change @ 140	0.0	
S# 15	140-150			Coarse - fn. Gravel wt Cobbles + a little crse Sand wet.	(SP)	0.0	
S# 16	150-160			Coase Sand and gravel to 155 ft grades to Brown Med-fn SAND wt Tree crse SAND	v Change @ 166' (SP)	0.0	
S# 17	160-170			Brown Med-fn SAND with some Crse Sand and fine gravel at 168-170 ft.	(SP)	0.0	
S# 18	~~160~~ 170-180			Brown fine Sand with some Med. Sand + Tree Silt.	(SP)	0.0	
S#19	180-190			Brown Med Sand wt some fine + crse Sand. + occasional Gravel	(SP)	0.0	

Bottom of hole @ 190'

FIELD BORING LOG

BORING NO. PBM8905

PROJECT NO.: 5753-09	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: L. Newman	DATE STARTED 3/2/89	COMPLETED 3/3/89
METHOD: HSA	CASING SIZE: 6.25"	TIP eV: TE=2 10.0eV	PROTECTION LEVEL: D
GROUND ELEV.: 852.3	SOIL DRILLED: 90'	WATER LEVEL: 81.4'	TOTAL DEPTH: 90'
LOGGED BY: J. Snowden	CHECKED BY: JCP.	DATE: 4/10/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	2'-4'		2.0 / 1.4	Dr Brown si m-fsa w/some m gvl & little Csa, moist, med. dense, poorly graded 0-5.0' Topsoil (SP)	spoons were pushed w/ the rig rather than driven	0	
S-2	8'-10'		2.0 / 1.6	Tan f-m sa w/trace si & some med. gvl, dry, loose, P. graded nonplastic (SP)		0	
S-3	18'-20'		2.0 / 1.4	similar to S-2 w/ 7 gvl %		0	
S-4	28'-30'		1.7 / 1.0	similar to S-2 w/ fsa seams		0	
S-5	38'-40'		2.0 / 1.3	similar to S-2		0	
S-6	48'-50'	50 for .5	.5 / .5	Tan f-m sa w/some C sa and, F gvl + cobs, dry-sl. moist, p.graded, loose, nonplastic (SP)	spoon was driven w/ MD the hammer	0	
S-7	58'-60'		2.0 / .6	similar to S-6 w/ 7 gvl + C sa %	spoon was pushed w/the rig	8	
S-8	68'-70'		1.2 / .8	similar to S-6 w/ < gvl + cob %		0	
S-9	78'-80'		1.4 / 1.0	similar to S-8	I NOT encountered	0	
S-10	88'-90'			sample not collected due to running sands	I encountered @ ~ 81'		
				BOB at 90.2'			

FIELD BORING LOG

BORING NO. PBM-89-07

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Dallas	DATE STARTED 3/2/89	COMPLETED 3/3/89
METHOD: HSA	CASING SIZE: 6.25"	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.: 846.6	SOIL DRILLED: 95 feet	WATER LEVEL: 77.2 feet bgs	TOTAL DEPTH: 95 feet
LOGGED BY: B.K.B.	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				0-2' bgs: black organic rich topsoil. 2-14' bgs: brown, sticky silt and fine sand. Moist LOESS 14-95' Well to Poorly graded fine to med. Sand with little gravel - outwash Hole overdrilled to 110'		

FIELD BORING LOG

BORING NO. PBM-89-09

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: L. NEWMAN	DATE STARTED 2/22/89	COMPLETED 3/1/89
METHOD: 6.25" HSA	CASING SIZE: 6.25" I.D.	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.: 880.6	SOIL DRILLED: 125'	WATER LEVEL: 110' ±	TOTAL DEPTH: 125'
LOGGED BY: J. Reeves for Partial	CHECKED BY: JSP.	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
N/A	JSP 2/28/89			No Samples collected from PBM-89-09 Logged borehole by action of HSA's	Note 0-5.0' (ML) Topsoil Loess		
				0-10.0' Coarse gravel & many cobbles tough drilling	(GP)		
				10.0'-78' Smooth drilling Do not appear to have any cobbles or Boulders - Sand & Gravel most likely well sorted few gravel zones.	✓Change @ 10.0' (SP)		
				78'-97' ~~[illegible]~~ GP numerous cobbles very difficult drilling @ 97' Broke Hex Rods in HSA & Dropped Hex Rods Down the Borehole. Will Try to Recover, but will have to pull HSA out of Boring to get Hex Rods out. 2/28/89	✓Change @ 78' (GP)		
				2/28/89 Drillers Pull All Augers out of PBM-89-09 & Retrieve all Hex Rods. Apparently Pins Vibrated out of the Hex Rods Allowing them to come apart. Drillers Run HSA Back down to 85' & Break for Lunch.			

FIELD BORING LOG

BORING NO. PBM-89-09

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: L. Newman	DATE STARTED 2/22/89	COMPLETED 3/1/89
METHOD: 6.25" HSA	CASING SIZE: 6.25" ID	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.: 880.6	SOIL DRILLED: 125'	WATER LEVEL: 108±	TOTAL DEPTH: 125'
LOGGED BY: J. Pucket	CHECKED BY: JP	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
N/A JP 2/22/89				Drilling from 95-105' very difficult have many cobbles. Most likely also coarse gravel & cobble zone. @ 105' drilling smooths out. Also out of HSA will get some HSA's from the Brent 22 Rig when they finish their well.	V change @ 105' (SP) @ 105		
				4:30 20' of HSA from Brent arrive @ F-10 Rig. Drill from 105' to 110' smooth augering very easy.	(SP)		
				Drill from 110' to 115' very smooth augering no cobbles or boulders. 4:50	(SP)		
				Drill from 115' to 120' very smooth drilling does not appear to be very cobbley	(SP)		
				3/1/89 7:45 AM			
				Remove hex rods from borehole H_2O ▽ @ 105' Have ± 5' of "heave" in bottom of HSA Inject 50 gallons H_2O then drill to 125' check depth open hole to 128' will now install well now in HSA.			
				Dropped well during installation see log book for details — Retrieved dropped well			

FIELD BORING LOG

BORING NO. PBN-8910D

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/5/89	COMPLETED 3/7/89
METHOD: DUAL WALL	CASING SIZE: 9 1/2"	TIP eV: 0.00	PROTECTION LEVEL: D 4/29/89
GROUND ELEV.: 880.9	SOIL DRILLED: 285	WATER LEVEL: 115	TOTAL DEPTH: 285'
LOGGED BY: D.W. BELAN	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10'			DK BRN (SM) FROZEN, WITH LITTLE FINE GRAVEL	TOPSOIL 0-5.0'	0.00	
S-2	10-20'			MED BRN (SM), LOOSE, SLIGHTLY DAMP, WITH TRACE GRAVEL		0.00	
S-3	20-30'			MED BRN (SM) LOOSE, DAMP, TRACE GRAVEL	✓ CUTTINGS @ 30'	0.00	
S-4	30-40'			[redacted] MED BRN SM-SP WITH SOME GRAVEL		00.0	
S-5	40-50'			MED BRN (SP) WITH LITLE GRAVEL LOOSE, MOIST		00.0	
S-6	50-60'			LT BRN (SP) WITH LITTLE GRAVEL		00.0	
S-7	60-70'			LT BRN (SP) WITH TR GRAVEL		00.0	
S-8	70-80'			LT BRN (SP) WITH SOME GW, WELL ROUNDED		00.0	
S-9	80-90'			(GW), WELL-MODERATELY ROUNDED WITH LITTLE LT BRN SP.	✓ @ 80'	00.0	
S-10	90-100'			(GW), WELL-MODERATELY ROUNDED WITH LITTLE LT BRN SP.	✓ @ 100'	00.0	
S-11	100-110'			LT BRN (SP) WITH SOME GW.		00.0	
S-12	110-120'			LT BRN (SP) WITH LITTLE GW. WET.		00.0	
S-13	120-130'			LT BRN (SP) WITH TRACE GW. WET		00.0	
S-14	130-140'			SIMILAR TO S-13		0.00	
S-15	140-150'			LT BRN (SP) WET, TRACE GW.		00.0	
S-16	150-160'			LT BRN (SP) WITH SOME GW.	✓ @ 160'	00.0	
S-17	160-170'			(GW) ROUNDED-ANGULAR, WITH ALTERNATING SP ZONES.		00.0	
S-18	170-180'			(GW) TO ~175', THEN FLOWING "RUNNING" SAND, SP.	✓ @ 175	00.0	
S-19	180-190'			LT BRN SP-SW, WITH LITTLE FINE GRAVEL		00.0	

FIELD BORING LOG

BORING NO. PBN-89-10D

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/5/89	COMPLETED 3/7/89 4/09/89
METHOD: DUAL WALL	CASING SIZE: 9½"	TIP eV: 0.00	PROTECTION LEVEL: D
GROUND ELEV.: 880.9	SOIL DRILLED: 255	WATER LEVEL: 115	TOTAL DEPTH: 255
LOGGED BY: D.H. BELAN	CHECKED BY: [illegible]	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-20	190 - 200'			LT BRN (SP) WET, TRACE FINE GRAVEL		00.0	
S-21	200 - 205'			LT BRN (SP) WET, TRACE FINE GRAVEL	-	00.0	
				UNABLE TO CONTROL HEAVING SANDS. ABANDON HOLE.	4/19/89 Completion of Hole w/ AP-1000		
				Many cobble boulder zones to 190 ft.			
S#21	200-210			brown med-fn SAND, Trce Crse Sand + Silt. Occasional cobbles.		2.1	
S#22	210-220			similar to S#21		0.0	
S#23	220-230			Brown med-fn SAND, little Crse Sand and fine gravel. Med-Crse Gravel layer at 230'		0.0	
S 24	230-240			Gray fn. Crse SAND wt occasion gravel + Cobbles		0.0	
S 25	240-250			similar to S#24, less gravel + Crse Sand		0.0	

FIELD BORING LOG

BORING NO. PBM-89-11

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: DON	DATE STARTED 3/3/89	COMPLETED 3/7/89
METHOD: HSA	CASING SIZE: 6.25"	TIP eV: 10.0 eV 2nd 3/4/89	PROTECTION LEVEL: d
GROUND ELEV.: 881.6'	SOIL DRILLED: 128 feet	WATER LEVEL: ~~105~~ 103 feet bgs	TOTAL DEPTH: 128 feet bgs
LOGGED BY: B. Butler	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				[No split spoons obtained) descriptions obtained from cuttings & behavior of HSA during drilling			
				Encountered ± 6.0' loess - Topsoil			
				5.0 - 75 feet fine to medium sand, well to poorly graded with variable fines, tr. gravel. tan	(SP)	Bkgd	
				75-78 feet: Gravel, cobbles	(GP) cobbles		
				78 - 87.5' cobbles - auger being refused at 80 feet.	(GP)	Bkgd	
				87.5 - 128' tan fine to medium sand with little co. sand, fine-med. gravel.	(SP)		
				BOB @ 128' - Due to running sand the auger were removed from the original borehole JCT and offset borehole was made ± 15' west of the original boring. The offset boring was advanced to 125'.			

FIELD BORING LOG

BORING NO. FBN-89-12S

PROJECT NO.: 5753- | PROJECT NAME: USATHAMA- BAAP | PAGE 1 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: G. Rodriguez | DATE STARTED 4/14/89 COMPLETED 4/15/89

METHOD: AP-1000 | CASING SIZE: 9 in | TIP eV: | PROTECTION LEVEL: D

GROUND ELEV.: 856 | SOIL DRILLED: 140 ft | WATER LEVEL: 85 ft | TOTAL DEPTH: 140 ft

LOGGED BY: JAB | CHECKED BY: JAB 4/26/89 | DATE: 4/14/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S1	0-10ft			light brown to tan fine-coarse SAND wt little fine angular gravel + silt. Dry	0-5.0 Topsoil	0.0	
S2	10-20			light brown fine-med SAND wt little Coarse Sand + fine-med Gravel - Moist. (SP)		0.0	
S3	20-30			Tan fine SAND wt trace coarse Sand + fine gravel slightly moist. (SP)		0.0	
S4	30-40			Same as S3 (SP)		0.0	
S5	40-50			Same as S3 dry (SP)		0.0	
S6	50-60			light brown fine-med SAND wt/ little Coarse Sand + fine gravel. slightly moist-dry (SP)		0.0	
S7	60-70			Same as S6 (SP)		0.0	
S8	70-80			light brown fine-med SAND. occasional Gravel slightly moist-dry (SP)		0.0	
S-9	80-90			light brown med-coarse SAND wt/ Gravel. + some fine Sand. dry grading to moist-wet below 85 ft. (SP)		0.0	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The predecessor of this form is HSHB-ES)

PROJECT Badger AAP

DATE 11 and 14 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-C1A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
0		Silt, very dark brown	
		Silt, with very fine grained sand, tan	
10		Sand, medium to coarse grained with fine gravel	
20		Sand, medium to coarse grained and fine gravel	
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 70, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The predecessor of this form is HSHB-ES)

PROJECT Badger AAP

DATE 14 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBN-85-01A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40		Sand, medium to coarse grained, with fine gravel (10%)	
50			
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 66, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 14 Sep 85

LOCATION South of Propellant DRILLERS 20th Eng Bde.

Burning Ground Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBN-85-01A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60			
		Sand, medium to coarse grained, gravel and cobbles	Drilling slower
70			
		Sand, medium to coarse grained and gravel	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 15 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBN-85-01A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100		Sand, coarse to fine grained with 20% fine gravel	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 13 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBN-85-01A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
120		Same as above	
130		Bottom of Hole	
140			
150			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 1 Oct 85

LOCATION South of propellant Burning Ground

DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
0		Clay with silt, medium brown-gray	
10		Sand with silt and some clay	
		Boulder	
20		Sand, medium to coarse grained and gravel	
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85

LOCATION South of propellant DRILLERS 20th Eng Bde.

Burning Ground Engineer - CPT Springer

DRILL RIG Failing 1500 BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40		Gravel, with sand	
		Sand, fine to medium grained, with gravel	
50		Sand, fine to medium grained	
		Gravel, with coarse to fine grained sand	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 1 Oct 85

LOCATION South of propellant Burning Ground

DRILLERS 20th Eng Bde. Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60		Sand, medium to fine grained, with increasing gravel at base	
70			
		Sand, coarse to fine grained	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85

LOCATION South of propellant DRILLERS 20th Eng Bde.

Burning Ground Engineer - CPT Springer

DRILL RIG Failing 1500 BORE HOLE P3N-85-02A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100		Gravel, with sand, medium to coarse grained	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 1 Oct 85

LOCATION South of propellant Burning Ground — DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500 — BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
120		Same as above	
130			
140		Bottom of Hole	
150			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 3 Oct 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde.

Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-03A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Clay with silt, dark brown	
		Sand, coarse to fine grained	
10			
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 3 Oct 85

LOCATION South of Propellant Burning Ground DRILLERS 20th Eng Bde. Engineer - CPT Springer

DRILL RIG Failing 1500 BORE HOLE P3N-85-03A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40		Sand, coarse to medium grained	
50			
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 3 Oct 85

LOCATION South of Propellant DRILLERS 20th Eng Bde.

Burning Ground Engineer - CPT Springer

DRILL RIG Failing 1500 BORE HOLE P3N-83-03A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60		Same as above	
70			
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 3 Oct 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Engineer - CPT Springer

DRILL RIG Failing 1500 — BORE HOLE PBN-85-03A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
		Bottom of Hole	
100			

AEHA Form T30, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 30 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBM-85-04A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, dark brown	
		Clay with silt, medium brown	
10		Sand, fine to coarse grained	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 30 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-04A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40			
50		Sand, medium to coarse grained, with gravel	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 30 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde. Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-04A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60		Same as above	
70		Sand, fine to medium grained	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 30 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBN-85-04A

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100			
110		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

FIELD BORING LOG

BORING NO. SBN-89-123

PROJECT NO.: 5753-06 | PROJECT NAME: USATHAMA- BAAP | PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: Bill Melhoene | DATE STARTED 4/14/89 | COMPLETED 4/15/89

METHOD: AP-1000 | CASING SIZE: 6" | TIP eV: | PROTECTION LEVEL: D

GROUND ELEV.: 852.6 | SOIL DRILLED: 140' | WATER LEVEL: 85' | TOTAL DEPTH: 140'

LOGGED BY: BSE | CHECKED BY: JSR 4/26/89 | DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S 10	90-100			Brown Fine-med SAND Trace Crse Sand Wet	(SP)	0 0	
S 11	100-110			Same as S 10	(SP)		
S 12	110-120			Same as S 10	(SP)		
S 13	120-130			Same as S 10	(SP)		
14	130-140			Same as S10 130-133 133-140 Crse SAND and Fn-Crse Gravel	(SP)		
				140' BOE			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 22 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, dark brown	
		Silt and clay, tan	
		Sand, fine to coarse grained and fine gravel	
10			
		Sand, medium to coarse grained and fine gravel	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 22 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40			
50		Coarse to fine gravel with sand coarse to fine grained and cobbles	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 22 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60			
		Boulder	Drilling very slow
70		Gravel, coarse to fine, and sand, coarse to fine grained, with occasional cobbles	Gravel caving into hole
80			
		Sand, fine to coarse grained, and fine to coarse gravel	
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 22 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE P3M-85-01

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100			
		Bottom of Hole	
110			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 17 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, very dark brown	
		Silt and sand, very fine grained, tan	
		Sand fine to coarse grained and fine gravel	
10			
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85

LOCATION South of Propellant Burning Ground DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30			
40		Gravel, coarse to fine with sand, medium to coarse grained and cobbles	Drilling slower
50		Gravel, coarse to fine and sand fine to coarse grained	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 17 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
60			
70		Sand, fine to coarse grained and fine gravel	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85

LOCATION South of Propellant DRILLERS 20th Eng Bde,

Burning Ground Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 18 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, very dark brown	
		Sand, fine to coarse grained, fine to coarse, gravel, some cobbles	Glacial Till (terminal moraine)
10			
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 18 Sep 85

LOCATION South of Propellant DRILLERS 20th Eng Bde.

Burning Ground Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40		Sand, fine to coarse grained and coarse to fine gravel	
50			
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 18 Sep 85

LOCATION South of Propellant DRILLERS 20th Eng Bde.

Burning Ground Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60		Same as above	
70			
80		Sand, fine to coarse grained, fine to coarse gravel and cobbles	Drilling slow
		Sand, fine to coarse grained and fine to coarse gravel	
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 18 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90			Drilling slow, possible boulder
		Coarse to fine gravel, with sand, fine to coarse grained	
100			
110			
		Sand, fine to coarse grained, with fine gravel	
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 18 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
120		Same as above	
		Sand, very fine to coarse grained with fine gravel	
130		Sand, fine to coarse grained, and fine gravel	
140			
150		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 24 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
0		Silt, dark brown	
		Silt and clay with very fine grained sand, with gravel, tan	
10		Coarse to fine gravel and sand, coarse to medium grained	
20		Sand, coarse to fine grained with fine gravel	
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 24 Sep 85

LOCATION South of Propellant DRILLERS 20th Eng Bde.

Burning Ground Geologist - Fox

DRILL RIG Failing 1500 BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40			
50			
60		Gravel, fine to coarse, sand, fine to coarse grained with occasional cobbles	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 24 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60			
70		Sand, fine to coarse grained, and fine gravel, occasional cobbles	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 24 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde.

Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90			
100		Boulder	
		Sand, fine to coarse grained, with fine gravel	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jan 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 24 Sep 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500 — BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
120		Same as above	
		Bottom of Hole	
130			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 28 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde. Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-05

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60			
		Gravel, coarse to fine and sand coarse to fine grained	
70			
80			
		Sand, fine to coarse grained with fine gravel	
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 28 Sep 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde, Geologist - Fox

DRILL RIG Failing 1500

BORE HOLE PBM-85-05

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
90		Same as above	
100			
110		Bottom of Hole	
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 4 Oct 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Engineer - CPT Sprinzer

DRILL RIG Failing 1500 — BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
0		Silt, with clay dark brown	
		Silt with clay, medium brown	
10			
		Sand, fine grained, with gravel	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP — DATE 4 Oct 85

LOCATION South of Propellant Burning Ground — DRILLERS 20th Eng Bde, Engineer - CPT Springer

DRILL RIG Failing 1500 — BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
30		Same as above	
40		Gravel, coarse to fine, and cobbles, with sand	
50		Gravel, coarse to fine, with sand	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP

DATE 4 Oct 85

LOCATION South of Propellant Burning Ground

DRILLERS 20th Eng Bde. Engineer - CPT Springer

DRILL RIG Failing 1500

BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
60		Same as above	
70		Sand, medium grained, with gravel	
80			
90		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBM-82-01
Surface Elevation 855.7
Job No. C 10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Stiff to Very Stiff, Black (5Y 2.5/1) Clayey SILT (ML)					
1	SS	13"	M	5	*		(2.0)				
2	SS	18"	M	7	5	**					
3	SS	18"	M	11							
4	SS	17"	M	19	10	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Trace to Little Silt & Clay, Some Fine Gravel (SP-SM)					
5	SS	18"	M	15	15						
6	SS	18"	M	20	20						
7	SS	15"	M	20	25						
8	SS	12"	M	19	30	Boring Completed to 30' on 2/10/82	( )	Pocket Penetrometer Reading, TSF			
					35	* 2.0' of Frost Present					
					40	**Loose, Dark Yellowish Brown (10YR 4/6) Fine SAND, Some Silt & Clay, Trace of Medium Sand (SM)					
					45						

(Continued)

WS-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-01
Surface Elevation 855.7
Job No. C 10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' - 100' on 3/18/82					
						Unit: SAMS-2 Chief: Larry F.					
9	SS	18"	M	129	55	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Trace to Little Silt & Clay, Some Fine Gravel (SP-SM)					
10	SS	18"	M	122	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt (SP)					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-01
Surface Elevation: 855.7
Job No.: C 10313
Sheet: 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					95						
11	SS	18"	W	16	100	Medium Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt (SP)					
						End Boring at 100'					
					105						
					110						
					115						
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling: _____
Upon Completion of Drilling: _____
Time After Drilling: ½-hour
Depth to Water: _____
Depth to Cave In: 30.0' Moist

GENERAL NOTES

Start: 2/10/82 Complete: 3/18/82
Crew Chief: JWG/MG Rig: 55-1
Drilling Method: CS 0-10'
FA 10-30'
DM/WO 30-100'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-02
Surface Elevation 870.9
Job No. C 10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
1	SS	18"	M	-	*	12" TOPSOIL					
2	SS	18"	M	12		Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CH)	(2.2)				
3	3"ST	12"	M	-	5	Shelby Tube Hydraulically Pushed at 100 PSI from 3'-5'			52.3	25.8	
4	SS	18"	M	11		**					
5	SS	24"	M	49	10						
6	SS	18"	M	26	15	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace to Little Silt & Clay, Little Coarse Sand & Fine Gravel (SP-SM)					
7	SS	18"	M	52	20						
8	SS	6"	M	37	25						
9	SS	4"	M	44	30	Some Fine Gravel Encountered at 29'					
						Boring Completed to 30' on 2/10/82					
					35	* 1' of Frost Present					
						**Medium Dense, Dark Brown (10YR 3/3) Fine SAND, Some Silt & Clay, Trace of Medium Sand (SC)					
					40						
					45						

( ) Pocket Penetrometer Reading, TSF

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-02
Surface Elevation: 870.9
Job No.: C 10313
Sheet: 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' to 115' on 3/17/82					
						Unit: SAMS-1 Chief: Larry F.					
					50						
10	SS	18"	M	106	55	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
					60						
					65						
					70						
					75						
11	SS	18"	M	120	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Gravel, Trace Silt, Occasional Cobbles (SP)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-02
Surface Elevation: 870.9
Job No.: C 10313
Sheet: 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
					105						
					110						
12	SS	18"	W	173	115	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
						End Boring at 115'					
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling: _____
Upon Completion of Drilling: _____
Time After Drilling: ½ hour
Depth to Water: _____
Depth to Cave In: 28'M

GENERAL NOTES

Start: 2/10/82 Complete: 3/17/82
Crew Chief: LS Rig: 55-2
Drilling Method: CS 0-10'
FA 10-30'
DM/WO 30-115'

W-4

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-03
Surface Elevation: 862.7
Job No.: C 10313
Sheet: 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						12" TOPSOIL					
1	SS	18"	M	7		Stiff to Very Stiff, Dark Brown (10YR 3/3) Clayey SILT (ML)	(2.0)				
						*					
2	SS	17"	M	6	5						
3	SS	15"	M	10							
4	SS	18"	M	39	10						
						Loose to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Trace to Little Silt & Clay, Little Fine to Coarse Gravel (SP-SM)					
5	SS	13"	M	25	15						
6	SS	12"	M	40	20						
7	SS	18"	M	44	25						
8	SS	7"	M	28	30	Boring Completed to 30' on 2/10/82					
						* Loose, Dark Brown (10YR 3/3) Fine SAND, Some Silt & Clay, Trace of Medium Sand (SC)					
					35		( ) Pocket Penetrometer Reading, TSF				
					40						
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-03
Surface Elevation: 862.7
Job No.: C 10313
Sheet: 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' to 107' on 3/16/82					
						Unit: SAMS-1 Chief: Larry F.					
					50						
9	SS	18"	M	177	55	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
					60						
					65						
					70						
					75						
10	SS	18"	M	130	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBM-82-03
Surface Elevation: 862.7
Job No.: C 10313
Sheet: 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		Qu	W	LL	PL	D
					95						
					100						
					105	Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
11	SS	12"	W	132							
						End Boring at 107'					
					110						
					115	No Mud Loss During Drilling Operation					
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling: ½ hour
Depth to Water
Depth to Cave In: 30.0' Moist

GENERAL NOTES

Start: 2/10/82 Complete: 3/16/82
Crew Chief: JWG/MG Rig: 55-1
Drilling Method: CS 0-10'
FA 10-30'
DM/NQ 30-TD'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-04
Surface Elevation 869.0
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_p	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)					
1	SS	18"	M	10			(1.4)				
2	SS	18"	M	7	5	Loose to Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
3	SS	18"	M	24							
4	SS	18"	M	30/6"	10						
5	SS	18"	M	20	15	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Silt & Clay, Trace of Gravel (SM)					
6	SS	18"	M	28	20						
7	SS	18"	M	32	25	Encountered More Gravel & Less Silt from 25' - 30'					
8	SS	16"	M	54	30	Boring Completed to 30' on 2/15/82	( ) Pocket Penetrometer Reading, TSF				
					35						
					40						
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-04
Surface Elevation 869.0
Job No. C.10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' to 113' on 3/16/82					
						Unit: SAMS-2 Chief: Larry F.					
					50						
9	SS	9"	W	82	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	8"	M	91	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-04
Surface Elevation 869.0
Job No. C 10313
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
					105						
					110						
11	SS	18"	W	100		Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					115	End Boring at 113'					
					120	No Mud Loss During Drilling Operation					
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling --
Time After Drilling ½ hour
Depth to Water
Depth to Cave In 28.2' Moist

GENERAL NOTES

Start 2/15/82 Complete 3/16/82
Crew Chief JWG/MG Rig 55-1
Drilling Method CS 0-10'
FA 10-30'
DM/WO 30-113'

W-6

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-05
Surface Elevation 873.7
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						10" TOPSOIL					
1	SS	18"	M	6		Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.5)				
2	SS	18"	M	6	5	*					
3	SS	18"	M	38		Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
4	SS	16"	M	52	10	Occasional Cobbles at 7.5'					
5	SS	18"	M	41	15						
6	SS	12"	M	52	20						
7	SS	8"	M	62	25	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
8	SS	12"	M	45	30	Boring Completed to 30' on 2/15/82	( ) Pocket Penetrometer Reading, TSF				
					35	* Loose, Dark Brown (10YR 3/3) Fine to Medium SAND, Some Silt & Clay, Some Gravel (SC)					
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-05
Surface Elevation 873.7
Job No. C 10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		Qu	W	LL	PL	D
						Boring Completed from 30' to 121.5' on 3/17/82					
						Unit: SAMS-2 Chief: Larry F.					
9	SS	18"	M	159	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
10	SS	5"	M	188	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Little to Some Gravel, Little Silt (SP-SM)					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBM-82-05
Surface Elevation 873.7
Job No. C 10313
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					95						
					100						
					105						
					110						
					115						
11	SS	18"	W	177	120	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
						End Boring at 121.5'					
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ¼ hour
Depth to Water
Depth to Cave In 29.0' Moist

GENERAL NOTES

Start 2/15/82 Complete 3/17/82
Crew Chief JWG/MG Rig 55-1
Drilling Method CS 0-10'
FA 10-30'
DM/WO 30-121.5'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-01A
Surface Elevation 881.5
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						12" TOPSOIL					
1	SS	18"	M	8	*	Medium to Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)					
2	SS	18"	M	4	5		(1.0)				
3	SS	16"	M	8							
4	SS	18"	M	24	10	Loose to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace to Little Silt, Little Gravel (SP-SM)					
5	SS	17"	M	20	15	Some Gravel Encountered from 14' to 20'					
6	SS	5"	M	28	20						
7	SS	9"	M	43	25		( )	Pocket Penetrometer Reading, TSF			
8	SS	6"	M	47	30	Boring Completed to 30' on 2/17/82					
					35	* 2' of Frost Present Note: Moved over and pushed 3" shelby tube hydraulically from 4' to 6' (50-100 PSI); Sample 2A: 20" Recovery					
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBN-82-01A
Surface Elevation 881.5
Job No. C-10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture									
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					50	Boring Completed from 30'-115' on 3/18/82 Unit: SAMS-1 Chief: Larry F.					
9	SS	18"	M	141	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace to Little Silt (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	18"	M	185	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					85	Drove a Boulder at 79'					
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project ...Badger Army Ammunition Plant.....

Location ...Baraboo, Wisconsin.....

Boring No. PBN-82-01A

Surface Elevation 881.5

Job No. C 10313

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		Qu	W	LL	PL	D
					95						
					100						
					105						
					110	Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt (SP)					
11	SS	18"	M	101	115						
					120	End Boring at 115'					
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling ½ hour

Depth to Water

Depth to Cave In 26' Moist

GENERAL NOTES

Start 2/16/82 Complete 3/18/82

Crew Chief JWG/MG Rig 55-1

Drilling Method CS 0-10'
FA 10-30'
DM/WO 30-115'

W-8

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBN-82-01B
Surface Elevation: 881.5
Job No.: C-10313
Sheet: 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						150 Gallons of Drilling Mud Loss between 20' - 30'					
					40	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-01A					
					80	300 Gallons of Drilling Mud Loss between 90' - 100'					
					120	End Boring at 129'					
					160						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/10/82 Complete 3/10/82
Crew Chief L.F. Rig SAMS-2
Drilling Method DM 0-129'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-01C
Surface Elevation 881.5
Job No. C-10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-01A 600 Gallons of Drilling Mud Loss from 18' - 22'					
					40						
					80						
					120						
						End Boring at 138.5'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/9/82 Complete 3/9/82
Crew Chief LF Rig SAMS-1
Drilling Method DM 0-138.5'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-02A
Surface Elevation 882.9
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						10" TOPSOIL					
1	SS	18"	M	14	*	Stiff to Very Stiff, Dark Yellowish Brown (10YR 3/3) Silty CLAY (CH)	(2.2)				
2	3"ST	24"	M	-	5	Shelby Tube Pushed Hydraulically at 900 PSI	(1.2)				
3	SS	18"	M	7		**					
4	SS	18"	M	100/4"	10	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND & GRAVEL, Little Silt & Clay (SM-SW)					
5	SS	18"	M	143	15						
6	SS	18"	M	44	20	Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Little Silt & Clay, Some Medium Sand (SP-SM)					
7	SS	18"	M	84	25						
8	SS	-	M	100/8"	30	No Recovery at 30'					
						Boring Completed to 30' on 2/10/82					
						* 1.5' of Frost Present	( ) Pocket Penetrometer Reading, TSF				
					35	**Loose, Dark Brown (10YR 3/3) Fine SAND, Some Silt & Clay, Little Medium Sand, Trace Coarse Sand (SC)					
					40						
					45						

(Continued)

W-2

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBN-82-02A
Surface Elevation: 882.9
Job No.: C 10313
Sheet: 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		Qu	W	LL	PL	D
						Boring Completed from 30' - 116' on 5/1/82					
						Unit: SAMS-2 Chief: Tom O.					
					50						
9	SS	18"	M	48	55	Dense, Very Pale Brown (10YR 7/3) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					60						
					65						
					70						
					75						
10	SS	24"	M	91	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Gravel, Trace Silt (SP)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-02A
Surface Elevation 882.9
Job No. C 10313
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
					105						
					110						
					115	Very Dense, Pale Brown (10YR 6/3) Fine to Medium SAND, Trace Silt (SP)					
11	SS	18"	M	62							
					120	End Boring at 116'					
					125	No Mud Loss Encountered During the Drilling Operation					
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water
Depth to Cave In 26'M

GENERAL NOTES

Start 2/10/82 Complete 5/11/82
Crew Chief LS Rig 55-2
Method CS 0-10'
10-30'
/WO 30-116'

WA

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBN-82-02B

Surface Elevation 882.9

Job No. C 10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-02A					
					40						
						No Water Loss - Used 7 Bags of Well Gell					
					80						
					120						
						End Boring at 129.5'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/8/82 Complete 3/8/82

Crew Chief LF Rig SAMS-1

Drilling Method DM 0-129.5'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-02C
Surface Elevation 882.9
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-02A					
					40						
						110 Gallons of Drilling Mud Loss from 40' - 60'					
					80						
					120						
						End Boring at 139'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/9/82 Complete 3/9/82
Crew Chief LF Rig SAMS-1
Drilling Method DM 0-139'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBN-82-03A
Surface Elevation: 857.6
Job No.: C 10313
Sheet: 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						12" TOPSOIL					
1	SS	M	18"	26	*	Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CH)					
2	SS	M	18"	6	5	**	(2.0)				
3	3"ST	M	7"	-							
4	SS	M	12"	10	10	Loose to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Trace of Silt & Clay, Little to Some Fine to Coarse Gravel (SP)					
5	SS	M	18"	30	15	Color Change at 15' to Light Yellowish Brown (2.5Y 6/4)					
6	SS	M	6"	22	20						
7	SS	M	12"	41	25						
8	SS	M	12"	41	30	Boring Completed to 30' on 2/11/82					
					35		( )	Pocket Penetrometer Reading, TSF			
					40	* 2' of Frost Present **Shelby Tube Pushed Hydraulically from 5.5' - 7.5' at 1000 PSI					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-03A
Surface Elevation 857.6
Job No. C 10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					50	Boring Completed from 30'-95' on 3/15/82 Unit: SAMS 2 Chief: Larry F.					
9	SS	18"	M	180	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	18"	M	168	80	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-03A
Surface Elevation 857.6
Job No. C 10313
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Pale Brown (10YR 6/3) Fine to Medium SAND, Little Silt (SP-SM)					
11	SS	12"	W	75	95						
						End Boring at 95'					
					100						
					105						
					110						
					115						
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ¼ hour
Depth to Water
Depth to Cave In 23.0' Moist

GENERAL NOTES

Start 2/11/82 Complete 3/15/82
Crew Chief JWG/MG Rig 55-1
Drilling Method CS 0-10'
FA 10-30'
DM/WO 30-95'

W-8

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-03B
Surface Elevation 857.6
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-3A					
					30						
					60						
					90						
					120	End Boring at 106'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/15/82 Complete 3/15/82
Crew Chief LF Rig SAMS-1
Drilling Method DM 0-106'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBN-82-03C

Surface Elevation 857.6

Job No. C 10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					30	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-03A					
						No Mud Loss During Drilling Operation					
					60						
					90						
					120	End Boring at 118'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/13/82 Complete 3/13/82

Crew Chief LF Rig SAMS-1

Drilling Method DM 0-118'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-04A
Surface Elevation 873.0
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	18"	M	46	*						
2	SS	12"	M	8	5	Loose to Very Dense, Yellowish Brown (10YR 5/6) Fine to Medium SAND, Some Silt & Clay, Trace to Little Gravel, Occasional Cobbles (SM)					
3	SS	18"	M	9							
4	SS	18"	M	14	10						
5	SS	17"	M	30	15	Some Gravel Encountered at 14'					
6	SS	18"	M	44	20						
7	SS	12"	M	60	25	Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Little Silt, Little to Some Gravel, Occasional Cobbles (SP-SM)					
8	SS	5"	M	42	30	Boring Completed to 30' on 2/16/82					
					35	* 2.5' of Frost Present					
					40	Note: Boring performed 20' north of proposed location due to presence of mud and snow.					
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-04A
Surface Elevation 873.0
Job No. C-10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30'-106' on 3/12/82					
						Unit: SAMS-2 Chief: Larry F.					
					50						
9	SS	18"	M	240	55	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt, Little to Some Gravel (SP)					
					60						
					65						
					70						
					75						
10	SS	18"	M	280	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-04A
Surface Elevation 873.0
Job No. C 10313
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		Qu	W	LL	PL	D
					95						
					100	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
					105						
11	SS	18"	W	285		End Boring at 106'					
					110	NOTE: Recorded blow counts for Sample #9, #10 & #11 may be inaccurate. Hammer failed to fall freely for the specified 30" drop.					
					115						
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ¼ hour
Depth to Water
Depth to Cave In 25.0' Moist

GENERAL NOTES

Start 2/16/82 Complete 3/12/82
Crew Chief JWG/MG Rig 55-1
Drilling Method FA 10-30' CS 0-10'
DM/WO 30-106'

we

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-04B

Surface Elevation:

Job No. C-10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					30	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-04A					
					60						
					90	Drilling from 90' - 118' performed on 3/13/82					
					120	End Boring at 118'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/12/82 Complete 3/13/82

Crew Chief LF Rig SAMS-1

Drilling Method DM 0-118'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-04C
Surface Elevation 873.0
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring PBN-82-04A					
					40						
					80						
					120						
						End Boring at 129'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/11/82 Complete 3/11/82
Crew Chief LF Rig SAMS-1
Drilling Method DM 0-129'

wb

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-05A
Surface Elevation 875.8
Job No. C-10313
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	12"	M	7	*	Black (5Y 2.5/1) Clayey SILT (ML)	(4.5+)				
2	SS	18"	M	11	5	Medium to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(3.5)				
3	SS	18"	M	7			(2.5)				
4	SS	18"	M	9	10	Little Sand at 10'	(0.8)				
5	SS	18"	M	2	15	Very Loose to Medium Dense, Dark Yellowish Brown (10YR 3/4) Fine SAND, Some Silt & Clay, Little Gravel (SM)					
6	SS	12"	M	18	20	Boring Completed to 20' on 2/15/82					
7	SS	14"	M	33	25	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt & Clay, Some Gravel (SP-SM)					
8	SS	14"	M	37	30	Boring Completed to 30' on 2/16/82					
					35	* 2.5' of Frost Present					
					40	Note: Moved over and pushed 3" ST hydraulically from 6' to 8' (100 PSI) Sample 3A: 14" Recovery	( )	Pocket Penetrometer Reading, TSF			
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-05A
Surface Elevation 875.8
Job No. C 10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture									
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30'-110' on 3/13/82					
					50	Unit: SAMS-2 Chief: Larry F.					
9	SS	14"	M	96	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Some Gravel, Little Silt & Clay (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	12"	M	45	80	Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBN-82-05A
Surface Elevation: 875.8
Job No.: C 10313
Sheet: 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
					105	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Some Gravel, Little S[illegible] and Clay (SP-SM)					
11	SS	9"	M	71	110						
						End Boring at 110'					
					115						
					120						
					125						
					130						

WATER LEVEL OBSERVATIONS

While Drilling: —
Upon Completion of Drilling: —
Time After Drilling: ½ hour
Depth to Water: 30.0'Moist
Depth to Cave In:

GENERAL NOTES

Start: 2/15/82 Complete: 3/13/82
Crew Chief: JWG/MG Rig: 55-1
Drilling Method: CS 0-10'
FA 10-30'
DM/WO 30-110'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. PBN-82-05B
Surface Elevation 875.8
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					40	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-05A					
						Drilling from 15' - 122' performed on 3/11/82					
					80						
						No Mud Loss During Drilling Operation					
					120						
						End Boring at 122'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/10/82 Complete 3/11/82
Crew Chief LF Rig SAMS-1
Drilling Method DM 0-122'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: PBN-82-05C
Surface Elevation: 875.8
Job No.: C 10313
Sheet: 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-05A					
					40						
						400 Gallons of Drilling Mud Loss at 90'					
					80	Drilling from 75' - 131' performed on 3/11/82					
					120						
						End Boring at 131'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start: 3/10/82 Complete: 3/11/82
Crew Chief: LF Rig: SAMS-2
Drilling Method: DM 0-131'

ws

FIELD BORING LOG

BORING NO. LOB-90-01

T NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/21	COMPLETED 8/21
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP #: TE#7	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 141.5'	WATER LEVEL: ≈140	TOTAL DEPTH: 141.5'
LOGGED BY: J Bliss	CHECKED BY: P. Bolan	DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-1.5	1 4 7	18" / 18"	dark brown med-fn SAND wt/ silt gravel, black vitrious slag	Fill	0.0	
S#2	5-6.5	5 2 4	18" / 1"	black vitreous slag waste nail. (possible asphalt)	metals + ABN sample	0.0	
	6.5-7.5	4 4 2	18" / 6"	black asphalt with wood sandy texture	Fill	0.0	
S#3	10-12.5	10 10 12	18" / 6"	dark brown to black oily asphalt waste wt wood.		3.9	
S#4	15-16.5	31 18 16	18" / 14"	15-15.5 dark brown to black asphalt was wt/ coarse aqu angular gravel.	change at 15.5	00	
				15.5-16.5 brown to tan fn-med sand wt/ little gravel. SP	glacial fill ↓	00	
S#5	20-21.5	12 11 13	18" / 18"	tan fn-med SAND wt/ little gravel + highly weathered gabbro boulder SP		00	
S#6	25-26.5	6 10 11	18" / 18	Tan fn-med SAND wt/ trace gravel SP		0.0	
S#7	46-47.5	7 12 15	18" / 18"	Tan Med-fn SAND wt trace gravel SP		0.0	

FIELD BORING LOG

BORING NO. LOB-90-01

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: C Rodriguez	DATE STARTED 8/21/90	COMPLETED
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP ID: TE#2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 141.5'	WATER LEVEL: ≈ 140	TOTAL DEPTH: 141.5'
LOGGED BY: J Blair	CHECKED BY: P Bolar	DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#8	67-68.5	6 20 44	18" / 14"	tan crse-fine SAND with gravel SP	Fluvial deposit	0.0	
S#9	86-87.5	10 25 35	18" / 18"	tan Med-Fn SAND wt occasional gravel layer GP/SP			
	87-116		-	Med-Fn SAND wt/gravel.			
	116-117		-	possible silt zone (silt encrusted on cuttings)			
	117-119		-	V dense gravel/cobble zone.			
	122-124		-	" " " " "			
	128		-	tan cuttings, less silt, cleaner. GP/SP			
S#10	140-141.5	14 37 35	18" / 12"	coarse gravel ~~prevents~~ results in loss of material from split spoon. 3rd attempt yields crse sand & gravel. GP			

FIELD BORING LOG

BORING NO. LOB-90-02

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/21	COMPLETED 8/21/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP ID: TE#2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 21.5'	WATER LEVEL: NA	TOTAL DEPTH: 21.5'
LOGGED BY: J Burke	CHECKED BY: Paul Bell	DATE: 8/21	

3" OD SS Sampler. Lo 9/25/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-1.5	9 9 11	18"/10	6" dark brown silt some gravel with roots red material Asphalt 12" brown to tan silty fine SAND	FILL to	0.0	
S#2	5-6.5	12 13 15	18"/18"	Tan fn SAND wt Med Gravel SP		0.0	
S#3	10-11.5	9 11 14		Tan fn SAND with little fine - Med Gravel SP		0.0	
S#4	15-16.5	9 12 12		similar to S#3. SP		0.0	
S#5	20-21.5	10 10 11		Similar to S#4 SP			
				20ft BOE Move 75ft SW to center of Old Landfill.			

FIELD BORING LOG

Boring No. LOM-91

Project No 06853-03	Project Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-10-91	completed 10-10-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 151'	∑ below ground 142	Total Depth 151'
Logged by RRR	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATM	LEL
S-1	0-10'			LT BROWN SAND, PGD, F, TR COBBLES, TR C GRAVEL, TR SILT	(SP)	0	0	0
S-2	10-20'			SAME AS S-1	(SP)	0	0	0
S-3	20'-30'			" " "	(SP)	0	0	0
S-4	30-40'			LT BROWN SAND, PGD, F LITTLE F GRAVEL, TR C GRAVEL, TR COBBLES, TR SILT	(SP)	0	0	0
S-5	40-50			SAME AS S-4	(SP)	0	0	0
S-6	50-60			" " "	(SP)	0	0	0
S-7	60-70			LT BROWN SAND, WGD, M-C, SOME FINE GRAVEL, TR COBBLES, TR F SAND	(SW)	0	0	0
S-8	70-80			SAME AS S-7	(SW)	0	0	0
S-9	80-90			80-84': SAME AS S-7 84-90: LT BROWN SAND, PGD, MED, LITTLE COARSE SAND, TR FINE SAND, TR FINE GRAVEL	(SW) (SP)	0	0	0
S-10	90-100			SAME AS S-9 (84-90')	(SP)	0	0	0
S-11	100-110			SAME AS S-10	(SP)	0	0	0
S-12	110-120			110-112: SAME S-10 112-120: COBBLE AND BOULDER ZONE, SOME C SAND, TR MEDIUM SAND	(SP)	0	0	0

FIELD BORING LOG

Boring No. LOM-91-01

Project No 0685303	Project Name BADGER AAP		Page 2 of 2
Contractor LAYNE	Driller C RODRIGUEZ	Date started 10-10-91	completed 10-10-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 151'	∇ below ground 142	Total Depth 151'
Logged by RRR	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU AIR	Monitoring LEL
S-13	120-130			120-123: SAME AS S-12 123-130: BROWN GRAVEL WGD, F-C, SOME C SAND LITTLE MED SAND, SOME COBBLES (GW)		0	0	0
S-14	130-140			LT BROWN SAND, PGD, C, LITTLE MED, TR F GRAVEL (SP)		0	0	0
S-15	140-150			LT BROWN SANDY GRAVEL F-C, WGD, SOME C SAND LITTLE MED. SAND, TR COBBLES (GW)	WATER TABLE AT 142'	0	0	0
				B.O.E. = 151'				

FIELD BORING LOG

Boring No. LOM-91-

Project No 06853-03	Project Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-25-91	completed 10-25-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 148'	↧ below ground 138'	Total Depth 148'
Logged by TRR	Checked by DRP	Date 10/28/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
S-1	0-10'	0-8		BROWN CLAYEY SILT, TR F SAND. PLD	(ML)		0	0
		8-10		LT BROWN SILTY SAND, PLD, F	(SP)			
S-2	10-20'			LT BRWN SAND, PLD, F, LITTLE M, LITTLE SILT	(SP)		0	0
S-3	20-30'			LT BROWN SAND, WLD, M, SOME F, LITTLE C, TR SILT, TR F GRAVEL, TR COBBLES	(SW)		0	0
S-4	30-40			SAME AS S-3	(SW)		0	0
S-5	40-50			LT BROWN SAND, PLD, M, LITTLE C, LITTLE F, TR F GRAVEL.	(SP)		0	0
S-6	50-60			LT BROWN SAND, WLD, C, SOME F GRAVEL, SOME M SAND, LITTLE C GRAVEL, TR F SAND, TR COBBLES	(SW)		0	0
S-7	60-70			SAME AS S-6	(SW)		0	0
S-8	70-80			SAME AS S-6	(SW)		0	0
S-9	80-90			" " "	(SW)		0	0
S-10	90-100			LT BROWN SAND, WLD, M, SOME C, LITTLE F, LITTLE TO TR F GRAVEL, TR COBBLES TR SILT.	(SW)		0	0
S-11	100-110	100-105		GREY-BROWN SANDY GRAVEL AND GRAVELLY SAND, WLD C SAND, F GRAVEL.	(SW) (GW)		0	0
		105-110		-COBBLE AND BOULDER ZONE				
NO	110-120 SAMPLE			COBBLE + BOULDERS			0	0
S-13	120-130	120-128		BROWN GRAVELLY SAND, WLD M-C, GRAVEL: F-C	(SW)		0	0
		128-130		LT BROWN SAND, PLD, M, SOME C, LITTLE F				

FIELD BORING LOG

Boring No. B Lom-91-0

Project No 06853-03	Project Name BADLER AAP		Page 2 of 2
Contractor LAYNE	Driller G ROBINSON	Date started 10-25-91	completed 10-25-91
Method DUAL WALL	Casing Size 9" 0.0	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 148'	⚓ below ground 138.5	Total Depth 148'
Logged by RRL	Checked by DRP	Date 10/28/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-14	130-140	130-133 135-140		SAME AS 128-130 BROWN SANDY GRAVEL, WGD, F-C, LITTLE COBBLES; SAND: C, SOME M, WET	(GW) ▼ 138.5'		0	0
S-15	140-148			BROWN GRAVEL, WGD, F-A, LITTLE F SAND, TR SILT B.O.E = 148'	(GW)		0	0

FIELD BORING LOG

BORING NO. LOM-8901

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 1 OF 1

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: G. RODRIGUEZ | DATE STARTED 2/16/89 COMPLETED 2/17/89

METHOD: DUAL WALL | CASING SIZE: 9" | TIP eV: 0.00 | PROTECTION LEVEL: D

GROUND ELEV.: 915.9 | SOIL DRILLED: 158.5' | WATER LEVEL: ~141' | TOTAL DEPTH: 158.5'

LOGGED BY: D. BELAN | CHECKED BY: GSP | DATE: 2/24/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 S-2	0-10' 10-20'			MED BRN, SM, MOIST, LOOSE SM POORLY SORTED, WELL ROUNDED GRAVEL		—	
S-3	20-30'			MED BRN, SP, MOIST, LOOSE OCCASIONAL FINE GRAVEL (SP)			
S-4	30-40'			MED GRN, SP, MOIST, LOOSE, TRACE FINE-MEDIUM GRAVEL (SP)			
S-5	40-50'			MED BRN, SM, MOIST, LOOSE, SOME COBBLES AND GRAVEL (SP)			
S-6	50-60'			MED. BRN, SM, MOIST, LOOSE, TR GRAVEL (SP)	✓ Change @ 60'		
S-7	60-70'			MED BRN, SM-GP, MOIST, LOOSE ABUNDANT WELL ROUNDED, POORLY SORTED GRAVEL (GP)			
S-8	70-80'			MED BRN SM, MOIST, LOOSE, ABUNDANT WELL ROUNDED GRAVEL (SP)	✓ Change @ 70'		
S-9	80-90'			MED BRN SM, MOIST, LOOSE, TRACE TO MODERATE WELL ROUNDED GRAVEL (SP)			
S-10	90-100'			MED BRN SM, MOIST, LOOSE, TRACE POORLY SORTED, WELL ROUNDED GRAVEL (SP)			
S-11	100-110'			SIMILAR TO S-10 (SP)			
S-12	110-120'			SIMILAR TO S-10 TO 112' ROCK FRAGMENTS. PURPLE QUARTZ LIMESTONE, GRAVEL (SP)		0.0	
S-13	120-130'			GP DHB POORLY SORTED, ROUNDED, SOME ROCK FRAGMENTS, WITH LT BROWN SAND, FINE, FAIR SORTING (GP)	✓ Change @ 130'	0.00	
S-14	130-140'			LT BRN, SM DRY TO MOIST, LOOSE, MODERATE GRAVEL (GM) WELL ROUNDED POOR SORTING (GP)		OG	
S-15	140-150'			GM WELL ROUNDED, POOR SORTING, TO ~144' THEN MED BRN SM, WET, MOD DENSE	I @ 141'	000	
S-16	150-160'			LT BRN SM, WET, MOIST, MODERATE GRAVEL (SP)	✓ Change @ 150'	0.0	

EOB 2/17/89 DHB

FIELD BORING LOG

BORING NO. LOM-8902B

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 2/17/89	COMPLETED 2/18/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP eV: 00.0	PROTECTION LEVEL: D
GROUND ELEV.: 918.9	SOIL DRILLED: 200'	WATER LEVEL: 145.5	TOTAL DEPTH: ~~198~~ 200'
LOGGED BY: D. BELAN	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10'			DK BRN, SM, MOIST, LOOSE TR GRAVEL		0.00	
S-2	10-20'			MED-DK BRN, SM, MOIST, LOOSE, MODERATE FINE GRAVEL, WELL ROUNDED.	(SP)	0.00	
S-3	20-30'			MED BRN, SM, MOIST, LOOSE, TRACE GRAVEL (FINE), WELL ROUNDED	(SP)	00.0	
S-4	30-40'			MED BRN, SM-ML, MOIST, LOOSE, SOME COBBLES AND GRAVEL	(SP)	00.0	
~~S-5~~	~~40-50'~~			MED BRN, SM-ML, MOIST, LOOSE SCATTERED COBBLES AND GRAVEL	(SP)	00.0	
S-6	50-60'			MED BRN, SM-ML, MOIST, LOOSE COPIOUS COBBLES, SOME GRAVEL	(SP) ✓ CHANGE @ 60'	00.0	
S-7	60-70'			GM, WELL ROUNDED, POOR SORTING, WITH SOME MED BRN SM-	(GP)	00.0	
S-8	70-80'			GM, WELL ROUNDED, POOR SORTING, W/SOME MED-LT BRN SM-	(GP)	00.0	
S-9	80-90'			SIMILAR TO S-8	(GP)	00.0	
S-10	90-100'			GM, WELL ROUNDED, FAIR SORTING WITH SOME LT BRN SM-	(SP) ✓ CHANGE @ 100'	00.0	
S-11	100-110'			GP-GM, WELL ROUNDED, AND LT BRN SAND, MOIST, LOOSE, VERY FINE-FINE GRAINED	(SP)	00.0	
S-12	110-120'			GW, ANG-MODERATELY ROUNDED LITTLE LT BRN SAND, MOIST, LOOSE, VERY FINE-FINE GRAINED, COBBLES	(SP)	00.0	
S-13	120-130'			GW, ANG-ROUNDED, TRACE-LITTLE LT BRN SAND, COBBLES	✓ CHANGE @ 120' (GP)	00.0	
S-14	130-140'			GW, TO APPROX 134'; THEN MOSTLY VERY LT BRN SP, COBBLES	(GP)	00.0	
S-15	140-150'			GW, ROUNDED; AND SP, VERY LT BRN,	(GP) ✓ CHANGE @ 150'	00.0	
S-16	150-160'			SP, LT BRN, VERY FINE GRAINED WET, LOOSE, WITH SOME POORLY SORTED GRAVEL	(SP)	00.0	
S-17	160-170'			SP, SIMILAR TO S-16	(SP)	00.0	
S-18	170-180'			SIMILAR TO S-16	(SP)	00.0	
S-19	180-190'			SP, WITH SOME GRAVEL	(SP) ✓ CHANGE @ 190'	00.0	
S-20	190'-200'			GW, COBBLES	(GP)	00.0	

EOB 2/18/89 1455 HRS

FIELD BORING LOG

BORING NO. LON 8903B

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 2/20/89	COMPLETED 2/20/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP eV: 00.0	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 200'	WATER LEVEL: 144.5'	TOTAL DEPTH: 200'
LOGGED BY: D.H. BELAN	CHECKED BY: GEP	DATE: 2/24/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10'			DK BRN. SP-SW, MOIST, LOOSE TRACE GRAVEL, WELL ROUNDED, FAIR SORTING.	(SW)	00.0	
S-2	10'-20'			SIMILAR TO S-1	V CHANGE @ 10'	0.00	
S-3	20'-30'			DK-MED BRN SP, SOME SW, MOIST LOOSE, TR GW-GP.	(SP)	00.0	
S-4	30-40'			SIMILAR TO S-3	(SP)	00.0	
S-5	40-50'			MED BRN SP, MOIST, LOOSE, SOME GW, WELL ROUNDED	(SP)	00.0	
S-6	50-60'			MED BRN SP, MOIST - LOOSE, SOME GW, WELL ROUNDED	(SP)	00.0	
S-7	60-70'			SIMILAR TO S-6	(SP)	00.0	
S-8	70-80'			MED BRN SP, MOIST, LOOSE, SOME GW GW, WELL ROUNDED	(SP)	00.0	
S-9	80-90'			MED BRN SP, DAMP, LOOSE, V-FINE-FINE GRAINED, SUB ANG, WITH SOME GW, WELL ROUNDED	(SP)	00.0	
S-10	90-100'			MED BRN SP, DAMP, LOOSE, V FG-FG, SUBANG, W/ LITTLE-TRACE GW, WL RND	(SP)	00.0	
S-11	100-110'			MED BRN SP, DAMP LOOSE, VF-FG, SUBANG, W/TRACE GW, WL RND	(SP)	00.0	
S-12	110-120'			SIMILAR TO S-11	(SP)	00.0	
[redacted]					V CHANGE	00.0	
S-13	120-130'			GW, SUBRND-SUBANG, W/TRACE SP MED BRN	(GP) @ 128'	00.0	
S-14	130-140'			GW, SUBRND-SUBANG, W/ LITTLE SP MED BRN VFG-FG	(GP)	00.0	
S-15	140-150'			GW, SUBRND-SUBANG, TO ~145'; THEN SP, WET, LOOSE, VFG-FG W LITTLE GP, BLACK, ANG.	(GP) ✓ CHANGE @ 15'	00.0	
S-16	150-160'			SP, WET, LOOSE, VFG-FG, WITH LITTLE GW, ROUNDED-ANG	(SP)	00.0	
S-17	160-170'			SIMILAR TO S-16	(SP)	00.0	
S-18	170-180'			SP, WET, LOOSE, VFG-FG, W/TRACE GW-GP, ROUND-ANG	(SP)	00.0	
S-19	180-190'			SP, WET, LOOSE, BROWN, VFG-FG SLIGHT TRACE GP	(SP) (SP)	0.00	
S-20	190-200'			SAME AS ABOVE.	(SP)	00.0	

EOB 1300 HRS @ 200'

DHB 2/20/89

FIELD BORING LOG

Boring No. SPB-91-01

Project No 6853-03	Project Name BAAP		Page 1 of 2
Contractor MATHES	Driller K. Bunselmeyer	Date started 10-14-91	completed 10-14-91
Method HSA/KNIFE 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 65'	∑ below ground 62.5	Total Depth 65'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	HNU AIR	LEL	SPB SPZ
13:56 S91014012	S-1	0-2'	2/6/6/9	2.0/1.4	Dark. Brown clayey Silt; trace organics and coarse sand; dry, Top Soil (ML)	Analytical		Bkg	Bkg	Bkg
14:01 S91014067	S-2	5-7'	4/5/6/6	2.0/1.2	Dk. Brown fine to med. Sand; some silt; trace organics and coarse sand, dry, Top soil (SM)	Analytical		Bkg	Bkg	Bkg
14:11 S91014012	S-3	10-12'	5/7/6/7	2.0/1.7	Brown fine sand; little medium sand in seams (~1" wide) is stained dk brown; no odor readings on stained soil or odor; dry (SP)	Analytical		Bkg	Bkg	Bkg
14:18	S-4	15-17	2/4/5/7	2.0/2.0	Tan medium Sand; trace fine and coarse sand; damp (SP)	Reference			Bkg	Bkg
14:26 S91014022	S-5	20-22	3/3/4/5	2.0/1.5	Brown medium Sand; some coarse sand; trace fine sand and medium gravel and dark brown silt. It appears the sample is stained (dark brown) in porosities -- could be organics from plow horizon/manure. (SP)	Analytical		Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. SP13-11

Project No 6153-03	Project Name BAAP		Page 2 of 2
Contractor MATHES	Driller K. Bumelmeyer	Date started 10-14-91	completed 10-14-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.71(10.2)	Protection Level D
Ground El	Soil Drilled 65'	∇ below ground 62.5	Total Depth 65'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATR	LEL	DR SAM
14:35	S-6	30-32	1/3/4/4	2/1.3	Brown medium Sand; little coarse sand; trace fine sand and silt in seams; damp. (SW)	Reference		BKG	BKG	D
14:50	S-7	40-42	8/11/11/20	2.0/1.6	Tan to brown medium sand; little coarse sand; trace fine to medium rounded gravel and silt. Sample peppered w/HM. damp. (SW)	Reference		BKG	BKG	BKG
15:00	S-8	50-52	6/7/8/12	2.0/2.0	Tan ~~fine~~ RHA medium Sand; little fine sand; trace HM; dry (SP)	Reference		BK	BKG	BK
15:15 SG101062	S-9	60-62	13/19/28/33	2.0/2.0	Tan fine Sand; wet (SP)	~~Reference~~ Analytical		BKG	BKG	BK
15:30 SG101067	S-10	65-67	4/10/15/21	2.0/1.6	Tan fine Sand; wet (SP)	Analytical ∇ 62.5 T.D. 65'		BKG	BKG	BK

FIELD BORING LOG

Boring No. SPN-91-02D

Project No 06853-03	Project Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-9-91	completed 10-9-91
Method DUAL WALL	Casing Size 6"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 190'	∇ below ground 65'	Total Depth 190'
Logged by TCRR	Checked by	Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	HNU ATR	LEL
S-1	0-10'			LT BROWN SAND, WGD, F-M, SOME GRAVEL, LITTLE COBBLES.	(SW)		0	0
	10-23'			GLACIAL ERRATIC BOULDER				
S-2	23'-30'			LT BROWN SANDY GRAVEL WGD, F-C GRAVEL, C. SAND, SOME COBBLES 2"-4" DIAM.	(GW-GP)		0	0
S-3	30-40'			LT BROWN SAND, WGD, COARSE, SOME MEDIUM SAND, SOME FINE GRAVEL TR. COBBLES.	(SW)		0	0
S-4	40-50'			SAME AS S-3 BUT W/ COARSE GRAVEL BED 45-46'			0	0
S-5	50-60'			50-55': SIMILAR TO S-3			0	0
				55'-60': LT BROWN SAND PGD, F-M, LITTLE C SAND TR. SILT, TR GRAVEL	(SP)			
S-6	60-70'			LT BROWN SAND, PGD, F-M, LITTLE C SAND, TR SILT, TR. GRAVEL	WATER TABLE AT ≈ 65' (SP)		0	0
S-7	70'-80'			LT BROWN SAND, PGD, F, LITTLE MEDIUM, TR SILT.	(SP)		0	0
S-8	80-90'			SIMILAR TO S-7	(SP)			

FIELD BORING LOG

Boring No. SPN-9

Project No	Project Name		Page 2 of 2
Contractor	Driller	Date started	completed
Method	Casing Size	HNU 11.7/10.2	Protection Level
Ground El	Soil Drilled	⚓ below ground	Total Depth
Logged by	Checked by	Date	

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
S-9	90-100			COARSE BROWN SAND SOME F. GRAVEL, P.GD (SP)		0	0	0
S-10	100-110			LT BROWN SAND P.GD. C, SOME F. GRAVEL TR. FINE SAND WET (SP)		0	0	0
S-11	110-120			LT BROWN SAND P.GD C, TR. F GRAVEL (SP)	SAMPLE SEEMS TO FINE DOWN			
S-12	120-130			SAME AS S-11 (SP)	CONSIDERABLE HEAVING	0	0	
S-13	130-140			BROWN SAND, P.GD, (SP) M-C, QUARTZITE COBBLE		0	0	0
S-14	140-150			SAME AS S-13 (SP) COARSENING DOWNWARD TO SOME FINE GRAVEL		0	0	0
S-15	150-160			BROWN SANDY GRAVEL, WGD FINE, ~~SOME COARSE~~ SAND, SOME MED. SAND TR COBBLES QTBITE		0	0	0
S-16	160-170			SAME AS S-15		0	0	0
S-17	170-180			BR GRAVELLY SAND, WGD M-C. TR COBBLES		0	0	0

FIELD BORING LOG

Boring No.

Project No	Project Name	Page ____ of ____
Contractor	Driller	Date started / completed
Method	Casing Size	HNU 11.7/10.2 / Protection Level
Ground El	Soil Drilled	⚓ below ground / Total Depth
Logged by	Checked by	Date

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-12	120-130			BROWN COARSE SAND (SP) P GRADED. WET TR. F. GRAVEL	FROM 120-130 NO CUTINGS COMING UP INITIAL CONSIDERABLE HEAVING.	0	0	0
S-13	130-140'			MED - COARSE BROWN SAND. QUARTZITE (SP) COBBLE. P. GRADED		0	0	0
S-14	140-150			SAME AS S-13 (SP) COARSENING DOWNWARD TO SOME FINE GRAVEL	SAND HEAVING FASTER THAN WATER BEING PUMPED. STOPPED TO GET NEW PUMP.	0	0	0
S-15	150-160			BRENN COARSE SAND + FINE GRAVEL. SOME COARSE GRAVEL. LITTLE COBBLES QTZITE. WELL GRADED WET. TR MED SND		0	0	0
S-16	160-170			SAME AS S-15		0	0	0
S-17	170-180			MED-COARSE SR, SAND P/GRADED WET.		0	0	0
S-18	180-190			COARSE SAND AND GRAVEL (FINE-MED) WELL GRADED. TR. MED SAND		0	0	0

FIELD BORING LOG

Boring No. SAN-91-02

Project No 06853-03	Project Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-9-91	completed 10-9-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 190'	∇ below ground 65	Total Depth 190'
Logged by TCRC	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL
S-1	0-10'			LT BROWN SAND, WGD, F-M, SOME GRAVEL, LITTLE COBBLES.	(SW)	0	0	0
	10-23'			GLACIAL ERRATIC BOULDER				
S-2	23'-30'			LT BROWN SANDY GRAVEL WGD, F-C GRAVEL, C. SAND, SOME COBBLES 2"-4" DIAM.	(GW)	0	0	0
S-3	30-40'			LT BROWN SAND, WGD, COARSE, SOME MEDIUM SAND, SOME FINE GRAVEL TR. COBBLES.	(SW)	0	0	0
S-4	40-50'			SAME AS S-3 BUT W/ COARSE GRAVEL BED 45-46'	(SW)	0	0	0
S-5	50-60'			50-55': SIMILAR TO S-3	(SW)	0	0	0
				55'-60': LT BROWN SAND PGD, F-M, LITTLE C SAND TR. SILT, TR GRAVEL	(SP)			
S-6	60-70'			LT BROWN SAND, PGD, F-M, LITTLE C SAND, TR SILT, TR. GRAVEL	(SP) WATER TABLE AT ≈ 65'	0	0	0
S-7	70'-80'			LT BROWN SAND, PGD. F, LITTLE MEDIUM, TR SILT.	(SP)	0	0	0
S-8	80-90'			SIMILAR TO S-7	(SP)			

FIELD BORING LOG

Boring No. SP13-91-01

Project No 68-53-03	Project Name BAAP		Page 2 of 2
Contractor MATHES	Driller K. Bunselmeyer	Date started 10-14-91	completed 10-14-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 65'	∇ below ground 62.5	Total Depth 65'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU ATR	Monitoring LEL	SP Samp
14:35	S-6	30-32	1/3/4/4	2/1.5	Brown medium Sand; little coarse sand; trace fine sand and silt in seams; damp. (SW)	Reference		BKg	BKg	D
14:50	S-7	40-42	8/11/11/20	2.0/1.6	Tan to brown medium sand; little coarse sand; trace fine to medium rounded gravel and silt. Sample peppered w/HM. damp. (SW)	Reference		BKg	BKg	BKg
15:00	S-8	50-52	6/7/8/12	2.0/2.0	Tan ~~RHA~~ medium Sand; little fine sand; trace HM; dry (SP)	Reference		Bk	Bkg	Bk
15:15 SG101062	S-9	60-62	13/19/29/33	2.0/2.0	Tan fine Sand; wet (SP)	~~Reference~~ Analytical		Bkg	Bkg	Bk
15:30 SG101067	S-10	65-67	4/10/15/20	2.0/1.6	Tan fine Sand; wet (SP)	Analytical ∇ 62.5 T.D. 65'		Bkg	Bkg	Bk

FIELD BORING LOG

Boring No. SPB

Project No 6853-03	Project Name BAAP		Page 1 of 2
Contractor MATHES	Driller K. Busselmeyer	Date started 10-14-91	completed 10-14-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 65'	⊻ below ground 62.5	Total Depth 65'
Logged by RHA	Checked by DRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	SP
13:56 59101002	S-1	0-2'	2/6/6/9	2.0 / 1.4	Drk. Brown clayey Silt; trace organics and coarse sand; dry, Top Soil (ML)	Analytical		Bkg	Bkg	Bk
14:01 59101007	S-2	5-7'	4/5/6/6	2.0 / 1.8	Drk. Brown fine to med. Sand; some silt; trace organics and coarse sand, dry, Top soil (SM)	Analytical		Bkg	Bkg	Bkg
14:11 59101012	S-3	10-12'	5/7/6/7	2.0 / 1.7	Brown fine sand; little medium sand in seams (2" thick) is stained dark brown; no HNU readings on stained soil or odor; dry (SP)	Analytical		Bkg		Bkg
14:18	S-4	15-17	2/4/5/7	2.0 / 2.0	Tan medium Sand; trace fine and coarse sand; damp (SP)	Reference			Bkg	Bk
14:26 59101022	S-5	20-22	3/3/4/5	2.0 / 1.5	Brown medium Sand; Some coarse sand; trace fine sand and medium gravel and dark brown silt. It appears the sample is stained (dark brown) in portions -- could be organics from plow horizon/manure. (SP)	Analytical		Bkg	Bkg	Bk

FIELD BORING LOG

Boring No. SAN-91-02D

Project No 06853-03	Project Name BADGER AAP			Page 2 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10.9.91	completed 10-9-91	
Method DUALWALL	Casing Size 9" O.D.	HNU 11.7/10.2		Protection Level D
Ground El	Soil Drilled 190'	∇ below ground 65'		Total Depth 190'
Logged by DRL	Checked by DBP	Date 10/11/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
S-9	90-100'			BROWN SAND, MOD. GR, M-C, SOME FINE GRAVEL TR. FINE SAND	(SW)	0	0	0
S-10	100-110			SIMILAR TO S-9	(SW)	0	0	0
S-11	110-120			" " "			0	0
S-12	120-130			BROWN SAND, PGD, MED, SOME C SAND, LITTLE F SAND, TR GRAVEL, TR SILT.	(SP)	0	0	0
S-13	130-140			SAME AS S-12	(SP)	0	0	0
S-14	140-150			SAME AS S-12	(SP)	0	0	0
S-15	150-160			" " "	(SP)	0	0	0
S-16	160-170			BROWN SAND, PGD, M.C. LITTLE F GRAVEL, TR. F. SAND, TR. SILT.	(SP)	0	0	0
S-17	170-180			BROWN SAND, WGD. C, SOME MED. SAND, SOME GRAVEL, TR FINE SAND	(SW)	0	0	0
S-18	180-190			SAME AS S-17	(SW)	0	0	0
				B.O.B. = 190'				

FIELD BORING LOG

Boring No. SPN-91-02D

Project No 06853-03	Project Name BADGER AAP.		Page 1 of 3
Contractor LAYNE	Driller G RODRIGEZ	Date started 9-25-91	completed 9-28-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 192'	∇ below ground 63'	Total Depth 192'
Logged by RRR	Checked by DRP	Date 10/10/91	

ABANDONED

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	HNU /ar	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-10'			LT BROWN, P GD, F-M SAND DAMP (SP)	0		0	0
S-2	0-20'			LT BROWN, P GD M-C SAND (SP) DAMP	0		0	0
S-3	20-30'			SAME AS S-2 (SP)	0		0	0
S-4	30-40'			BROWN, MOD. GD (SW), M-C SAND, SOME F. GRAVEL. DAMP	0		0	0
	40-50'			NO SAMPLE				
S-5	50-60'			LT BROWN, MOD. GD (SW), M-C SAND, SOME F. GRAVEL, TR. DOLOMITE COBBLES	0		0	0
S-6	60-70'			BROWN SAND (SP) P GD, F-M. WET	0	HIT WATER TABLE AT 63' 9-25-91 / 9-26-91	0	0
S-7	70-80			LT BROWN SAND (SP) P GD, F-M, TR. COARSE, TR. SILT WET	0		0	0
S-8	80-90			SAME AS S-7 (SP)	0		0	

FIELD BORING LOG

Boring No. SPN-91-02D

Project No 06853-03	Project Name BADGER AAP		Page 2 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 9-25-91	completed 9-28-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 192'	⚓ below ground 63'	Total Depth 192'
Logged by RRR	Checked by DRP	Date 10/10/91	

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-9	90-100			COARSE BROWN SAND SOME F. GRAVEL, P. GD (SP)		0	0	0
S-10	100-110			LT BROWN SAND P.GD. C, SOME F. GRAVEL TR. FINE SAND WET (SP)		0	0	0
S-11	110-120			LT BROWN SAND P.GD C, TR. F GRAVEL (SP)	SAMPLE SEEMS TO HAVE DOWN			
S-12	120-130			SAME AS S-11 (SP)	CONSIDERABLE HEAVING	0	0	0
S-13	130-140			BROWN SAND, P.GD, (SP) M-C, QUARTZITE COBBLE		0	0	0
S-14	140-150			SAME AS S-13 (SP) COARSENING DOWNWARD TO SOME FINE GRAVEL		0	0	0
S-15	150-160			BROWN SANDY GRAVEL, WGD (GW) FINE, ~~SOME COARSE~~ SAND, SOME MED. SAND TR COBBLES QTZITE		0	0	0
S-16	160-170			SAME AS S-15 (GW)		0	0	0
S-17	170-180			BR GRAVELLY SAND, WGD (SW) M-C. TR COBBLES		0	0	0

FIELD BORING LOG

Boring No. SPN-91-[illegible]

Project No 06853-03	Project Name ISADORA AAP		Page 3 of 3
Contractor LAYNE	Driller L. RODRIGUEZ	Date started 9-25-91	completed 9-28-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 192'	∇ below ground 63'	Total Depth 192'
Logged by RRR	Checked by DRP	Date 10/10/91	

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-18	180-190			BROWN GRAVELLY SAND (SW) GRADING TO SANDY GRAVEL (GW) F-M GRAVEL C SAND WET		BKG AIR	0
				B.O.E. 192'			
				WELL ABANDONED ON 9-28-91 DUE TO INABILITY TO PREVENT HEAVING SANDS			

FIELD BORING LOG

Boring No. SPN-91 03D

Project No 06853-03	Project Name RADGER AAP		Page 1 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-8-91	completed 10-8-91
Method DUAL WALL	Casing Size 9"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 200'	∇ below ground 60'	Total Depth 200'
Logged by RRR	Checked by	Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	HNU ATR	LEL
S-1	0-10'			LT BROWN SAND F-M, PGD, TR COBBLES (FRACTURED)	(SP)	7.4	0	0
S-2	10-20'			LT BROWN SAND PGD, M-C TR F. GRAVEL, TR F. SAND	SP	2	0	0
S-3	20-30'			LT BROWN SAND PGD, M-C, LITTLE COBBLES 2"-4", TR F. SAND, TR F. GRAVEL	SP	0	0	0
S-4	30-40'			LT BROWN SAND MOD. GRD, M-C, TR COBBLES 2"-4" LITTLE FINE GRAVEL TR. F. SAND.	SP-SW	0	0	0
S-5	40-50'			SIMILAR TO S-4	SP-SW	0	0	0
S-6	50-60'			BROWN SAND, PGD, M-C, TR FINE GRAVEL TR F. SAND	HIT WATER TABLE AT 60' (SP) TRIPPED OUT TO CHANGE BITS ON CASING	1.1	0	0
S-7	60-70'			BROWN SAND, PGD F-M, TR SILT	SP	0	5.2	0
S-8	70-80'			SIMILAR TO S-7	SP	0	0	0

FIELD BORING LOG

Boring No. SPN-91-031

Project No 0685J-01	Project Name BADGER AAP		Page 2 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-8-91	completed 10-8-91
Method DUAL WALL	Casing Size 9"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 200'	⚓ below ground 60'	Total Depth 200'
Logged by RRR	Checked by	Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL
S-9	80-90'			80-87' - SIMILAR TO S-7 87'-90' BROWN SAND WGD, M-C, SOME COARSE GRAVEL, LITTLE COBBLES, TR SILT	(SW)	0	0	0
S-10	90-100			BROWN GRAVELLY SAND WGD, MED, SOME COARSE, LITTLE FINE SAND. TR SILT. GRAVEL: FINE-MED	(SW) TOOK VOA SAMPLES AT 100'	0	0	0
S-11	100-110'			BROWN SAND MOD. GRD, M-C, SOME F-M GRAVEL, TR COBBLES, TR F. SAND, TR SILT	(SW-GW)			
S-12	110-120'			BROWN SAND, PGD, MED, SOME COARSE, TR FINE GRAVEL, LITTLE F. SAND.	(SP)	0	0	0
S-13	120-130'			SAME AS S-12	(SP)	0	0	01
S-14	130-140			SAME AS S-12	(SP)	0	0	0
S-15	140-150			SAME AS S-12	(SP)	0	0	0
S-16	150-160			SAME AS S-12 @ 150-155' 155-160' @ BROWN SAND MED, PGD, SOME COARSE, LITTLE F. SAND, TR F-M GRAVEL, TR COBBLES.	(SP)	0	12.5	0

FIELD BORING LOG

Boring No. SPN-91 03D

Project No 06853-05	Project Name RADFORD AAP		Page 3 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-8-91	completed 10-8-91
Method DUAL WALL	Casing Size 9"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 200'	∑ below ground 60'	Total Depth 200'
Logged by RRR	Checked by	Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
S-17	160-170			BROWN SAND, PGD, MED. SOME COARSE, LITTLE FINE. TR SILT. TR COBBLES.	(SP)	0	0	0
S-18	170-180			SAME AS S-17	(SP)	0	0	0
S-19	180-190			180-185': SAME AS S-17 185-190: BROWN GRAVELLY SAND, WGD, MED, SOME COARSE SAND. GRAVEL: F-M TR SILT, LITTLE F. SAND	(SW)	0	0	0
S-20	190-200			BROWN SAND AND GRAVELLY SAND ALTERNATING BEDS. M-C, WGD, GRAVEL: F-C, LITTLE F-SAND, TR SILT.	(SW)	0	0	0
				BOB = 202' AT 12:30				

FIELD BORING LOG

Boring No. SB-91-04

Project No 06853-03	Project Name BADGER AAP		Page 1 of 3
Contractor LAYNE	Driller L. Rodgers	Date started 9-28-91	completed 10-2-91
Method DUALWALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level
Ground El.	Soil Drilled 212'	∑ below ground 48'	Total Depth 212'
Logged by RRR	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZR	Monitoring HNU ATR	Monitoring LEL%
S-1	0 - 10			ORGANIC MATTER, DARK TO LIGHT BROWN SAND W PEB, FINE - MED. SOME SILT, DRY LITTLE F-M GRAVEL	(SP) TECHNICAL PROBLEMS WITH P.I.D. METER	0		01
S-2	10 - 20			LT BROWN GRAVELY SAND WOB. F-M W SOME COARSE SAND. LAYERS OF COARSE GRAVEL, DRY VERY LOOSE	(SW)	0		00
S-3	20 - 30			LT BROWN SAND. MOD. GD. M-C, LITTLE FGR. TR COARSE GR	(SW)	0		
S-4	30 - 40			LT BROWN ~~SAND~~ GRAVELY SAND WOB M-C ~~SOME MEDIUM - COARSE~~ TRACE COARSE GRAVEL TRACE ∉ 3" QUARTZITE COBBLES, DAMP	(SW)	0		0
S-5	40 - 50			SAME AS S-4	(SW) HIT WATER TABLE AT 48'	0		0
S-6	50 - 60			LT BROWN SAND P.GD. FINE - MED TRACE FINE GRAVEL, WET	(SP)	0		0
S-7	60 - 70			SIMILAR TO S-6	(SP)	0		

FIELD BORING LOG

Boring No. SPN-91-04D

Project No 06853-03	Project Name BADGER AAP		Page 2 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 9-28-91	completed 10-2-91
Method DUALWALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 212	∇ below ground 43'	Total Depth 212
Logged by RLR	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL
S-8	70-80			70-75' LT BROWN SAND (SP) PGD, F-M TR SILT	NOTED @ AT 75' WATER	0	0	0
				75-80' BROWN SANDY GRAVEL (GW), SAND M-C, WGD SOME COARSE GRAVEL LITTLE COBBLES Ø 6" IN DIA TR SILT	TURNED DARK BROWN.	0	0	0
S-9	80'-90'			BROWN GRAVELLY SAND (SW) WGD, M-C, LITTLE COARSE GRAVEL, TR. SILT, TR FINE SAND.		0	0	0
S-10	90-100			BROWN SAND (SP) PGD, MED SOME COARSE, TR. FINE		0	0	0
S-11	100-110			SAME AS S-10 WITH (SP) LITTLE FINE GRAVEL		0	0	0
S-12	110-120			SAME AS S-11 (SP)		0	0	0
S-13	120-130			BROWN SAND M-C PGD. TR FINE GRAVEL (SP) TR FINE SAND, TR SILT		0	0	0
S-14	130-140			SAME AS S-13 (SP)		0	0	0
S-15	140-150			BROWN SAND (SW), MOD. GD M-C, SOME GRAVEL, TR. SILT			0	0
S-16	150-160			BROWN GRAVELLY SAND (SW) WGD. M-C, TR. SILT TR. COBBLES 2" - 4" DIAM.		0	0	0
NO SAMPLE	160-170			NO SAMPLE				
S-17	170-180			ALTERNATING BEDS OF GRAVELLY SAND (SW), SANDY GRAVEL (GW), AND SAND, M-C WGD., TR. SILT		0	0	0

FIELD BORING LOG

Boring No. SPN-91-OW3

Project No 06853-01	Project Name BADGER		Page 3 of 3
Contractor LAYNE	Driller G RODRIGUEZ	Date started 9-29-91	completed 10-2-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 212'	∇ below ground 48'	Total Depth 212'
Logged by RKR	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL
S-18	180-190			BROWN SAND, PGD (SP) M-C, TR FINE GRAVEL TR SILT	WATER BROWN DUE TO SILT	0	0	0
S-19	190-200			SAME AS 180-190 (SP)		0	0	0
S-20	200-205			BROWN SAND MED-C. PGD. SOME FINE INTERBEDS OF COARSE WGD GRAVELS ≤ 1" DIAM. (SP) (GW)		0	0	0
				BEDROCK	BOE 212'			

FIELD BORING LOG

BORING NO. SPN-89-01C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/29/89	COMPLETED 3/29/89
METHOD: DUAL WALL	CASING SIZE: 9½"	TIP eV: 0.0	PROTECTION LEVEL: D
GROUND ELEV.: 827.8	SOIL DRILLED: 135'	WATER LEVEL: 63'	TOTAL DEPTH: 135'
LOGGED BY: D.H. BELAN	CHECKED BY: JCP.	DATE: 4/10/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0 - 10			MED-DARK BRWN SAND, FINE GRAINED, POORLY GRADED, TRACE-LITTLE GRAVEL	0-5.0 TOP SOIL	00.0	
S-2	10 - 20			GRAVEL, MODERATELY-WELL GRADED, WELL ROUNDED, WITH SOME MED BROWN FINE SAND (GW)		00.0	
S-3	20 - 30			GRAVEL, WELL GRADED, FINE, W LITTLE COARSE GRAVEL AND SOME FINE MED BRN SAND (GW)	✓ CHANGE @ 30'	00.0	
S-4	30 - 40			GRAVEL, FINE, POORLY GRADED, WITH TRACE COARSE GRAVEL, SOME MED BRN FINE SAND (GP)	✓ CHANGE @ 40'	00.0	
S-5	40-50			LT BRN SAND, POORLY GRADED, FINE, CLEAN, TRACE VERY FINE GRAVEL (SP)		00.0	
S-6	50-60			LT BRN SAND, POORLY GRADED, FINE, ANGULAR, WITH LITTLE FINE ROUNDED GRAVEL (SP)		00.0	
S-7	60 - 70			LT BRN SAND, POORLY GRADED, FINE, SUBROUND-SUBANG, SOME VERY FINE ROUNDED GRAVEL, WET (SP)		00.0	
S-8	70 - 80			LT BRN SAND, WET, POORLY GRADED FINE, TRACE FINE GRAVEL (SP)		00.0	
S-9	80 - 90			LT BRN SAND, WET, POORLY GRADED FINE, CLEAN (SP)		00.0	
S-10	90 - 100			SIMILAR TO S-9 (SP)	✓ CHANGE @ 100'	00.0	
S-11	100 - 110			GRAVEL, WELL GRADED & ROUNDED WITH SOME FINE LT BRN SAND (GW)	✓ CHANGE @ 110'	00.0	
S-12	110 - 120			SAND, LT BRN, CLEAN, FINE, POORLY GRADED, TRACE GRAVEL (SP)		00.0	
S-13	120 - 130			LT BRN SAND, WET, POORLY GRADED FINE, WITH TRACE FINE GRAVEL (SP)		00.0	
S-14	130-135			SIMILAR TO S-13 (SP)		00.0	
				EOB 1310 HRS			

FIELD BORING LOG

BORING NO. SPN-8902C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: B. MEHORN	DATE STARTED 4/14/89	COMPLETED 4/14/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 820.0	SOIL DRILLED: 140'	WATER LEVEL:	TOTAL DEPTH: 140'
LOGGED BY: BCM	CHECKED BY: [illegible]	DATE: 4/25/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP
S-1	0-10			LT BROWN SAND, PGD, F-M, DAMP (SP)	0-5 TOPSOIL	0
S-2	10-20			SIMILAR TO S-1 (SP)		0
S-3	20-30			BROWN SAND, PGD, F-M SA, LI SI, DAMP (SP)		0
S-4	30-40			BROWN SAND, PGD, F-M W/ TR-LI C SA, DAMP (SP)		0
S-5	40-50			BROWN SAND, PGD, F-M, TC SA, SO F-C GRV, DAMP (SP)		0
S-6	50-60			SIMILAR TO S-5 W/ CHANGE IN COLOR TO LT BROWN (SP)	~~60'~~	0
S-7	60-70			BROWN SAND, PGD TO WGD, F-M TO F-C SA W/ TR GRV MOIST TO WET SP/SW		0
S-8	70-80			BROWN SAND, PGD, F-M, TRC SA, LI C SRD TO RD GRV, WET (SP)	✓ Change @ 80'	0
S-9	80-90			BROWN SILTY FINE SAND, F TO TR M SA, NON PLASTIC WET (SM)		0
S-10	90-100			BROWN SAND, PGD, F-M SA, TR C SA TO F GRV, WET (SP)	✓ Change @ 90'	0
S-11	100-110			BROWN SAND PGD, F-M CHANGING TO WGD, F-C SA W/ SO F-C GRV, WET SP/SW		0

FIELD BORING LOG

BORING NO. SPN-8902C

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: B MELCHOEN	DATE STARTED 4/14/89	COMPLETED 4/14/8
METHOD: DUAL WALL	CASING SIZE: 9"	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 820.0	SOIL DRILLED: 140'	WATER LEVEL:	TOTAL DEPTH: 140'
LOGGED BY: BCM	CHECKED BY: JSP.	DATE: 4/26/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	110-120			BROWN SAND, PGD, M-C SA, TR F SA, SOME F-C GRV, WET (SP)	WATER OFF CUTTINGS HAD A RAINBOW SHEEN	0	
S-13	120-130			SIMILAR TO S-12		0	
S-14	130-140			SIMILAR TO S-12 (SP)			

FIELD BORING LOG

BORING NO. SPN-8903

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 4/1/89	COMPLETED 4/13/89
METHOD: DUAL WALL	CASING SIZE: 9 1/2"	TIP eV: CC.C	PROTECTION LEVEL: D
GROUND ELEV.: 815.3	SOIL DRILLED: 150'	WATER LEVEL: 37'	TOTAL DEPTH: 150'
LOGGED BY: D.H. BELAN	CHECKED BY: GS. 4/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0 - 10			DARK-MEDIUM BROWN SAND, FINE-MEDIUM GRAIN, MODERATELY GRADED, WELL GRADED GRAVEL (SP)	0-5 TPSU	00.0	
S-2	10 - 20			MEDIUM BRN SAND, FINE, POORLY GRADED, LITTLE POORLY GRADED GRAVEL, ANGULAR (SP)		00.0	
S-3	20 - 30			MED-LT BRN SAND, FINE, POORLY GRADED, SOME ~~WELL GRADED~~ GRAVEL, ROUNDED (SP)		00.0	
S-4	30 - 40			SIMILAR TO S-3 (SP)		00.0	
S-5	40 - 50			LT BRN SAND, FINE, POORLY GRADED (SP) SOME FINE ROUNDED GRAVEL	✓change @ 50'	00.0	
S-6	50 - 60			GRAVEL, ROUNDED, FAIR GRADING, WITH SOME LT BRN SAND (GW)		00.0	
S-7	60 - 70			LT BRN SAND, FINE, POORLY GRADED (SP) 0 - TRACE FINE GRAVEL	✓change @ 70'	00.0	
S-8	70 - 80			LT BRN SAND, FINE, POORLY GRADED (SP)		00.0	
S-9	80 - 90			SIMILAR TO S-8 (SP)		00.0	
S-10	90 - 100			SAND TO APPROX 94 FT. GRAVEL, ROUNDED, WELL GRADED. (GW)	✓change @ 94'	00.0	
S-11	100 - 110			GRAVEL, ROUNDED, WELL GRADED, SOME LT BRN SAND (GW)		00.0	
S-12	110 - 120			LT BRN SAND, FINE, POORLY GRADED (SP) TRACE FINE GRAVEL	✓change @ 110	00.0	
S-13	120 - 130			SIMILAR TO S-12 (SP)		00.0	
S-14	130 - 140			LT BRN SAND, FINE, POORLY GRADED (SP) TRACE FINE GRAVEL		00.0	
S-15	140 - 150			SIMILAR TO S-14 (SP)		00.0	
				BOB @ 150', 1530 HRS. ABANDON HOLE (HEAVING SAND)			

FIELD BORING LOG

BORING NO. SPN-8904 C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/30/89	COMPLETED
METHOD: DUAL WALL	CASING SIZE: 9 1/2	TIP eV: 00.0	PROTECTION LEVEL: D
GROUND ELEV.: 800.7'	SOIL DRILLED: 130'	WATER LEVEL: 37±'	TOTAL DEPTH: 130'
LOGGED BY: D.H. BELAN	CHECKED BY: [signature] 4/10/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10			DK BRN SAND, MUDDY, SILTY, FINE, WITH SOME PEBBLES(?)	ML - TOPSOIL ✓change @ 6'	00.0	
S-2	10-20			MED BRN SAND, FINE, POORLY GRADED WITH LITTLE ROUNDED GRAVEL (SP)		00.0	
S-3	20-30			MED BRN SAND, FINE, POORLY GRADED WITH SOME MODERATELY GRADED GRAVEL, ROUNDED. (SP)		00.0	
S-4	30-40			MED BRN SAND, FINE-MEDIUM, POORLY GRADED WITH SOME WELL GRADED GRAVEL ROUNDED, SOME SUBANGULAR (SP)		00.0	
S-5	40-50			LT-MED BRN SAND, FINE, POORLY GRADED WET, TRACE POORLY-MODERATELY GRADED GRAVEL (SP)		00.0	
S-6	50-60			LT BRN SAND, FINE, POORLY GRADED WET, TRACE POORLY GRADED GRAVEL (SP)		00.0	
S-7	60-70			SIMILAR TO S-6		00.0	
S-8	70-80			LT BRN SAND, FINE, POORLY GRADED TO APPROX 74 FT. THEN WELL ROUNDED/GRADED GRAVEL, WITH SLIGHT PETROLEUM "RAINBOW" IN WATER (GW)	✓change @ 74'	00.0	
S-9	80-90			GRAVEL, WELL GRADED, MOSTLY ROUNDED LITTLE SUBANGULAR, WITH SOME LT BRN FINE SAND. ~~DARK~~ BROWN ~~WATER WITH SOME RAINBOW EFFECT~~ (GW)		00.0	
S-10	90-100			GRAVEL TO ~95'; THEN LT BRN FINE SAND, TRACE FINE GRAVEL (GW)	✓change @ 95'	00.0	
S-11	100-110			LT BRN SAND, FINE [redacted] GRAIN, POORLY GRADED, SLIGHT TRACE FINE GRAVEL (SP)		00.0	
S-12	110-120			LT BRN SAND, FINE, POORLY GRADED VERY SLIGHT TRACE GRAVEL (SP)		00.0	
S-13	120-130			SIMILAR TO S-12 (SP)		00.0	
				BOB @ 1020 HRS.			

FIELD BORING LOG

Boring No. DBB-91-01

Project No 6853-03	Project Name BAAP		Page 1 of 5
Contractor MATHES	Driller K. Bunselmeyer	Date started 10-15-91	completed 10-15-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 115'	∑ below ground ≈ 116	Total Depth 118.5
Logged by RHA	Checked by DRP	Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU AIR	LEL
08:00 D9101002	S-1	0-2	1/4/4/8	2.0/1.6	Bottom 0.2' - Black ash and soot; trace green fine sand; Typ 0.2-1.6 Lt. brown fn. Sand; trace organics, and fn. to med gvl. dry. (SP)	Analytical	2.0	Bkg	Bkg
08:08 D9101004	S-2	2-4	4/5-4/3	2.0/1.6	Tan to greenish-yellow (staining) fine Sand, slight chemical odor, blotches of black staining; trace clayey-silt in lenses; dry; and medium rounded gvl. (SP).	Analytical	4.0	Bkg	Bkg
08:16 D9101006	S-3	4-6	2/4/5/6	2.0/2.0	Bottom 0.7' - Lt brown clayey-Sand; trace of coal Sand; Lt. middle 0.7-1.0' Olive fine Sand, stained; trace medium sand; Lt. middle 1.0-1.2' Black medium Sand, ash-(burned); Typ 1.2-2.0 Lt. Brown Sandy-Clay; trace medium Sand, dry (SC/SP)	Analytical	5.0	Bkg	Bkg
08:27 D9101008	S-4	6-8	5/6/6/7	2.0/1.9	yellow-green stained med. sand; trace coarse Sand in seam (2") near top of spoon; and medium rounded gvl.; dry (SP)	Analytical 5 ppm in auger head.	1.0	Bkg	Bkg

FIELD BORING LOG

Boring No. DBB-91-01

Project No 6453-03	Project Name BAAP		Page 2 of 5
Contractor MATHES	Driller K. Brinkmeyer	Date started 10-15-91	completed 10-15-91
Method HSA/CME 75	Casing Size 4.25	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 115'	∑ below ground ≈116	Total Depth 116.5
Logged by RHA	Checked by DRP	Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	Sizing
08:32 0910-1010	S-5	8-10	4/5/6/13	2.0/2.0	Button 0.3'- tan fine Sand; trace medium sub-rounded gravel; middle 0.3-1.0' Silty fin. Sand, green stains; Top 1.0-2.0 olive med. Sand; some fine sand; stained (green); trace coarse sand; damp SP/SM/SP	Analytical	1.0	Bkg	Bkg	1.0
08:46 0914-1015	S-6	13-15	7/12/19/21	2.0/1.7	Button 0.2'- Tan medium Sand; trace fn. Sand and HM; Top 0.2-1.7 Olive (stained) fine sand, slight chemical odor; dry (SP)	Analytical	3.0	Bkg	Bkg	7.0
08:56 0914-1020	S-7	18-20	5/10/11/15	2.0/2.0	Streaked tan to olive fine Sand (stained); little medium sand; dry (SP)	Analytical Driller having difficulty screwing together 24" spoons - will switch to 18"	2.0	Bkg	Bkg	1.0
09:15 0914-1025	S-8	23-24.5	7/13/18	1.5/1.5	Button 0.3' Tan to black Streaked Silty Sand; green to black liquid waste; top 0.3-1.5 Tan fine sand; dry (SM/SP)	Liquid waste at ~24.5 bgs. Analytical	NA	Bkg	Bkg	150

* N.A. Reference samples could not be collected.

FIELD BORING LOG

Boring No. DBB-91

Project No 68153-03	Project Name BAAP		Page 3 of 5
Contractor MATHERS	Driller K. Bunselmeyer	Date started 10-15-91	completed 10-15-91
Method HSA/cme 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 115'	& below ground 2116	Total Depth 116.5
Logged by RHA	Checked by DRP	Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	Spare
09:24 D9101030	S-9	28-30	11/15/13/17	2.0/1.9	Tan fine Sand - (RHA) grading to medium Sand towards bottom of spoon; dry; trace medium gravel (SP)	No staining Analytical	BK	BK	BK	BK
~~09:45~~ 10:07 D9101042	S-10	(RHA) ~~30~~ 40-41.5	11/11/12		Lt. brown medium Sand; trace course Sand, medium gravel and clay; dry (SP)	spoon spoon refusal at 38' - drill to 40' and try again. Difficult drilling at 38' - cobbles. Analytical No reading on Draeger tube (chloroform, PCE, CH2Cl2)	NA	BK	BK	BK
10:21 D9101044	S-11	42-43.5	7/9/13	1.5/1.5	Tan fine Sand; little medium Sand and fine rounded gravel, trace rock frags.; dry (SP)	Analytical	BK	BK	BK	BK
10:33 D9101052	S-12	50-52	12/23/17/30	2.0/1.8	Tan medium Sand; little fine Sand; trace course Sand and fine to medium subrounded gravel and rock frags.; dry (SP)	Analytical	BK	BK	BK	BK

FIELD BORING LOG

Boring No. DBB-91-01

Project No 6853-03	Project Name BAAP		Page 4 of 5
Contractor MATHES	Driller K. Bumgardner	Date started 10-15-91	completed 10-15-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 115'	∇ below ground 2/16	Total Depth 116.5
Logged by RHH	Checked by DRP	Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	HNU ATR	LEL	SPT
10:47	S-13	60-61.5	14/26/53	1.5/1.5	Tan medium Sand; little fine sand; trace coarse sand and fine rounded gravel. dry, sample appeared uniform. (SP)	Reference	Bkg	Bkg	Bkg	Bkg
11:12 D9101092	S-14	70-71.5	22/33/46	1.5/1.5	Tan medium Sand; little fine and coarse sand; trace fine rounded gravel and H.M.; dry (SP)	Analytical	Bkg	Bkg	Bkg	Bkg
11:34	S-15	80-81.5	21/45/78	1.5/1.5	Tan fine and medium sand; some fine to medium subrounded gravel.; trace coarse sand; dry (GW)	Reference Lunch Break	Bkg	Bkg	Bkg	Bkg
3:41 D9101092	S-16	90-91.5	56/55/65	1.5/1.5	(RW) Bottom 0.5'- Tan fine Sand; Middle 0.5-1.0 Tan medium sand; trace fine to medium gravel. Top 1.0 -1.5 Tan fine sand; dry (SP)	Analytical	Bkg	Bkg	Bkg	Bkg
9:15	S-17	100-101.5	17/50/73	1.5/1.5	Bottom 0.3 - Tan med. Sand; trace coarse sand and H.M.; Middle 0.75-0.85 - Tan medium sand; some fine to medium gravel.; To 0.85 to 1.5 Tan fine Sand; dry. (SP)	Reference	Bkg	Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. DBB-9[illegible]

Project No 6853-03	Project Name BAAP		Page 5 of 5
Contractor MATHES	Driller K. Bumgarner	Date started 10-15-91	completed 10-15-91
Method HSA / CME 75	Casing Size 4.25"	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 115'	∑ below ground ≈116	Total Depth 116.5
Logged by RHA	Checked by DRP	Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
14:31 D9101112	S-18	110-111.5	15/30/80	1.5/1.5	Tan fine sand; trace coarse sand; dry.	Analytical	Bkg	Bkg	Bkg
14:50 D9101117	S-19	115-116.5	11/26/31	1.5/1.5	Bottom 1.0' - Tan medium sand, little fine sand; trace coarse sand and fine gravel; wet. Top 1.0-1.5' Tan fine sand, clean layer (1") near top of spoon; dry.	Analytical T.D. 116.5	Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. DBB9102

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 3
Contractor MATHER	Driller T. CRANE	Date started 10-15-91	completed 10-16-91
Method HSA 4 1/4"	Casing Size ——	HNU 11.7/10.2 @ 3	Protection Level D
Ground El	Soil Drilled 120'	∑ below ground 118	Total Depth 122'
Logged by D. LOUCKS	Checked by DRP	Date 10/16/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
1030	S-1	0-2	2/4/13/14	2.0/1.7	DARK BROWN SILT GRADING TO LT TAN FINE GRN SAND, 2" BLACK ZONE OF ASH OVER SLWR GRN SILT & GRAVEL, FILL	Reference Sample	0	0	
1035	S-2	2-4	7/7/7/7	2.0/1.2	DARK BROWN SAND W/ WELL ROUNDED GRAVEL GRADING TO DARK BROWN CLAY, MOIST, STIFF, FILL	ANALYTICAL SAMPLE D9102004	15	0	
1045	S-3	4-6	3/9/14/16	2.0/1.8	SILTY CLAY TO SILT SAND, TO FINE SAND, DARK BROWN TO TAN, WELL ROUNDED GRAVEL	ANALYTICAL SAMPLE D9102006	0	0	
1051	S-4	6-8	5/7/9/13	2.0/1.6	MED BRN FINE SAND W/ WELL ROUNDED PEBBLES/GRAVEL GRADING INTO LIGHT TAN MEDIUM SAND (WELL SORTED), MOIST	ANALYTICAL SAMPLE D9102008	0	0	
1100	S-5	8-10	5/8/10/13	2.0/1.6	LIGHT TAN MED SAND W/ WELL ROUNDED PEBBLES	ANALYTICAL/REF SAMPLE D9102010	0	0	
1110	S-6	10-12	9/12/12/11	2.0/2.0	MED BROWN SAND & GRAVEL GRADING INTO LIGHT TAN FINE SAND (WELL SORTED)	ANALYTICAL SAMPLE NOT SENT	0	0	
1115	S-7	12-14	3/5/7/7	2.0/2.0	LIGHT TAN, WELL SORTED FINE SAND, LOOSE, DRY	ANALYTICAL SAMPLE D9102014	0	0	
1120	S-8	14-16	4/7/9/8	2.0/2.0	LIGHT TAN, WELL SORTED FINE SAND, LOOSE, DRY	ANALYTICAL SAMPLE D9102016	0	0	
1130	S-9	16-18	2/6/10/11	2.0/1.7	LIGHT TAN, FINE SAND W/ CRYSTOBALITE, WELL SORTED, LOOSE, DRY	ANALYTICAL SAMPLE NOT SENT	0	0	

FIELD BORING LOG

Boring No. DBB-91-

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-15-91	completed 10-16-91
Method HSA 4¼"	Casing Size —	HNU 11.7 (10.2) #3	Protection Level D
Ground El.	Soil Drilled 120'	∑ below ground 118	Total Depth 122'
Logged by D. LOUCKS	Checked by DRP	Date 10/16/91	

Spoon — Breathing Zone

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
1135 S-10	18-20	5/12/13/14	2.0/2.0	SAME AS S-9	ANALYTICAL SAMPLE D9102020	0	0	
1140 S-11	20-22	6/10/11/17	2.0/2.0	LIGHT TAN FINE SAND GRADING TO LIGHT TAN MED. SAND W/ WELL ROUNDED PEBBLES (10%), LOOSE	ANALYTICAL SAMPLE NOT SENT	0	0	
1320 S-12	25-27	4/11/23/30	2.0/2.0	LIGHT TAN FINE SAND W/ A 4" BAND SAND & WELL ROUNDED GRAVEL MIX, LOOSE	ANALYTICAL SAMPLE D9102027	0	0	
1395 S-13	30-32	8/26/24/23	2.0/2.0	LIGHT TAN FINE SAND, DRY, LOOSE	REFERENCE SAMPLE	0	0	
1345 S-14	40-42	2/7/5/8	2.0/1.8	LIGHT TAN FINE SAND GRADING INTO TAN SILT, SUB ROUNDED TO ROUNDED GRAVEL (15%) SCATTERED THROUGHOUT, SLIGHTLY MOIST, LOOSE	ANALYTICAL SAMPLE D9102042	0	0	
S-15	50-52	10/19/26/14	2.0/2.0	TAN FINE SAND W/ ANGULAR TO SUB-ROUNDED QUARTZITE ROCK TO 2" LONG (30%) MOIST, LOOSE	REFERENCE SAMPLE ~~D9102052~~	0	0	
1430 S-16	60-62	9/30/50/5"	1.5/1.5	BROWN COARSE SAND W/ ROUNDED PEBBLES TO LIGHT TAN FINE SAND (WELL SORTED) TO MEDIUM TAN SAND W/ ROUNDED PEBBLES, LOOSE, MOIST	ANALYTICAL SAMPLE D9102062	0	0	

FIELD BORING LOG

Boring No. DBB-91-02

Project No 685303	Project Name USATHAMA BAAP		Page 3 of 3
Contractor MATHES	Driller T. CRANE	Date started 10-15-91	completed 10-16-91
Method HSA 4¼"	Casing Size ——	HNU 11.7/10.2 #3	Protection Level D
Ground El	Soil Drilled 120	∑ below ground 118	Total Depth 122
Logged by D. LOOCKS	Checked by DRP	Date 10/16/91	

SMEAR / BREATHING ZONE

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZR	Monitoring HNU AIR	Monitoring LEL
S-17	70-72	6/11/12/15	2.0/2.0	TAN, MEDIUM COARSE SAND W/ WELL ROUNDED PEBBLES TO FINE LIGHT TAN SAND W/ WELL ROUNDED PEBBLES, MOIST, LOOSE	ANALYTICAL SAMPLE D9102072	0	0	
S-18	80-82	14/48/50/4"	1.33/1.33	LIGHT TAN, FINE SAND W/ WELL ROUNDED PEBBLES (5%), MOIST, LOOSE	REFERENCE SAMPLE	0	0	
S-19	90-92	23/50/45/50	2.0/2.0	LIGHT TAN FINE SAND W/ GRAVEL RANGING FROM .5 INCHES TO 1.5 INCHES, WELL ROUNDED, DENSE, MOIST	ANALYTICAL SAMPLE D9102092	0	0	
S-20	100-102	26/45/50/4"	1.33/1.33	LIGHT TAN FINE SAND W/ SCATTERED, WELL ROUNDED GRAVEL RANGING FROM .5 INCHES TO 1.25 INCHES, DENSE, MOIST	REFERENCE SAMPLE	0	0	
S-21	110-112	25/50/50/3"	1.25/1.25	TAN, FINE SAND, WELL SORTED, DENSE, MOIST	ANALYTICAL SAMPLE D9102102	0	0	
S-22	120-122	2/3/2/2	2.0/2.0	TAN, FINE SAND, WELL SORTED, WET, VERY LOOSE	ANALYTICAL SAMPLE D9102122	0	0	
				BOB AUGERS 120' SPLIT SPOON 122'				

FIELD BORING LOG

Boring No. DBB-91

Project No 6853-03	Project Name BAAP		Page 1 of 5
Contractor MATHES	Driller K. Bunselmeyer	Date started 10-16-91	completed 10-16-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El.	Soil Drilled 120'	% below ground 118	Total Depth 122'
Logged by RHA	Checked by DRP	Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	Sp. Spun
07:42	S-1	0-1.5	5/8/12	1.5/1.1	Brown fine sand; some med. sand; trace coarse sand, fine to med. gravel, and organics; dry (SP)	Reference Rocky drilling		Bkg	Bkg	0
08:00 D9103004	S-2	2.0-3.5	9/16/30	1.5/1.3	Brown fine and med. sand; little fine to med. gravel; trace rock frags. and organics; dry. (SW)	Analytical Rocky drilling		Bkg	Bkg	131
08:04	S-3	4.0-5.5	21/30/29	1.5/1.2	Brown fine to coarse sand; some fine to coarse gravel; little rock frags.; dry (SW) sweet odor	Reference		Bkg	Bkg	3k
08:17 D9103012	S-4	6-7.5	15/15/11	1.5/1.0	Brown fine to coarse sand; some fine to medium angular gravel; dry (SW)	Analytical		Bkg	3k	0
08:28	S-5	8.0-9.5	11/16/24	1.5/1.1	Olive fine sand, little med sand and fine to med. gravel; dry. sweet chemical odor. (SW) (2nd)	Reference Not enough recovery - sampling @ 24" span.		Bkg	Bkg	31
08:36 D9103012	S-6	10-12	13/24/36/50	2.0/1.0	Olive med. sand; little fine angular gravel; trace coarse sand and rock frags; sweet odor; dry (SW)	Analytical		Bkg	Bkg	0

FIELD BORING LOG

Boring No. DBB-91-03

Project No 6853-03	Project Name BAAP		Page 2 of 5
Contractor MATHES	Driller K. Busselmeyer	Date started 10-16-91	completed 10-16-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 120'	∑ below ground 118	Total Depth 122
Logged by RHA	Checked by DRP	Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU AIR	Monitoring LEL	Sample Spoon
08:54 D9103014	S-7	12-14	16/17/16/16	2.0/1.8	Bottom 1.2' Olive (stained) fine sand; Top 1.2-2.0 brown medium sand; little fine sand; trace coarse sand and fine to medium gravel, sweet odor; dry (SP)	Analytical		Bkg	Bkg	1.0
09:03 D9103016	S-8	14-16	4/5/12/15	2.0/1.8	Bottom 0.5' Tan to olive (stained) med. sand; trace fine sand; Top 0.5-1.8' Olive (stained) fine sand, trace coarse sand, sweet odor; dry (SP)	Analytical		Bkg	Bkg	Bkg
09:12 D9103018	S-9	16-18'	7/11/15/22	2.0/2.0	Bottom 1.7' Tan fine Sand trace med. Sand; Top 1.7 to 2.0 Olive (stained) fine sand; trace med sand; dry (SP)	Analytical		Bkg	Bkg	Bkg
09:20 D9103020	S-10	18-20'	9/16/33/21	2.0/2.0	Bottom 1.3'- Tan fine sand; trace med. sand, H.M. and x-bedding; Top 1.3-2.0 is brown silty fine sand; trace med sand; dry. (SP/SM).	Analytical		Bkg	Bkg	Bkg
9:26 D9103022	S-11	20-22	9/18/20/32	2.0/2.0	Bottom 1.6' Tan fine sand; little medium sand; trace H.M; Top 1.6-2.0 is brown fine sand; some silt; trace med. sand; dry (SP/SM)	Analytical		Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. DBB-91-03

Project No 6853-03	Project Name BAAP		Page 3 of 5
Contractor MATHES	Driller K. Burkelmeyer	Date started 10-16-91	completed 10-16-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El.	Soil Drilled 120'	⚓ below ground 118	Total Depth 122
Logged by RHA	Checked by DRP	Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	S
09:37 D9103027	S-12	25-27	7/15/18/25	2.0/1.9	Tan f. me sand; little med sand, lt. brown silty fine sand seam (18") 0.3' from bottom; trace H.M.; dry (SP)	Analytical		Bkg	Bkg	
09:45	S-13	30-32'	18/24/40/40	2.0/2.0	Bottom 0.1 lt. brown fine sand; little med. sand; middle 0.1-1.6' Tan f. me sand; little med. sand; trace coarse sand and H.M., Top 1.6-2.0 lt. brown med. sand; trace fine and coarse sand and fine rounded gravel; dry (SP)	Reference		Bkg	Bkg	
10:04 D9103042	S-14	40-42	15/26/35/45	2.0/1.9	Tan med. Sand; little fine and coarse sand and fine to medium sub rounded gravel; trace rock frags; dry. (SW)	Analytical		Bkg	Bkg	B
10:20	S-15	50-52	12/18/26/32	2.0/1.8	Bottom 0.9'- Lt brown med sand; some fine gravel and coarse sand; little fine sand; Top 0.9-1.8 Tan f. me sand; trace medium to coarse sand and fine rounded gravel dry. (GW/SP)	Reference cuttings at 55'		Bkg	Bkg	B

FIELD BORING LOG

Boring No. DBB-91-03

Project No 6853-03	Project Name BAAP			Page 4 of 5
Contractor MATHES	Driller K. Busselmeyer	Date started 10-16-91	completed 10-16-91	
Method HSA/CME 75	Casing Size 4.25	HNU 11.7/(10.2)	Protection Level D	
Ground El	Soil Drilled 120'	⚓ below ground 118	Total Depth 122'	
Logged by RHA	Checked by DRP	Date 10/16/91		

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	Spec. Spec
10:51 D9103021	S-16	60-62	2-/32/54/50	2.0/2.0	Tan f. sand; trace med. and coarse sand; thin beds (1/4 - 1/2") of alternating LT. brown silty f. sand and tan medium to coarse sand; dry. (SP)	Analytical		Bkg	Bkg	BL
11:20	S-17	70-72	5/8/25/46	2.0/1.7'	Tan f. sand; little med. sand in lenses; trace coarse sand; trace fine gravel and H.M.; dry.	Reference Grave at 75'		Bkg	Bkg	Bkg
11:47 D9103082	S-18	80-82	20/33/55/50 for 2"	1.7/2.0	Tan f. sand; little medium sand and fine rounded gravel; trace coarse sand and medium to coarse gravel; dry	Analytical		Bkg	Bkg	BL
14:00	S-19	90-92	12/20/37/50	2.0/2.0	Tan f. sand; trace medium and coarse sand and fine rounded gravel. dry. (SP)	Reference.		Bkg	Bkg	BL
14:26 D9103102	S-20	100-102	15/28/50/50 for 3"	1.75'/2.0	Bottom 1.7' Tan f. sand; little medium sand; trace coarse sand and H.M.; top 1.7-2.0 Brown fine sand; trace medium sand; dry (SP)	Analytical		Bkg	Bkg	BL

FIELD BORING LOG

Boring No. DBB-9

Project No 6853-03	Project Name BAAP		Page 5 of 5
Contractor MATHES	Driller K. Bumstead	Date started 10-16-91	completed 10-16-91
Method HSA/CME 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 120'	∇ below ground 118	Total Depth 122'
Logged by RHA	Checked by DRP	Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATR	LEL
15:00	S-21	110-112	13/27/35/42	2.0/2.0	Tan fine sand; little medium sand; trace coarse sand and fine rounded gravel. LT brown silty fine sand lense (1") 1.5' from bottom of spoon; dry (SP)	Reference cobbles at 116'	13½	13½	13½
15:47	S-22	120-122	5/11/12/19	2.0/2.0	Tan fine Sand; + race medium sand; wet (SP)	∇ 118' T.D. 122 Analytical	13½	13½	13½
DT 10/31/22									

FIELD BORING LOG

BORING NO. DBB-8901

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: ~~Bee~~ Roo Pae	DATE STARTED 1/17/89	COMPLETED 1/20/89
METHOD: HSA	CASING SIZE: 4.85" ID	TIP ev: #75	PROTECTION LEVEL: C-dermal
GROUND ELEV.: 899.5	SOIL DRILLED: 120.5'	WATER LEVEL: 120 ± JSR	TOTAL DEPTH: 120.5'
LOGGED BY: PLB/BM	CHECKED BY: JSR 2/27/89	DATE: 1/17/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING Headspace
S-1	0-2'	27-35-42-43	2.0 / 2.0	0-.2 lg br to br organic .2-.8' lg br to br med to Fi sa tr course poorly graded, loose, damp .8-1.0 clay lens, olive brown, plastic damp (clay cap?) plastic right on top of the clay. 1.0-2.0 — lg br to brown med to fi, tr coarse sa, poorly graded, loose dense		Bkg 3.2	Bkg -3.9
-2	2-4'	~~34~~-28-20-16	2.0 / 1.8	0.-.8- As above .8-1.4- Black med to Fi sand (Burn layer) tr ~~gravel~~ coarse PB, poorly graded loose, d PB moist 1.4-1.7 br to lg brown clay, plastic, firm moist 1.7-1.8 br to lg brown med to Fi sa poorly graded, loose, moist	Took Analytical ~~[illegible]~~ PB (Fill)		
S-3	4-6'	8-7-9-7	2.0 / 2.0	0-.4 Blk med to fi sa tr ~~coarse~~ poorly graded, loose moist .4-2.0 olive br med to fi sa Tr C poorly graded loose moist (SP)	Took Analytical (Fill)	10.3	-2.6
S-4	6-8'	5-3-2-1	2.0 / 1.9	0-1.5 olive to lg brown (varied colors) Fi to c sa well graded, loose, moist, well stratified, (uniform) (SW) 1.5-1.9 lg tan med to fi sa Trc poorly graded, loose, moist (SP)	Took Analytical (Fill)	-3.6	-4.0

Bkg = -4.9 Bkg ...

FIELD BORING LOG

BORING NO. OBB6501

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rod Parr	DATE STARTED 1/17/89	COMPLETED 1/20/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 899.5	SOIL DRILLED: 120.5'	WATER LEVEL: 120.0'	TOTAL DEPTH: 120.5'
LOGGED BY: PLB/BM	CHECKED BY: JSK 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING HEL (Headspace)
S-5	6-10'	10-25-21-27	20/16	0-1.6 lg br to br med to Fi sa tr c Tr gr, loose, moist, well graded (SW)	Analytical (Water) ✓ change @ ≈ 8.5'	Bkg	-3.9
S-6	13-15'	4-9-11-19	20/20	lg br to tan Fi sa Tr med, poorly graded, loose, moist, olive (stain?) stratification between 1.0 - 1.6 (SP)	Analytical	Bkg	-3.6
S-7	18-20'	7-11-16-23	20/18	lg br to tan Fi sa tr med poorly graded loose, moist, olive staining from .6 - 1.7 (stratified) Coarse sand lens at .5 - .6 0 - .5 - completely stained olive color (SP)	Analytical	30.1	-2.3
S-8	23-25'	13-23-25-35	20/20	Tan Fi sa tr med, poorly graded, loose, moist, olive staining in layers throughout the spoon. (SP)	Analytical	27.4	0
S-9	28-30'	11-26-40-43	20/16	Tan Fi to med sa tr c, loose, moist, poorly graded, well stratified, some layers 3" thick (SP)	Analytical	Bkg	-3.5
S-10	38-40'	12-40-66-100	1.5/1.4	0-1.1 dk tan to olive Fi sa, dry to moist as you go down the spoon, very dense 1.1-1.4 Beige silt, tr very F. sand, non plastic, moist, very stiff (SP)	Analytical	1800	129
S-11	40-42'	23-35-34-28	2.0/1.6	0-.9 Dk Beige silt, tr very Fi sa incr in moisture as you go down to saturated at .7-.9 nonplastic, stiff. (MH) .9-1.6 Dk Beige Fi to med sa tr coarse, Tr gr well graded, moist, compact (SW)	Analytical Silt content ✓ change @ 42'	43.4	-2.1
S-12	42-44'	13-50-91-40	20/17	0-.3 Dk olive Fi sa tr med, poorly graded .3-1.7 Dk Beige Fi to med sa tr c, tr Fi rounded gr, well graded, damp, dense (SW) Black micaious lens at 1.1-1.4	Analytical	8.6	-2.9

Bkg = 1.4

FIELD BORING LOG

BORING NO. DBB-8901

PROJECT NO.: 5753-00	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rod Fie	DATE STARTED 1/17/89	COMPLETED 1/20/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP ev.: 15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 899.5	SOIL DRILLED: 120.5'	WATER LEVEL:	TOTAL DEPTH: 120.5'
LOGGED BY: PLB/BM	CHECKED BY: [illegible] 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING BEJ (or Headspace)
S-13	52-54'	75-100 refusal	.9 / .3	Beige Fi to med Sa Trc, Tr Fi gr, poorly graded, compact, moist (SP)	Refusal at .9' No Analytical ≈ 55' cobble zone began (chatter)	Bkg	-3.7
S-14	62-64'	20-55-57-92	2.0 / 1.5	Lt tan to tan mod to Fi sa, Tr c, Tr Fi gr, poorly graded, very dense, moist gravel layer at .8 - 1.0 (SP)	Took Analytical stiff in cobbles	Bkg	-4.0
S-15	72-74'	10-21-44-66	2.0 / 1.6	As above but w/out gr layer	No Analytical	Bkg	-4.0
S-16	82-84'	17-44-76-88	2.0 / 1.6	Lt Tan to tan Fi to med sa Trc (dec't from last spoon), Trc gr, poorly graded, very dense, moist, some stratification from F to c. w/ depth. (SP)	Took Analytical ≈ 85' end of cobble zone	Bkg	-3.9
S-17	92-94'	38-53-82 WOH/4	1.9 / 1.8	Tan Fi to med sa, poorly graded very dense, moist, some strat. fractures c layers at .5-.6 and .9 - 1.1 (SP)	No Analytical	Bkg	Bkg
S-18	102-104'	28-63-65-76	2.0 / 1.3	Tan Fi to med sa, Trc, Trcgr, poorly graded, very dense, moist, some stratification (SP)	Took Analytical	Bkg	Bkg
S-19	112-114' ▽ 113.59	21-61-100/.5	1.4 / 1.1	Tan Fi to med sa, tr c, poorly graded, very dense, moist (SP)	Took Analytical	Bkg	Bkg
S-20	122-124'	7-7-20-70	2.0 / 1.3	Tan Fi to med sa, PD ½ poorly graded, very dense, saturated (SP)	Took Anal, trial	Bkg	Bkg
				BOB e 120.5			

Bkg ≈ -3.2

FIELD BORING LOG

BORING NO. DBB490Z

PROJECT NO.: 5753-08 | PROJECT NAME: USATHAMA- BAAP | PAGE 1 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: F. Heinz | DATE STARTED 1/10/89 COMPLETED 1/11/89

METHOD: 4.25" HSA | CASING SIZE: 4.25" | TIP ELEV: 10.0 TE (ft) | PROTECTION LEVEL: D

GROUND ELEV.: 897.9 | SOIL DRILLED: 117 | WATER LEVEL: 113 | TOTAL DEPTH: 117

LOGGED BY: J. Snowden | CHECKED BY: 2/27/89 | DATE:

SAMPLE NO.	DEPTH IN FEET (897.9)	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL	HNU/OVA SPAC
S-1	0-2	18/15/15	1.5/.8	Tan+Black si m-f sa w/trace m gvl, dry, m. dense, w. graded, nonplastic Fill	Analytical Not Taken	0	0	0.3
S-2	2-4	5/9/11/12	2.0/1.2	Dr Brown clayey sl w/trace-little f sa, moist, stiff, p. graded, med. plastic Fill	Analytical Taken ✓	0		0
S-3	4-6	9/7/7/4	2.0/1.6	Dr Brown clayey si w/trace f-m sa, grading to a Brown si m-f sand w/ some med. gvl, moist, loose to firm, p. graded to w. graded, med. plastic to nonplastic Fill	Analytical Taken -Change @ 5.5' ✓	0	0	0
S-4	6-8	4/3/6/11	2.0/1.6	upper .6 similar to bottom of S-3 .6-1.6 -Tan f-m sa w/ little si, trace gvl, moist, loose, well graded, nonplastic Fill - SP	-Change @ 7.5 Analytical NOT Taken	0	0	0
S-5	8-10	NS	0	Not sampled due driller error				0
S-6	10-12	17/18/13/8	2.0/1.7	Tan-Lt Brown m-f sa w/trace-little si, moist, loose, well graded (some med rounded gvl), nonplastic SP	Analytical Taken ✓	0	0	0
S-7	12-14	2/8/10/13	2.0/1.8	similar to S-6 w/ > med.-f round gvl -sweet odor headspace = 0.3	-Analytical Taken ✓	0	0	
S-8	14-16	7/10/11/16	2.0/1.6	similar to S-6 (sand becoming more stratified w/depth)	-Analytical Taken ✓	.3	0	0
S-9	16-18	9/11/16/21	2.0/2.0	Similar to S-6	Analytical Not Taken	0	0	0
S-10	18-20	NS		Not Sampled				

FIELD BORING LOG

BORING NO. DBB8902

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Heinz	DATE STARTED 1/10/89	COMPLETED 1/11/89
METHOD: HSA	CASING SIZE: 4.25"	TIP eV: 10.0 TE	PROTECTION LEVEL: D
GROUND ELEV.: 897.9	SOIL DRILLED: 117	WATER LEVEL: 113	TOTAL DEPTH: 117
LOGGED BY: J. Snowden	CHECKED BY: [illegible] 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-11	20-22	11/11/22/26	2.0/2.0	Similar to S-6	Advanced boring to 25' to complete drilling 1/10 Analytical Taken		
S-12	25-27	7/11/24/22	2.0/2.0	Coarse sand, some med. sand, dry, fairly well sorted, brown. (2" fn. gravel lense @ 1.4 ft.) (SP)	Analytical taken	0	0
S-13	30-32	8/15/22/34	2.0/2.0	30-31.3 Med sand, well sorted, dry, brown (SP) 31.3-32 Fine sand well sorted, dry, brown, (SP)	Analytical taken	0	0
S-14	40-42	14/21/25/50	2.0/2.0	40-40.7 Coarse & med. sand, tr. of fn. gravel, poorly sorted, moist, brown (SW) 40.7-41.4 Silt, brown, moist (SM) 41.4-42 Med. & fn. sand, tr. of fn. gravel, moist, brown, oxidized lensing (SW) P. sorted	Analytical Taken	0	0
S-15	50-52	21/35/50	1.5/1.0	Med. sand, trace fn. sand, trace fn. gravel, trace coarse sand, poorly sorted, moist, brown. (SW)	Reference sample only		
S-16	60-62	45/62/84/50	1.5/1.5	Coarse sand & fn. gravel some med. sand very poorly sorted trace of med. gravel moist, brown (SW) GP	Analytical taken Contact @ 70.7 med. sand to fn. gravels.	0	0
S-17	70-72	10/41/100	1.5/1.5	Coarse sand, tr. of fn. gravel, brown, dry, poorly sorted. (SW)	reference sample only	0	0
S-18	80-82	4/23/42/75	2.0	same as S-17	Analytical taken	0	0

FIELD BORING LOG

BORING NO. DSB8902

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Heinz	DATE STARTED 1/10/89	COMPLETED 1/11/89
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP eV: 10.0 TE	PROTECTION LEVEL: D
GROUND ELEV.: 897.9	SOIL DRILLED: 117	WATER LEVEL: 113	TOTAL DEPTH: 117
LOGGED BY: D. Dittmer	CHECKED BY: [signature] 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-19	90-92	9/20/26/46	2.0 / 2.0	coarse sand & fn. gravel, brown, dry, poorly sorted grading into a well sorted, brown, coarse sand (SW)	~~Ref. sample only~~ Analytical taken	0	0
S-20	100-102	~~75/50 for~~ .2	1.2 / 1.0	med. sand, brown, dry, well sorted (SP) siliceous cobble ~~present~~ present in spoon at approx. 100 ft.	Ref. sample only	0	0
S-21	110-112	9/25/50 for .2	1.2 / 1.2	Same as S-20 (minus the siliceous cobble) (Sample wet @ the tip of the spoon)	Analytical taken	0	0
S-22	115-117	12/25/18/23	2.0 / 1.0	coarse sand, brown, fairly well sorted, brown (SW), WET At approx 115' there is a very thin silt layer, grey, wet.	Analytical taken	0	0
				. 113.7 E.O.B. . WATER TABLE: 113			

✓

FIELD BORING LOG

BORING NO. DBB89C3			
PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Heinz	DATE STARTED 1/7/89	COMPLETED
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP eV: 10.0 TE	PROTECTION LEVEL: D
GROUND ELEV.: 897.8	SOIL DRILLED: 122'	WATER LEVEL: 119'	TOTAL DEPTH: 122'
LOGGED BY: J. Snowden	CHECKED BY: JSP 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2	6/14/18/8	2.0 / 1.7	Brown m-f sa w/ trace silt, & m gvl, dry, ~~p. sorted~~ p. graded, nonplasic, loose SP	-nose of s/s has si clay	0	0
S-2	2-4	6/15/15/20	2.0 / 1.6	similar to S-1 -si clay layer @ 2.0'	-top of s/s has si clay; Analitical taken	0	0
S-3	4-6	13/24/34/25	2.0 / 1.1	Similar to S-1 w/ > gvl & cob	Analitical Taken	0	0
S-4	6-8	32/56/40/17	2.0 / 0.7	Lt Brown silty m-f sand w/ some m-c gvl, loose, dry, w. graded, nonplastic SP	-Change @ ~6.5'	0	
S-5	8-10	17/17/18/23	2.0 / 1.5	Brown si m-c sa w/ some m gvl, loose, moist, w. graded, nonplastic w/ apparent solvent odor	Analitical Taken -Change @ 9.5' to	0	0
S-6	10-12	30/30/22/31	2.0 / 1.4	Lt Br-Tan m-f sa w/ trace si + little m gvl, loose, moist, w. sorted sweet odor cont. (JSP)	Analitical taken	1.0	
S-7	12-14	6/17/19/23	2.0 / 1.5	Similar to S-6 w/ sweet odor (JSP)	Analitical Taken	.8	0
S-8	14-16	24/25/32/30	2.0 / 2.0	Similar to S-6 sweet odor (JSP)	Analitical Taken	0	
S-9	20-22	22/56/100 0.0'	1.5 / 1.5	Similar to S-6 w/ tan clayey si lenses contact w/ si lenses @ ~21' (JSP)	Analitical Change @ 21'	0	
S-10	25-27	18/34/46/50	2.0 / 2.0	Similar to S-9 / No ref. sample (JSP)	Analitical Taken	0	
		Head Space screening of ref. samples		sample — PE: S-1 — .8; S-2 — EMPTY; S-3 — 0.2*; S-4 — 0.5; S-5 — 0.8; S-6 — 0.5; S-7 — 0.2; S-8 — 0.5; S-9 — 0.5; * 0.2 Background	S-10 EMPTY		

FIELD BORING LOG

BORING NO. DBB-4-903

PROJECT NO.: 5753-05	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Heinz	DATE STARTED 1/7/89	COMPLETED 1/9/89
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP eV: 10.0 TC	PROTECTION LEVEL: D
GROUND ELEV.: 897.8	SOIL DRILLED: 122'	WATER LEVEL: ~~119.9~~ 122'	TOTAL DEPTH: ~~119.9~~ 122'
LOGGED BY: D. D. Hmar	CHECKED BY: JSP. 2/27/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-11	30-32	34/35/32/23	1.5/1.5	Med. sand, brown, trace fn. sand, dry. 31.5'-32.0'; sorted med. sand, and fine gravel. poorly sorted dry (SP)	Analytical sample	0	0
S-12	40-42	36/33/43/56	2.0/2.0	Med. sand and fine gravel, brown, trace fn. sand some coarse (SW) sand, moist, very p. sorted.	Analytical sample	0	0
S-13	50-52	43/60/100 for .3'	1.3/1.3	SAME AS S-12, coarse-fine 3" sand lense @ 50.8' (SW)	Analytical sample	0	0
S-14	60-62	24/49/60/51	2.0/2.0	Fine Sand, some med. sand, well sorted, brown, fairly dry. (SP)	-cobble in tip of SS -cobbles noted in auger spoils @ approx. 60 ft. Analytical Sample	0	
S-15	70-72	53/91/89/100	2.0/2.0	70-71 - Coarse sand & fn. gravel, (SW) brown, p. sorted, dry. 71-72 - med. sand, tr. of coarse sand, brown, fairly well sorted, dry. (SP)	reference sample only	0	0
S-16	80-82	14/15/17/23	2.0/2.0	Same as S-15, 70-71	Analytical Sample	0	0
S-17	90-92	17/33/47/46	2.0/2.0	90-91.5 Coarse sand, brown, tr. fn. gravel, p. sorted, dry. (SW) 91.5-92 med and fn. sand, brown, fairly w. sorted, dry (SP)	ref. sample only.	0	0
S-18	100-102	20/24/21/24	2.0/2.0	Same as S-17 91.5-92	ref. sample only.	0	0
S-19	110-112	19/32/50/46	2.0/2.0	Coarse & med sand, brown, fairly well sorted, wet @ ~~111.5~~ 111.5 ft. (SP) #spoon used as plug to drill to 120.	∑ encountered during drilling at 119.8' Ref. Sample only	0	0
S-20	120-122	Blow in sands.	2.0/2.0	med. & fine sand, brown, fairly well sorted wet (SP)	Analytical sample -not able to collect undisturbed sample due to ~~blow in~~ running sand in the auger	0	0

BOB @ 122'

FIELD BORING LOG

BORING NO. DBB-90-3

PROJECT NO.: 5753-C8	PROJECT NAME: USATHAMA- BAAP	PAGE 3 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Heinz	DATE STARTED 1/7/89	COMPLETED 1/7/89
METHOD: 4.25" HSA	CASING SIZE: 4,25"	TIP eV: 10.0 TE	PROTECTION LEVEL: D
GROUND ELEV.: 897.8	SOIL DRILLED: 122'	WATER LEVEL: 122'	TOTAL DEPTH: 122'
LOGGED BY:	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP / LEL
				HEAD SPACE SCREENING OF REFERENCE SAMPLES		
				SAMPLE — PI READING (PPM)		
				S-11 — 0.1 *		
				S-12 — 0.1		
				S-13 — 0.1		
				S-14 — 0		
				S-15 — 0.4		
				S-16 — 1.1		
				S-17 — 0.1		
				S-18 — 0.4		
				S-19 — 0.1		
				S-20 — 0.1		
				* BACKGROUND		

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBB-82-01
Surface Elevation 895
Job No. C 10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES ϕ	W	LL	PL	D
1	SS	18"	M	3		FILL: Mixture of Silty Clayey Sand, Cinders & Tar Paper					
2	SS	12"	M	16	5						
3	SS	12"	M	24		Medium Dense to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt & Clay, Trace to Little Gravel, Occasional Cobbles (SP-SM)					
4	SS	12"	M	26	10						
5	SS	15"	M	20		Less Silt & Clay Present from 8' to 15'					
					15	Boring Completed to 10' on 3/10/82					
6	SS	12"	M	15	20						
7	SS	12"	M	49	25						
8	SS	18"	M	32	30						
						Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					35						
					40						
					45						

(Continued)

W-2

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: DBB-82-01
Surface Elevation: 895.3
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
9	SS	18"	M	43	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling	2.6' (Possible Perched Condition)				
Upon Completion of Drilling	—				
Time After Drilling	½ hour				
Depth to Water	10.8' DM				
Depth to Cave In					

GENERAL NOTES

Start: 3/10/82 Complete: 3/11/82
Crew Chief: JWG/SW Rig: 55-1
Drilling Method: CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBB-82-02

Surface Elevation 898.5

Job No. C 10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	18"	M	11		FILL: Mixture of Silty Clay, Sand & Gravel					
2	SS	18"	M	9	5						
3	SS	18"	M	8		Loose, Dark Yellowish Brown (10YR 3/4) Fine to Coarse SAND, Some Gravel, Some Silt & Clay, Occasional Cobbles (SM)					
4	SS	12"	M	30	10	Medium Dense to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Gravel, Trace Silt (SP)					
5	SS	12"	M	40	15						
6	SS	18"	M	24	20	Boring Completed to 20' on 3/9/82					
7	SS	18"	M	42	25	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, and GRAVEL, Little Silt (SP-SM)					
8	SS	14"	M	18	30	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt & Clay (SP-SM)					
					35						
					40						
					45	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Gravel, Little Silt & Clay, Occasional Cobbles & Boulders (SP-SM)					

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: DBB-82-02
Surface Elevation: 898.5
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Gravel, Little Silt & Clay, Occasional Cobbles & Boulders (SP-SM)					
9	SS	18"	M	60	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: NW
Upon Completion of Drilling:
Time After Drilling: ½ hour
Depth to Water: 10.0'DM
Depth to Cave In:

GENERAL NOTES

Start 3/9/82 Complete 3/10/82
Crew Chief JWG/SW Rig 55-1
Drilling Method CS 0-10'
FA 10-20'
DM/WO 20-50'; DC(4") 0-10'

W-5

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBB-82-03

Surface Elevation 897.

Job No. C-10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						FILL: Mixture of Silty Clay, Gravel & Asphalt Shingles					
1	SS	18"	M	11							
2	SS	18"	M	17	5	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP)					
3	SS	18"	M	13							
4	SS	18"	M	22	10						
5	SS	18"	M	22	15						
6	SS	18"	M	24	20	Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace Silt (SP)					
7	SS	18"	M	24	25	Some Silt from 24' to 27' Water Appears to be Perched at 27'					
8	SS	18"	W	24	30	Medium to Stiff, Light Olive Brown (2.5Y 5/4) Clayey SILT, Some Fine Sand (ML)	(1.0)				
					35						
					40		( )	Pocket Penetrometer Reading, TSF			
					45	Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Silt & Clay, Some Gravel, Occasional Cobbles (SP-SM)					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBB-82-03
Surface Elevation 897.2
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
						Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Silt & Clay, Some Gravel, Occasional Cobbles (SP-SM)					
9	SS	18"	M	39	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ¼ hour
Depth to Water 12.0'
Depth to Cave In

GENERAL NOTES

Start 2/24/82 Complete 2/24/82
Crew Chief JWG/JS Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: DBB-82-04

Surface Elevation: 89

Job No.: C 10313

Sheet: 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	18"	M	3		FILL: Mixture of Fine to Coarse Silty Sand, Clay, Cinders & Brick Fragments					
2	SS	12"	M	13	5						
3	SS	12"	M	31							
4	SS	15"	M	12	10	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt, Occasional Cobbles (SP)					
5	SS	14"	M	12	15	Seam of Very Silty Sand Encountered at 14'					
6	SS	14"	W	20	20						
7	SS	12"	W	19	25	Trace to Little Coarse Sand & Gravel Encountered at 24'					
8	SS	15"	M	32	30	Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Some Silt & Clay (SM)					
					35						
					40	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM)					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: DBB-82-04
Surface Elevation: 898.4
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM)					
9	SS	18"	M	58	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: – NW

Upon Completion of Drilling:

Time After Drilling: ¼ hour

Depth to Water: 10.0' DM

Depth to Cave In:

GENERAL NOTES

Start: 3/9/82 Complete: 3/9/82

Crew Chief: JWG/SW Rig: 55-1

Drilling Method: CS 0-10'; DM/WO 10-50'; DC(4") 0-10'

FIELD BORING LOG

BORING NO. DBN 89-02

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 2-1-89	COMPLETED 2/2/89
METHOD: Dual wall	CASING SIZE: 9"	TIP eV: #10	PROTECTION LEVEL: D
GROUND ELEV.: 884.8	SOIL DRILLED: 160'	WATER LEVEL: 105	TOTAL DEPTH: 160
LOGGED BY: FREDERICK BRAGDON	CHECKED BY:	DATE: 2-1-89	

BK=0.1

SAMPLE NO.	DEPTH IN FEET	~~BLOWS PER 6 INCHES~~ Time	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING Time/10feet (m/s)	MONITORING TIP	MONITORING LEL
S-1	0-10	12:10		Fill over topsoil over Br SAND Gravel	1:39	0.1	
S-2	10-20	1:07		Br med SAND (SP)	1:11	0.1	
S-3	20-30	1:11		BR med SAND w/ Some GRSA Layers	1:18	0.1	
S-4	30-40	1:20		Br fi to med SA w/ Med Co. Gravel layers	1:38	0.1	
S-5	40-50	1:23		Same (SP)	1:30	0.1	
S-6	50-60	1:26		Same	0:54	0.1	
S-7	60-70	1:32		Brown Med SA w/ + gravel @ 65' (hard) - 66' (SP)	2:30	0.1	
S-8	70-80	1:34		Brown ~~[illegible]~~ SAND w/ trace of Gravelly SAND	1:19	0.1	
S-9	80-90	1:39		Brown SA w/ Gravel Layers	1:25	0.1	
S-10	90-100	1:43		Same (SP)	1:15	0.1	
S-11	100-110	1:45		* SAND w/ wet Bfine SA and Layers of Cl SILT ~~[illegible]~~	change @ 100' 1:19	0.1	
S-12	110-120	1:51		BR SAND and gravel layers water (maybe Cl SI at top. (GP)	110 change @ 110' 2:47	0.0	
S-13	120-130	1:59		GRAV SA & SA GRAV (GP) Co Gravel @ 121	?	0.0	
S-14	130-140	2:40		SA Gravel much water (GP)	2:30	0.0	
S-15	140-150	2:45		SA Gravel (GP)	3:24	0.0	
S-16	150-160	2:50		SA fine Gravel (GP)	2:10	0.0	

* Cl SILT started at 107 maybe 5-8' thick at max

FIELD BORING LOG

BORING NO. DBN-89-04B

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 7/Feb/89	COMPLETED 7Feb89
METHOD: Hammer	CASING SIZE: 9 in.	TIP el:	PROTECTION LEVEL: D
GROUND ELEV.: ~917.7	SOIL DRILLED: ~~80 ft~~	WATER LEVEL: ~140 ft.	TOTAL DEPTH: ~~480 ft~~ 495'
LOGGED BY: J. Bliss	CHECKED BY:	DATE: 7 Feb/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10 ft			Brown silty fine to medium SAND with gravel + cobbles, moist. TILL well rounded cobbles (SM)	Smooth runs	0.9	
S#2	10-20 ft			Brown grading to tan fine to medium SAND w/ occasional gravel (angular) TILL. cobbles + gravel at 20 ft. (SP)		0.1	
S#3	20-30 ft			Brown fine angular gravel with medium to fine SAND. Dry to slightly moist. (SP)		0.1	
S#4	30-40 ft			Brown medium to fine gravel w/ coarse gravel (angular) and fine to medium sand. Dry (SP) Note: The majority of the gravel appears to consist of dolomite + limestone fragments with a little shale, v. little gram igneous materials.		0.0	
S#5	40-60 ft			Brown medium to fine Sand w/ little fine gravel + occasional cobbles. (SP) dry.		0.1	
S#6	60-70 ~~60-80 ft~~			Brown Crse to Med Sand w/ some fine gravel + a little silt (SP)		0.1	

FIELD BORING LOG

BORING NO. DBN-89-04B

PROJECT NO.: 5753-	PROJECT NAME: USATHANA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 7 Feb 89	COMPLETED 7 Feb 89
METHOD: Hammer	CASING SIZE: 9 in	TIP ø:	PROTECTION LEVEL: D
GROUND ELEV.: ~~900~~	SOIL DRILLED: 180 Ft	WATER LEVEL: ~140 Ft	TOTAL DEPTH: 180 Ft
LOGGED BY: J. Buss	CHECKED BY:	DATE: 7/Feb/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S# 7	70-80 Ft			*Pounding on boulder at 73 Ft* Brown Coarse to Fine SAND wt some gravel. TILL (SP) dry.		0.4	
S#8	80-90 Ft			Brown Fine to Coarse SAND with cobble zones dry (SP)	air line not working properly slow advance	0.0	
S# 9	90-100 Ft			Brown med. to crse SAND wt/ some Fine Sand and gravel. dry (SP)		0.0	
S#10	100-110 Ft			Brown Med to Fn SAND wt/ Little Crse Sand and gravel dry (SP)		0.1	
S#11	110-120 Ft.			Brown Fine Sand, trce med Sand and occasional gravel. dry (SP)		0.0	
S#12	120-130			Brown Fine-Med Sand. trce gravel Dry to slightly moist (SP)		0.0	
S 13	130-140			Brown Fine-med Sand, wt/ trce gravel wet at 140 Ft	water at 140 Ft.	0.0	

FIELD BORING LOG

BORING NO. DBN-89-04B

PROJECT NO.: 5753- | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST | DRILLER: G. Rodriguez | DATE STARTED 7 Feb 8 | COMPLETED ~~7 Feb 8~~

METHOD: Hammer | CASING SIZE: 9 in | TIP @: | PROTECTION LEVEL: D

GROUND ELEV.: 9170 | SOIL DRILLED: 195' | WATER LEVEL: ~ 140 Ft. | TOTAL DEPTH: ~~180 Ft.~~ 195

LOGGED BY: Jim Bass | CHECKED BY: | DATE: 7/Feb/88

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-14	140-150			Brown Med-Fn Sand wt some gravel and cobbles wet, (SP) No silt		0.1	
S-15	150-160			Brown Med-Fine SAND wt Trce gravel, wet (SP) No Silt layers		0.2	
S-16	160-~~170~~	166 Ft		Fine-med Sand occasional Silt lense (SP)-(SM)	✓Change @ 160'	0.2	
S-17	166-170			Silt at 166 Ft, brown wt little Sand or clay. (ML)	✓Change @ 166'	0.2	
S-18	170-180			Fine gravel with some crse to fine SAND, gravel becomes coarser wt/ depth (GP)	✓Change @ 170'	0.3	
				~~Test Hole~~ Feb 9/89 boring extended to 190 ft to accomodate heaving Sands			
	180-~~190~~ 195			brown Crse-Med SAND wt Gravel			

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBM-82-01
Surface Elevation 917.0
Job No. C-10313
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						16" TOPSOIL					
1	SS	18"	M	6		Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(2.5)				
2	3"ST	14"	M	-	5	ST Pushed Hydraulically at 100 PSI	(1.5)				
3	SS	18"	M	6							
4	SS	16"	M	26	10	Loose to Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt & Clay, Some Gravel (SP-SM)					
5	SS	12"	M	40	15	More Coarse Sand and Gravel Encountered at 14'					
6	SS	4"	M	30	20						
7	SS	12"	M	30	25	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt & Gravel (SP-SM)					
8	SS	18"	M	40	30	Boring Completed to 30' on 2/23/82	( ) Pocket Penetrometer Reading, TSF				
					35	Boring Completed from 30' - 176' on 3/19/82 - 3/22/82					
						Unit: SAMS-1 Chief: Mark O.					
					40						
					45						

(Continued)

W-2

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project ....Badger Army Ammunition Plant.....

Location .....Baraboo, Wisconsin.....

Boring No. DBM-82-01
Surface Elevation ...917.0
Job No. .....C 10313
Sheet ..... 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					50	Lost 80 Gallons of Mud from 0' - 50'					
9	SS	18"	M	82	55	Very Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Some Silt & Clay (SM)					
					60						
					65	Lost 175 Gallons of Mud from 50' - 80'					
					70						
					75						
10	SS	4"	M	125	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. DBM-82-01

Surface Elevation 917

Job No. C 10313

Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
11	SS	3"	M	119	105	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Silt, Little Gravel (SP-SM)					
					110	Lost 175 Gallons of Mud from 80' - 120'					
					115						
					120						
					125						
12	SS	6"	M	125	130	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
					135	Boring Completed to 130' on 3/20/82					

(Continued)

W-7

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Location: Baraboo, Wisconsin

Boring No. DBM-82-01
Surface Elevation 917.0
Job No. C 10313
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					140						
					145	Sand					
					150	Hard, Yellowish Brown (10YR 5/4) Silty CLAY, Trace Sand (CL)					
13	SS	18"	M	147	155		(4.5+)				
					160	Boring Extended an Additional 20' to get Below Clay Stratum					
					165	Screen -	( ) Pocket Penetrometer Reading, TSF				
					170	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
	SS	2"	W	130	175						

End Boring at 176'

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water
Depth to Cave In 25.0' Moist

GENERAL NOTES

Start 2/23/82 Complete 3/22/82
Crew Chief JWG/JS Rig 55-1
Drilling Method CS 0-10'
FA 10-30'; DM/WO 30-176'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBM-82-02

Surface Elevation 918

Job No. C-10313

Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						7" TOPSOIL					
1	SS	18"	M	16	*	Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.5)				
2	3"ST	16"	M	-	5	***			42.4	20.2	
3	SS	18"	M	22		**					
4	SS	7"	M	42	10	Medium Dense to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
5	SS	12"	M	65	15						
6	SS	18"	M	26	20	Medium Dense to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
7	SS	9"	M	38	25						
8	SS	12"	M	38	30	Boring Completed to 30' on 2/24/82					
					35	* 2' of Frost Present					
						** Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt & Gravel (SP)					
					40	*** Shelby Tube Hydraulically Pushed at 600 PSI	( ) Pocket Penetrometer Reading, TSF				
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: DBM-82-02
Surface Elevation: 918.2
Job No.: C 10313
Sheet: 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' - 155.5' on 3/19/82					
					50	Unit: SAMS-2 Chief: Tom O.					
9	SS	18"	M	95	55	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Gravel, Little Silt & Clay (SW-SM)					
					60						
					65						
					70						
					75						
10	SS	18"	M	79	80	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. DBM-82-02
Surface Elevation 918
Job No. C-10313
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
11	SS	18"	M	145	105	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					110						
					115	seal					
					120						
					125						
12	SS	12"	M	98	130	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt (SP)					
					135						

(Continued)

W-7

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBM-82-02
Surface Elevation 918.2
Job No. C 10313
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					140	Hard, Yellowish Brown (10YR 5/4) Stratified Silty CLAY and Fine SAND (CL/SM)					
					145						
					150						
13	SS	-	M	-			(4.5+)				
14	SS	18"	W	139	155						
						End Boring at 155.5'					
					160						
						No Mud Loss During the Drilling Operation					
					165						
					170						
					175						

( ) Pocket Penetrometer Reading, TSF

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water 27' Moist
Depth to Cave In

GENERAL NOTES

Start 2/24/82 Complete 3/19/82
Crew Chief JWG/JS Rig 55-1
Drilling Method CS 0-10
FA 10-30'
DM/WO 30-155.5'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBN-82-01B

Surface Elevation 905

Job No. C 10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. S-1122					
					50	800 Gallons of Drilling Mud Loss from 15' - 20'					
						Drilling from 45' - 157' performed on 3/23/82					
					109						
					150						
						End Boring at 157'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/22/82 Complete 3/23/82

Crew Chief TO Rig SA

Drilling Method DM 0-157'

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. DBN-82-01C
Surface Elevation 905.0
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					30	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. S-1122					
					60						
					90	Drilling from 75' - 167' performed on 3/22/82					
					120						
					150						
					180	End Boring at 167'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/20/82 Complete 3/22/82
Crew Chief TO Rig SAMS-2
Drilling Method DM 0-167'

WB

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-01

Surface Elevation 899.2

Job No. C-10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	18"	M	7		Stiff to Very Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)	(2.0)				
2	3"ST	24"	M	2	5	ST Pushed Hydraulically from 3-5'	(1.3)		26.9	19.8	
3	SS	12"	M	10		Loose to Medium Dense, Dark Yellowish Brown (10YR 4/6) Fine to Coarse GRAVEL and SAND, Little Silt, Occasional Cobbles (GW-GM) *					
4	SS	16"	M	18	10						
5	SS	15"	M	20	15	Medium Dense, Yellowish Brown (10YR 5/4) Sandy SILT (ML)					
6	SS	18"	M	20	20						
7	SS	18"	M	16	25	Medium Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt & Clay (SP-SM)					
8	SS	15"	M	27	30	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Some Silt & Clay (SM)					
					35	* Greater Percentage of Sand than Gravel noted at 9'					
					40	Occasional Gravel and Cobbles Encountered at 43'	( )	Pocket Penetrometer Reading, TSF			
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-01
Surface Elevation 899.2
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES q_u	W	LL	PL	D
						Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Some Silt & Clay (SM)					
9	SS	18"	M	22	50	**	(1.5)				
						End Boring at 50'					
					55						
					60		( ) Pocket Penetrometer Reading TSF				
					65	** Stiff, Light Yellowish Brown (10YR 6/4) Silty CLAY, Trace Fine Sand (CL)					
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling NW
Upon Completion of Drilling —
Time After Drilling ½ hour
Depth to Water 8.0' DM
Depth to Cave In

GENERAL NOTES

Start 3/12/82 Complete 3/12/82
Crew Chief JWG/SW Rig 55-1
Drilling Method CS 0-10'; DM/WO 10-50'; DC(4") 0-10'

W-5

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-02

Surface Elevation 90[redacted]

Job No. C 10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	18"	M	10		Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)	(1.5)				
2	3"ST	16"	M	-	5	Shelby Tube Pushed Hydraulically from 3-5'	(1.5)				
3	SS	9"	M	15		Medium Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM)					
4	SS	12"	M	21	10						
5	SS	18"	M	28	15	Color Change to Light Olive Brown (2.5Y 5/4) at 9'					
6	SS	18"	M	13	20	Medium Dense, Very Pale Brown (10YR 7/4) Fine SAND, Little Silt (SP-SM)					
7	SS	18"	M	26	25	Medium Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND [illegible] Gravel, Trace Silt					
8	SS	18"	M	27	30	Medium Dense, Light Olive Brown (2.5Y 5/4) Sandy SILT (ML)					
					35	Very Fine to Fine SAND, Trace Silt (SP)	( ) Pocket Penetrometer Reading, TSF				
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-02
Surface Elevation 902.8
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Very Fine to Fine SAND, Trace Silt (SP)					
						*					
9	SS	7"	M	80	50						
						End Boring at 50'					
					55	* Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Some Silt & Clay, Little to Some Gravel, Occasional Cobbles (SM)					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: NW
Upon Completion of Drilling:
Time After Drilling: ½ hour
Depth to Water: 13.0'DM
Depth to Cave In:

GENERAL NOTES

Start 3/15/82 Complete 3/15/82
Crew Chief JWG/SW Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

W-5

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELB-82-03

Surface Elevation: 910.4

Job No.: C 10313

Sheet: 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
1	SS	18"	M	11		Stiff to Very Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL) *	(2.0)				
2	3"ST	18"	M	-	5						
3	SS	18"	M	41		Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Little Silt, Occasional Cobbles (SP-SM)					
4	SS	12"	M	40	10						
5	SS	12"	M	80	15	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse GRAVEL and SAND, Little Silt (GP-GM)					
6	SS	18"	M	14	20						
7	SS	18"	M	32	25	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM) Some Medium Sand & Gravel Encountered at 25'					
8	SS	18"	M	27	30						
					35	Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Some Silt & Clay (SM)	( )	Pocket Penetrometer Reading, TSF			
					40	* Shelby Tube Pushed Hydraulically from 3' to 5' at 1000 PSI					
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-03
Surface Elevation 910.4
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Some Silt & Clay (SM)					
9	SS	18"	M	17	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling NW
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water 13.0'DM
Depth to Cave In

GENERAL NOTES

Start 3/11/82 Complete 3/11/82
Crew Chief JWG/SW Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-04
Surface Elevation 906.6
Job No. C.10313
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qp	W	LL	PL	D
1	SS	27"	M	26		FILL: Silty Clay					
						12" TOPSOIL					
2	SS	30"	M	6	5	Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(2.2)				
3	3"ST	9"	M	--		ST Pushed Hydraulically at 600 PSI	(1.4)				
4	SS	24"	M	15	10	Medium Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND & GRAVEL, Some Silt & Clay (SM)					
5	SS	18"	W	39	15	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse GRAVEL, Little Silt, Some Fine to Coarse Sand, Occasional Cobbles (GW-GM)					
6	SS	18"	W	34	20						
7	SS	18"	W	20	25	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)					
8	SS	18"	W	17	30	Medium Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Trace Silt (SP)					
					35						
					40						
					45	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)					

( ) Pocket Penetrometer Reading, TSF

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELB-82-04
Surface Elevation: 906.6
Job No.: C 10313
Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qp	W	LL	PL	D
						Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)					
9	SS	17"	W	26	50						
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling: —
Upon Completion of Drilling: —
Time After Drilling: ½ hour
Depth to Water: 6.0'DM
Depth to Cave In: —

GENERAL NOTES

Start: 2/23/82 Complete: 2/23/82
Crew Chief: LS Rig: 55-2
Drilling Method: CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELB-82-

Surface Elevation: 919.6

Job No.: C 10313

Sheet: 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						FILL: Silty Fine to Medium Sand, Occasional Gravel					
1	SS	24"	M	90							
2	SS	30"	M	4	5	FILL: Mixture of Silty Sand, Cinders, Paper, Wood & Asphalt Shingles					
3	SS	25"	M	12							
4	SS	30"	M	14	10						
5	SS	18"	W	58	15	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM)					
6	SS	18"	W	24	20	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM)					
7	SS	18"	W	32	25	2" Seam of Coarse Sand & Gravel Encountered at 25'					
8	SS	18"	W	26	30						
					35						
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-05
Surface Elevation 919.6
Job No. C-10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qp	W	LL	PL	D
						Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM)					
9	SS	18"	W	12	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water 6.0' DM
Depth to Cave In

GENERAL NOTES

Start 2/23/82 Complete 2/23/82
Crew Chief LS Rig 55-2
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

W-9

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-06

Surface Elevation 922.

Job No. C 10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	15"	M	11		FILL: Fine to Coarse Silty Sand and Gravel					
2	SS	18"	M	8	5						
3	3"ST	12"	M	-		Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)	(1.8)				
4	SS	18"	M	19	10	Medium Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse GRAVEL and SAND, Little Silt (GP-GM)					
5	SS	5"	M	14	15						
6	SS	12"	M	17	20	Medium Dense to Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Little Silt (SP-SM) Occasional Cobbles Encountered at 16' Some Silt & Clay Present at 24'					
7	SS	17"	M	29	25		( ) Pocket Penetrometer Reading, TSF				
8	SS	17"	M	25	30						
					35						
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELB-82-06
Surface Elevation 922.7
Job No. C 10313
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Medium Dense to Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Little Silt (SP-SM)					
9	SS	12"	M	30	50	Trace Silt Present at 49'					
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling NW
Upon Completion of Drilling
Time After Drilling ½ hour
Depth to Water 13.0'DM
Depth to Cave In

GENERAL NOTES

Start 3/17/82 Complete 3/17/82
Crew Chief WG/JS Rig 55-1
Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WS

FIELD BORING LOG

Boring No. ELN-91

Project: No 06853-03	Project: Name BADGER AAP		Page 1 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-10-91	completed 11-10-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled /30'	∇ below ground /18'	Total Depth /30'
Logged by RRR	Checked by DRP	Date 11/20/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL
SEE ELN-91-03	0-10'			DK BROWN - RED CLAYEY SILT. TR F SAND, TR C GRAVEL TR COBBLES COHESIVE	ML		0	0
	10-20'			LT BROWN SILTY SAND, WGD F, SOME M, LITTLE C, TR F GRAVEL, TRACE CLAY PELLETS, COHESIVE	SW		0	0
	20-30'			LT BROWN SAND, WGD. M, SOME F, LITTLE SILT LITTLE C, TR GRAV, TR COBBLES	SW		0	0
	30-40'	30-32 32-40		SAME AS ABOVE COBBLE AND BOULDER ZONE			0	
	40-50	40-42 42-50		COBBLE AND BOULDER ZONE LT BROWN SAND, RED M, SOME C, LITTLE F, TR F GRAV, TR C GRAV	SP		0	0
	50-60			LT BROWN SAND, WGD, M-C SOME F GRAV, SOME F SAND TR COBBLES	SW		0	0
	60-70	70-72 72-80		SAME AS ABOVE LT BROWN SANDY GRAVEL, WGD, GRAV: F, LITTLE C, TR COBBLES, SAND: M-C	GW		0	0
	70-80			SAME AS ABOVE	GW		0	0
	80-100			SAME AS ABOVE	GW		0	0
	100-106	100-101		SAME AS ABOVE	GW		0	0
		101-106		ORANGE - RED SAND, WGD C, SOME M, SOME F GRAV TR COBBLES	SW		0	0
SPOON #1	106-108	7/11/25/40	2/1.5	LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAV. TR C GRAV	SW		0	0

FIELD BORING LOG

Boring No. EW-91-07A

Project: No 06853-03	Project: Name BADGER AAP		Page 2 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-10-91	completed 11-10-91
Method DUAL WALL	Casing Size 9" O.D.	HNU T1.7/10.2	Protection Level D
Ground El	Soil Drilled 130'	▽ below ground 118'	Total Depth 130'
Logged by RCR	Checked by DRP	Date 11/20/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
SPOON #2	108-110'	12/25/33/35	2/0	NO RECOVERY CYCLONE CUTTINGS = F GRAVEL LT BROWN	(GW)		0	0
SPOON #3	110-112	22/33/38/47	2'/1.3'	LT BROWN GRAVELLY SAND, WGD, SAND: M-C, LITTLE F, GRAVEL: F, LITTLE C, TR COBBLES	(SW)		0	0
SPOON #4	112-114	6/19/36/36	2'/1.4'	LT BROWN SAND, WGD, C. SOME M, LITTLE-SOME F GRAV LITTLE F SAND	(SW)		0	0
SPOON #5	114-116	11/50→5"	1'/1'	LT BROWN SAND, PGD, M, SOME C, TR F GRAVEL	(SP)		0	0
SPOON #6	115-117	19/50→0.2'	0.3'/0.3'	LT BROWN SAND, WGD, M-C, LITTLE F GRAVEL, LITTLE C GRAVEL LITTLE F SAND	(SW)		0	0
SPOON #7	REFUSAL AT 116' BGS							
115-120				LT BROWN SAND AND GRAVEL, C SAND, F GRAVEL WGD	(SW) (RR) ▽ 118' (GW)		0	0
120-130				LT BROWN GRAVELLY SAND, WGD, M-C, GRAVEL: F, SOME C T.D.E = 130'	(SW)		0	0

FIELD BORING LOG

Boring No. ELN-91-[illegible]

Project No 0685J-03	Project Name BAXTER AAP		Page 1 of 2
Contractor LAYNE	Driller G ROSENKUELZ	Date started 11-9-91	completed 11-8-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 150'	∇ below ground 115'	Total Depth 150'
Logged by RKR	Checked by DRP	Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU AIR	Monitoring LEL
S-1	0-10'			D BROWN - RED BROWN CLAYEY SILT, TR F SAND TR M SAND, COHESIVE, MOIST.	(ML)		0	0
S-2	10-20'	10-18'		LT BROWN - RED SILTY SAND AND SILT, WGD, SAND: F-M, TR CLAY PELLETS, TR - LITTLE COBBLES	(SM)		0	0
		18-20		LT BROWN SAND, WGD, M-C, SOME F SAND, TR GRAV	(SW)			
S-3	20-30'			BOULDER AND COBBLE ZONE W/ LT BROWN SAND WGD, M-C	BIT IS PICKING UP OTBITE BOULDERS AND PUSHING THEM AHEAD BLOCKING THE BIT OPENING		0	
S-4	30-40'			SAME AS ABOVE	"		0	0
S-5	40-50'			SAME AS ABOVE	"		0	0
S-6	50-60'	50-55		SAME AS ABOVE			0	0
		55-60		LT BROWN SAND, WGD, M-C SOME F GRAV, LITTLE C GRAV, TR COBBLES	DISLODGE ROCK AT 55' (SW)			
S-7	60-70'			SAME AS 55-60'	SW		0	0
S-8	70-80'			LT BROWN SANDY GRAVEL CHANGING INTO GRAVELY SAND, WGD, SAND = M-C TR F SAND, GRAVEL: F, SOME C GRAV, TR COBBLES (SP)				

FIELD BORING LOG

Boring No. EW-91-07B

Project No 06853-03	Project Name BADGER AAP		Page 2 of 2
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-9-91	completed 11-9-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 150'	∇ below ground 115'	Total Depth 150'
Logged by DRP	Checked by DRP	Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL
S-9	80-90'	80-84'		LT BROWN SAND, WGD. C SOME M, SOME F GRAV, LITTLE C GRAV.	(SW)		0	0
		84-90'		GREY-BLACK GRAVEL, PGD, C GRAVEL, SOME F GRAVEL, LITTLE C SAND, LITTLE COBBLES	(GP)			
S-10	90-100	90-97'		GRAVEL AND SANDY GRAVEL AS ABOVE SAND: M-C	(GP)		0	0
		97-100'		GRAVELLY SAND, WGD. SAND: M-C, LITTLE F SAND GRAVEL: F, SOME C, TR COBBLES	(SW)			
S-11	100-110	100-106		LT BROWN SAND, WGD, C, SOME M, SOME F GRAV, LITTLE F SAND, TR C GRAV	(SW)		0	0
		106-110		LT BROWN GRAVEL, WGD, C GRAVEL, SOME F GRAVEL, SOME C SAND.	(GW)			
S-12	110-120	110-117		LT BROWN SANDY GRAVEL, WGD. AS ABOVE 106-110	(GW)		0	0
		117-120		LT BROWN SAND, WGD, C, SOME M, LITTLE-SOME F GRAV	▼ 115'			
S-13	120-130			LT BROWN SANDY GRAVEL, WGD. GRAV: F, LITTLE C SAND: M-C, LITTLE F SAND LITTLE SILT	(GW)		0	0
S-14	130-140			SAME AS S-13	(GW)		0	0
S-15	140-150			LT BROWN SAND, WGD, C, SOME M, SOME F GRAV	WATER TURNED DARK BROWN AT 149' (SW)		0	0
				B.O.E. = 150' BGS				

FIELD BORING LOG

Boring No. ELM-9

Project No. 06853-03	Project Name BADGER AAP			Page 1 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-13-91	completed 11-13-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El.	Soil Drilled 155'	∇ below ground 141'	Total Depth 155'	
Logged by KRR	Checked by DRP	Date 11/20/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATR	LEL
S-1	0-10'	0-7'		LT BR CLAYEY SILT, LITTLE F SAND, TR C SAND, COHESIVE.	(ML)	0	0	0
		7-10'		LT BROWN GRAVELLY SAND WGD, C, SOME M, GRAV=F, TR COBBLES, LITTLE SILT	(SW)			
S-2	10-20	10-15"		SAME AS 7-10' W/ OCCASIONAL COBBLE ZONES		0	0	0
		15-20'		LT BROWN SAND, WGD, C, SOME M, LITTLE-SOME F GRAV, LITTLE F SAND, LITTLE SILT.	(SW)			
S-3	20-30'	20-24'		SAME AS 15-20'	(SP)	0	0	0
		24-30'		LT BR SAND, PGD, F, LITTLE M, LITTLE-SOME SILT TR C SAND TR GRAV.				
S-4	30-40			SAME AS 24-30'	(SP)	0	0	0
S-5	40-50			SAME AS 24-30'	(SP)	0	0	0
S-6	50-60			LT BROWN SAND, PGD, F-M LITTLE SILT, LITTLE C SAND TR F GRAV	(SP)	0	0	0
S-7	60-70'			LT BROWN SAND, PGD CHANGING TO WGD W/ DEPTH, M, SOME C, SOME F, LITTLE F GRAVEL, TR C GRAVEL TR SILT	(SP) (SW)	0	0	0
				AT 70' ENCOUNTER A COBBLE ZONE IN A F SAND AND SILT MATRIX				

FIELD BORING LOG

Boring No. ELM-91-10

Project No. 06853-03	Project Name BADGER AAP			Page 2 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-13-91	completed 11-13-91	
Method HALWALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El	Soil Drilled 155'	∑ below ground 141'	Total Depth 155'	
Logged by RRR	Checked by DRP	Date 11/20/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	JAR	ATR	LEL
S-8	70-80	70-74'		COBBLE AND GRAVEL ZONE					
		74-76'		BROWN GRAVEL, WGD, F SAND, SOME C, SOME COBBLES	(GW)				
		76-79'		LT BROWN SAND, WGD, M, SOME C, SOME F GRAVEL, LITTLE C GRAVEL			0	0	0
		79-80		COBBLE AND BOULDER ZONE W/ C GRAVEL	(GP)				
S-9	80-90			LT BROWN-RED SILTY SAND, WGD, F, SOME M, TR LITTLE F GRAVEL, TR COBBLES	(SW)		0	0	0
S-10	90-100'			LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F. GRAV: F, LITTLE C	(SW)		0	0	0
S-11	100-110	100-103		SAME AS 90-100					
		103-110		LT BROWN SAND, WGD, C, SOME M, SOME F GRAV, LITTLE C GRAV	(SW)		0	0	0
S-12	110-130			SAME AS ABOVE	(SW)		0	0	0
	130-133'			NO SAMPLE TAKEN					
SPOON #1	133-134.8	5/22/41/50	1.8/1.7	LT BROWN SAND, MOD, C, SOME M, LITTLE F GRAVEL, TR C GRAVEL.	(SP) ✓ 10:50		0	0	0
SPOON #2	135-137	7/19/29/40	20/1.7	SAME AS SPOON #1, DENSE	(SP)		0	0	0
SPOON #3	137-139	3/5/16/29	20/1.5	SAME AS SPOON #1	(SP)		0	0	0

FIELD BORING LOG

Boring No. ELM-9

Project No. 06853-031	Project Name BANGER AAP		Page 3 of 3
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 11-13-91	completed 11-13-91
Method DUALWALL	Casing Size 4" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 155'	∇ below ground 141'	Total Depth 155'
Logged by	Checked by DRP	Date 11/20/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
SPOON #4	139-141	17/21/33/54	2.0/0.6	-LT BROWN SAND, WGD, C, SOME M, LITTLE C GRAVEL	ROCK STUCK IN SHOE (SW)	0	0	0
SPOON #5	141-142.2	9/15/24/35	2.0/1.2	AS ABOVE, WET - 141-141.5' 141.5-142.2 - LT BR SAND, PGD, C	▼ 141' (SP)	0	0	0
SPOON #6	143-144.3	2/6/10/16	2.0/1.3	LT BR SAND, PGD, C	(SP)	0	0	0
SPOON #7	145-146.4	4/6/7/12	2.0/1.4	SAME AS ABOVE	(SP)	0	0	0
SPOON #8	147-149	3/4/6/17	2.0/2.0	LT BR SAND, PGD, M-C, LITTLE F	(SP)	0	0	0
SPOON #9	149-150.8	5/10/16/33	2.0/1.8	LT BROWN SAND, PGD FINING DOWNWARD. M → F 0.1' THICK LENS OF SILT AT 150.6'.	(SP)	0	0	0
SPOON #10	151-153	5/16/15/24	2.0/2.0	LT BROWN SAND, PGD, F, SOME - LITTLE SILT. LITTLE M, TR C.	(SP)	0	0	0
SPOON #11	153-155	5/10/23/44	2.0/2.0	153-154.6 - SAME AS ABOVE 154.6-155: LT BROWN CLAYEY SILT, TR F SAND, COHESIVE, FIRM	(SP) (ML)	0	0	0

FIELD BORING LOG

BORING NO. ELN-89-02A

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 1	OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/24/89	COMPLETED 1/24/89
METHOD: Dual Wall	CASING SIZE: 9.0" O.D/6 5/8" OD	TIP ØV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: NA	SOIL DRILLED: 140'	WATER LEVEL: 138	TOTAL DEPTH: 140'
LOGGED BY: SNW	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	LEL
S-1	0 - 10'			0-5 - med to coarse sand Tan Brown w/ little far gravel 5-10 Brown (tr) silty fine sand w/ some med-lg gravel cobbles	Topsoil ✓ change @ 5' Gravel seam @ 7-8'		
S-2	10 - 20'			Brown f-m sand w tr c-sand Some sub rounded to rounded gravel	(SP)		
S-3	20 - 30'			Brown f-m sand w/ little gravel (sm - med) sub rounded to rounded grading to / w/ depth a f-sand w/ tr. med sand tr. gravel	(SP)		
S-4	30 - 40'			Brown f-c sand w/ sub ∡ to sub rounded sm to lg gravel gravel seam @ 37-39'	(SP)		
S-5	40 - 50			Same as above fining w/depth	(SP)		
S-6	50 - 60			Tan f-m sand w/ tr c-sand tr. gravel sm rounded	(SP)		
S-7	60 - 70			same as above <u>Silt lens</u> @ ~ 64' - Brown dry - firm grading to a brown f-c Sand w/ little to some gravel	✓ change @ 64' (SM) ✓ change @ 70' (SP)		

FIELD BORING LOG

BORING NO. ELM-89-02A

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP			PAGE 2	OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/24		COMPLETED 1/24/89	
METHOD: Dual Wall	CASING SIZE: 9"OD/6.25 ID	TIP eV: 10.6		PROTECTION LEVEL: D	
GROUND ELEV.: NA	SOIL DRILLED: 140'	WATER LEVEL: 138		TOTAL DEPTH: 140'	
LOGGED BY: GNW	CHECKED BY:	DATE:			

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-8	70-80			Brown f-c Sand w/ Sub rounded gravel (sm.-lg)	(SP)		
S-9	80-90		1ft.	Brown f-m Sand w/ tr c-sand. tr sm. gravel	(SP)		
S-10	90-100'			Same as above little red-brown f. Sand	(SP)		
S-11	100-110			Gravel (sm-lg) w/ cobbles w/ little f-c Sand Grading to a f-c sand + gravel w/ depth	103'- Gravel 106' Blow, w ∨ Change @ (SP)	103'	
S-12	110-120			Tan, lt. Brown f-M Sand w some c-Sand, little sm.-med gravel	∨ Change @ (SP)	110'	
S-13	120-130			Same as S-12	(SP)		
S-14	130-140			Same as S-13 increase in gravel content Brown Silty Silt w/ tr clay tr f. Sand- damp stratified	(SP) ∨ Change @ (ML)	140	
S-15	140-150			BOB - 140'			

FIELD BORING LOG

BORING NO. ELM-89-03

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/24/89	COMPLETED 1/25/89
METHOD: Dual Wall	CASING SIZE: 9.0"O.D/6.6"O.D	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 914.0	SOIL DRILLED: 180'	WATER LEVEL: 134.5'	TOTAL DEPTH: 180'
LOGGED BY: SNW	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-10'			Reddish Tan f-sand w/tr. C. Sand tr. gravel, moist. tr. silt, poorly graded	0-4.0' Top Soil		
S-2	10-20'			lgt Tan f-sand w/tr m-c sand tr. silt poorly graded moist (SP)			
S-3	20-30'			lgt tan to Brown f-sand w/ tr. silt tr m-c sand - darkening w/depth. poorly graded. Silt content increases w/depth (SP)			
S-4	30-40		lgt	Tan to Reddish brown Stratified f-m-c sand + gravel - fine sand lenses; well graded S+G Stratum; washed pea gravel (SW)	∨ change @ 30' (SW)		
S-5	40-50'	Change ∨ 43-		Brown Sand + gravel well graded 46- gravel layer 47- Rounded gravel > cobbles Sub Rounded ↓ 50 (SW)	Partial loss of circulation due to size of gravel, hard penetration (SW)		
S-6	50-60'			Brown M-C Sand & Gravel w/ little fine; tr silt (SW)			
S-7	60-70'			Stratified Sand & Gravel gravel content increases w/depth (SW)			
S-8	70-80			Same as S-7 (SW) Gravel increases w/depth	76'-Gravel Stratum		

FIELD BORING LOG

BORING NO. ELM-89-03

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/24/89	COMPLETED 1/25/89
METHOD: Dual Wall	CASING SIZE: 9.00 O.D / 6.6" O.D	TIP el: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 914.0	SOIL DRILLED: 180'	WATER LEVEL: 134.5'	TOTAL DEPTH: 180'
LOGGED BY: SNW	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-9	80-90'			Stratified f-c san + gravel tr. silt, c sand lense at 89-90' (SP)	80' ✓ cuttings		
S-10	90-100			same as above fining w/depth to a f-c sand w/sm gravel (SP)			
S-11	100-110			Same as above more gravel + larger gravel w/depth (SP)	hard penetration ✓ hard "		
S-12	110-120			predominately Gravel sm-med little f-m-c sand (GW)	✓@110'		
S-13	120-130			same as above (GW)			
S-14	130-140			Same as above ▽ 134.0 - apparent after completion (GW)			
S-15	140-150			Same as above (GW)	▽ 2 150 ✓ cuttings		
S-16	150-160			Gravel 4ar 159 - Sand Stratum - fm sand w/ little gravel (SP)	@ 150'		

FIELD BORING LOG

BORING NO. ELM-89-03 (GSP)

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 1/24/89	COMPLETED 1/25/89
METHOD: Dual Wall	CASING SIZE: 9.0"O.D / 6.6"O.D	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 914.0	SOIL DRILLED: 180'	WATER LEVEL: 134.5'	TOTAL DEPTH: 180'
LOGGED BY: SNW	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-17	160-170			Gravel sm - lg w/ coarse Sand f-m sand lenses Gravel size increases w/depth rounded to ¼ar (SB)			
S-18	170-180			sm-med Gravel tr C. Sand wet (GW)	↓change @ 176		
				Bob @ 180 Pulled up to 150 to set well			
				▽ = 134.5 below G.S.			

FIELD BORING LOG

BORING NO. ELM-89-05

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G Rodriguez	DATE STARTED 1-31-89	COMPLETED 2-1-89
METHOD: Dual Wall	CASING SIZE: 9"	TIP eV: ≈ 10	PROTECTION LEVEL: D
GROUND ELEV.: 898.2	SOIL DRILLED: 140'	WATER LEVEL: ≈ 118	TOTAL DEPTH: 140'
LOGGED BY: TJ Bragdon	CHECKED BY:	DATE: 2-1-89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
	0-2			Gravel Fill (FILL)			
	2-4			Dk Brown topsoil (SILT) (TOPSOIL)			
	4-35			Dk Brown ~~Sandy Gravelly~~ Gravelly SAND w/ some gravelly sand (SW)			
	35-73			Lt Brown fine to Med SAND w/ trace of fine gravel Layers (SP)			
	73-98			SL SILTY GRAVELLY SAND "Till like" ~~soil~~ (SM)			
	98-140			gravelly SAND w/ some Sandy Gravel generally coarser with depth (SW)			
				Well installed @ 133'			

FIELD BORING LOG

BORING NO. ELM-89-07

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: B. MARKUS	DATE STARTED 4/4/89	COMPLETED 4/18/89*
METHOD: 6.25" ϕ hollow stem auger	CASING SIZE: 4.25" ID.	TIP eV: 45	PROTECTION LEVEL: D
GROUND ELEV.: 913.7	SOIL DRILLED: 120.0'	WATER LEVEL: NR	TOTAL DEPTH: 120'
LOGGED BY: TP ALLEN	CHECKED BY: [illegible] 4/25/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				0-9 Loess. Dk br to bl organic silt Grading to med br si fi SAND			
S-1	8'-10'		80%	8-9. Loess (med br si fi SAND to sa SILT		—	
				9-10 lt br to tan f-m SAND (SP)			
S-2	18'-20'			fi-med (banded) SAND grading from lt tan to variety br to gy to med br. Bands 1-3 cm in thickness		—	
S-3	28'-28.5'		100%*	f-m lt br SAND w/ gravel and cobbles Cobble zone from 20-36, probably deeper (SP)	*Spoon refusal on cobble	—	
S-4	38-40		10%	f-m lt br SAND w/ gravel (SP)		—	
S-5	48'-50'		75%	f-m lt br SAND w/some gravel and tr cobbles (SP)	Spoon refusal @18"	—	
S-6	58'-60'		50%	f-m lt br gravelly sand w/tr cobbles	Spoon refusal @12" (D=59')	—	
S-7	68'-70'		70%	f-m lt br gravelly SAND w/tr cobbles grading to med tan gravelly SAND. (SP) (Upper portion sample probably cave).	Fault	—	
S-8	78'-80'		25%	tan med SAND (SP)	(Spoon refusal @6")	—	
S-9	88-90		20%	lt br f-m gravelly SAND (SP)	(Spoon refusal @6")	—	
S-10	98-100'		25%	lt br to tan med gravelly SAND (SP)		—	
S-11	108'-110'		25%	lt br f-m gravelly SAND SP		—	
S-12	118'-120'		10%	lt br m gravelly SAND (SP)		—	
				ABANDONED BORING DUE TO COBBLES & BROKEN HSA @ 20'			

* Boring completed by AP-1000 & Dual wall Drilling methods

FIELD BORING LOG

BORING NO. ELM-89-07

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: GRodriguez	DATE STARTED 4/17/89	COMPLETED 4/18/89
METHOD: AP-1000	CASING SIZE: 9 3/4"	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.: 913.7	SOIL DRILLED: 170'	WATER LEVEL: 140' ±	TOTAL DEPTH: 170'
LOGGED BY: Buss	CHECKED BY: gof 4/26/89	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
Sel	0-10			For detailed soil description see log prepared when HSA initially drilled well. brown fine-med SAND wt/ numerous cobbles + Boulders, some silt + fine Sand. (GP) very hard driving on (GP) boulders at 120-120 ft.	TIP Bkgd = 0-0.5		
S#13	120-130			dry, v. hard gravel, cobbles + boulder. Much dust in cyclone + angular gravel from driving through boulders. (GP)		0.2	
S#14	130-140			hard gravel, cobbles + boulders. dry. Moist sand and gravel zone 134-137 ft.	▽ = 140 ft.	0.1	
S#15	140-150			Med - fine GRAVEL wt some Crse Gravel + Cobbles little med-crse Sand wet (GP)		0.3	
S#16				Crse - Med SAND wt some Gravel, cobbles + boulders little fine SAND (GP)		0.4	
S#17				fine-med Sand wt/ Crse Sand Cobbles + boulders.		0.5	

FIELD BORING LOG

BORING NO. EM-89-08

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: D. MARKUS	DATE STARTED 3/30	COMPLETED 4/1/89
METHOD: 6.25" ϕ AUGER	CASING SIZE: 6.25" I.D.	TIP eV: #5	PROTECTION LEVEL: D
GROUND ELEV.: 903.0	SOIL DRILLED: 149	WATER LEVEL: 131	TOTAL DEPTH: 149'
LOGGED BY: R. P. ALLEN	CHECKED BY:	DATE: 4/10/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	8-10		24"/3" 12%	f-m SAND w/gravel and cobbles - very boney, hard drilling	(0-2 = loose, dk br to bl moist silt w/organics) 0-2' TOPSOIL	—	
S-2	20-22		24"/24" 100%	Med SAND w/gravel, tr cobbles (SP)	Cobble zone from 2-20'	—	
S-3	28-30		100%	Med lt br SAND w/tr silt, some gravel and cobbles		—	
S-4	38-40		10%	Similar to S-3 (SP)		—	
S-5	48-50		50%	Similar to S-3. Sample has fragments of friable granite/granite	Spoon refusal on apparent cobble @ 49'		
S-6	58-60		50%	Med lt br to tan SAND w/some gravel and tr cobbles	Spoon refusal on cobble @ 59'	—	
S-7	68-70		40%	Med lt br to tan SAND w/some gravel and cobbles	Spoon refusal on cobble @ 69'	—	
S-8	78-80		60%	Tan med SAND w/some gravel		—	
S-9	88-90		80%	Lt tan med SAND (SP)		—	
S-10	98-100 103-106		25%	Lt br/tan med SAND w/tr gravel Cobble zone		—	
S-11	108-110		10%	Lt br med to coarse SAND w/gravel and cobbles gravelly		—	
S-12	118-120		25%	Lt br med to coarse SAND w/some cobbles (SP)		—	
	(No samples below 120')			▽ @ 131.0'			
BOH	149						

FIELD BORING LOG

BORING NO. ELM-8909

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: M. DANIELS	DATE STARTED 4/10/89	COMPLETED 4/13/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 919.6	SOIL DRILLED: 160	WATER LEVEL: 140	TOTAL DEPTH: 160
LOGGED BY: BCM	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2	FROM CUTTINGS		DARK OLIVE TO DARK BROWN CLAYEY SILT, MEDIUM PLASTICITY, MOIST, ORGANIC MATERIAL PRESENT ML	COBBLES STARTING @ 3'	0.0	
S-2	10-12	PUSHED	1.5 / 0.6	BROWN GRAVELLY SAND, WELL GRADED F-C SAND, 20-30% SANG F-C GRN, TRACE SI, DRY, MED DENSE SW	COBBLES	0.0	
S-3	20-22	PUSHED	1.0 / 1.0	TAN, GRAVELLY SAND TO VERY FINE SAND, 20-30% SANG F-C GRN, TR SI, DRY, LOOSE SW/SP	✓ CHANGE 21'	0.0	
S-4	30-32	PUSHED	1.0 / 0.9	BROWN SAND, W GRD F-M, LI, SANG F-C SAND, DAMP, MOD DENSE SW	✓ CHANGE @ 30'	0.0	
S-5	40-42	PUSHED	2 / 2.0	TAN SAND, P GRD, VF TO M SA W/ A 0.4' SLTNE SI LAYER, NON PLASTIC, AT 40.6', DRY, LOOSE SP	✓ CHANGE @ 40'	0.0	
S-6	50-52	PUSHED	1.0 / 1.0	50-50.5 TAN, P GRD, F-M SA, LOOSE, DAMP SP 50.5-51 BROWN GRAVELLY SAND, P GRD F-M, 20-30% SRD C GRN, MOD, DENSE, DAMP SP (SHARP CONTACT @ 50.5')		0.0	

FIELD BORING LOG

BORING NO. ELM-8909

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: M. DANIELS	DATE STARTED 9/10/89	COMPLETED 9/13/89
METHOD: HSA	CASING SIZE: 6.25	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 919.6	SOIL DRILLED: 160	WATER LEVEL: 140	TOTAL DEPTH: 160
LOGGED BY: BCM	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-7	60-62	PUSHED	0.5/0.5	BROWN SAND, P GRD, F-M, TR C, FEW F-C GRV, LOOSE, DAMP SP		0.0	
S-8	70-72	PUSHED	0.6/0.5	BROWN SAND, W GRD F TO C SA W/ LI SRD C GRV MOD DENSE, DAMP SW	COBBLES ✓change @ 70' COBBLES	0	
S-9	80-82	PUSHED	0.5/0.5	BROWN SAND, P GRD, F TO M, LI C SA TO C GRV, MOD DENSE, DAMP SP	✓change @ 80'	0	
S-10	90-92	PUSHED	0.5/0.4	AS ABOVE W/ INCREASE IN P GRV SP			
S-11	100-102			ALL CAVE, NOT SAMPLED			
S-12	110-112	PUSHED		BROWN SAND, P GRD, F-M, TR C SA - F GRV, DAMP SP		0	
S-13	120-122	PUSHED		AS ABOVE W/ LITTLE C SA - F GRV, DAMP SP		0	
S-14	130-132	PUSHED		BROWN SAND, P GRD, F-M SA, TR C SA - F GRV, DAMP SP		0	
				BOB @ 160			

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82-

Surface Elevation: 902.8

Job No.: C 10313

Sheet: 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qp	W	LL	PL	D
						12" Silt, Sand & Gravel (Toe of Hill)					
1	SS	18"	M	6		Medium to Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.0)				
2	3"ST	13"	M	-	5	Shelby Tube Pushed Hydraulically from 3-5' at 900 PSI	(1.5)				
3	SS	12"	M	30		Medium Dense to Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND, Some Gravel, Some Silt & Clay, Occasional Cobbles (SM)					
4	SS	18"	M	18	10						
						More Gravel Encountered at 10'					
5	SS	12"	M	32	15						
6	SS	12"	M	18	20	Medium Dense to Dense, Light Olive Brown (2.5Y 5/6) Fine to Medium SAND, Some Silt & Clay, Little Gravel (SM)	( ) Pocket Penetrometer Reading, TSF				
7	SS	6"	M	31	25	Lacking Gravel at 25'					
8	SS	7"	M	25	30	Boring Completed to 30' on 3/17/82					
					35						
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-01A
Surface Elevation 902.8
Job No. C 10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' - 132' on 3/29/82					
						Unit: SAMS-2 Chief: Tom O.					
					50						
9	SS	18"	M	53	55	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM)					
					60	200 Gallons of Mud Loss at 60'					
					65						
					70						
					75						
10	SS	12"	M	188	80	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
						2" Clayey Sand Seam Encountered at 79'					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-01

Surface Elevation: 90[illegible]

Job No. C-10313

Sheet 3 of 3

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SAMPLE No.	Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks	Qu	W	LL	PL	D
					95						
					100						
11	SS	18"	M	77	105	Very Dense, Pale Brown (10YR 6/3) Fine SAND, Little Silt and Clay (SP-SM)					
					110						
					115						
					120						
					125	* Hard, Yellowish Brown (10YR 5/4) Clayey SILT, Trace to Little Sand (ML)					
					130						
12	SS	14"	1	63		* End Boring at 132'					

WATER LEVEL OBSERVATIONS NW

While Drilling					
Upon Completion of Drilling					
Time After Drilling	½ hour				
Depth to Water	26.0'				
Depth to Cave In					

GENERAL NOTES

Start 3/15/82 Complete 3/29/82

Crew Chief JWG/Sw[illegible] 55-[illegible]

Drilling Method CS 0-10'
FA 10-30'
DM/WO 30-132'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-01B
Surface Elevation 902.4
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-01A					
					40						
						Drilling proceeded hard from 60' to 70'. No mud loss during drilling operation					
					80						
					120						
						End Boring at 143.5'					
					160						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/30/82 Complete 3/30/82
Crew Chief Tom O Rig SAMS-2
Drilling Method DM 0-143.5'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. ELN-82-01C

Surface Elevation

Job No. C 10313

Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	
					40	Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-01A					
					80	No mud loss observed during drilling operation					
					120						
					160	End Boring at 153.5'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/29/82 Complete 3/29/8

Crew Chief Tom O Rig SAMS-2

Drilling Method DM O-152

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-02A
Surface Elevation 912.1
Job No. C 10313
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
1	SS	18"	M	4		Stiff to Very Stiff, Very Dark Grayish Brown (10YR 3/2) Silty CLAY (CL)	(1.0)				
2	3"ST	19"	M	-	5	Shelby Tube Hydraulically Pushed from 3-5'	(1.6)				
3	SS	18"	M	6							
4	SS	12"	M	45	10	Medium Dense to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
5	SS	12"	M	25	15						
6	SS	12"	M	46	20	Dense to Very Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse GRAVEL, Some Fine to Coarse Sand, Some Silt & Clay (GM)	( )	Pocket Penetrometer Reading, TSF			
7	SS	12"	M	38	25						
8	SS	7"	M	108	30	Boring Completed to 30' on 3/18/82					
					35						
					40						
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-C

Surface Elevation 912.1

Job No. C-10313

Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					50	Boring Completed from 30' - 130' on 3/31/82 Unit: SAMS-2 Chief: Tom O.					
9	SS	18"	M	41	55	Dense, Very Pale Brown (10YR 7/4) Fine SAND, Trace Silt (SP)					
					60						
					65						
					70						
					75						
10	SS	18"	W	45	80	Dense, Yellowish Brown (10YR 5/4) Fine to Coarse GRAVEL & SAND, Little Silt, Occasional Cobbles (GP-GM)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82-02A
Surface Elevation: 912.1
Job No.: C-10313
Sheet: 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
11	SS	18"	M	110	105	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
					110						
					115						
					120						
					125						
					130	Boring Completed from 130' - 142' on 4/1/82 Unit: SAMS-2 Chief: Tom O.					
					135						

(Continued)

W.7

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-02A

Surface Elevation 912.

Job No. C 10313

Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE No.	Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks	Qu	W	LL	PL	D
					140	Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt (SP)					
12	SS	18"	W	37							
					145	End Boring at 142'					
					150						
					155						
					160						
					165						
					170						
					175						

WATER LEVEL OBSERVATIONS

While Drilling NW

Upon Completion of Drilling

Time After Drilling ½ hour

Depth to Water

Depth to Cave In 16.0'M

GENERAL NOTES

Start 3/18/82 Complete 4/1/82

Crew Chief JWG/JS Rig 55-1

Drilling Method CS 0-10', FA 10-30', DM/WO 30-142'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. ELN-82-02B
Surface Elevation 914.6
Job No. C-10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					40	Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-02A					
					80						
					120						
					160	End Boring at 151.5'					

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 4/1/82 Complete 4/1/82
Crew Chief Tom O Rig SAMS-2
Drilling Method DM 0-151.5'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-02C

Surface Elevation [redacted]

Job No. C 10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-02A					
					50						
					100	Based on Cuttings Obtained by Driller, Well Installed in: Brown Silty CLAY					
					150						
						End Boring at 162.8'					
					200						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 4/2/82 Complete 4/2/82

Crew Chief Tom O Rig SAMS-2

Drilling Method DM O-[redacted]

WB

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-03A
Surface Elevation 925.2
Job No. C-10313
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qp	W	LL	PL	D
						9" TOPSOIL					
1	SS	29"	M	13		Very Stiff, Dark Brown (10YR 3/3) Silty CLAY, Little Fine Sand (CL) *	(2.3)				
2	3"ST	18"	M	-	5				42.2	19.1	
3	SS	27"	M	25		Medium Dense to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
4	SS	24"	M	44	10						
5	SS	18"	W	87	15						
6	SS	18"	W	18	20	Medium Dense, Yellowish Brown (10YR 5/6) Fine SAND, Trace to Little Silt (SP-SM)					
7	SS	18"	W	16	25						
8	SS	18"	W	28	30	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Some Silt & Clay, Trace Gravel (SM)					
						Boring Completed to 30' on 2/24/82	( ) Pocket Penetrometer Reading, TSF				
					35	* Shelby Tube Pushed Hydraulically from 2.5' to 4.5' at 600 PSI					
					40						
					45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82

Surface Elevation: 925.2

Job No.: C 10313

Sheet: 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						Boring Completed from 30' - 155' from 3/23/82 to 3/24/82					
					50	Unit: SAMS-1 Chief: Larry F.					
9	SS	18"	M	90	55	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	5"	M	200/0"	80	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM) Hit a Cobble or Boulder after 6" of Driving at 79'					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-03A
Surface Elevation 925.2
Job No. C 10313
Sheet 3 of 4

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qp	W	LL	PL	D
					95						
					100						
11	SS	14"	M	188	105	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Some Silt & Clay, Little Gravel (SM)					
					10						
					15						
					20						
					25						
12	SS	14"	M	147	130	Very Dense, Very Pale Yellow (10YR 7/4) Fine to Medium SAND, Little Gravel, Trace Silt (SP)					
					135						

(Continued)

WR-7

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-03A

Surface Elevation 925.2

Job No. C.10313

Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					140						
					145						
					150						
13	SS	18"	W	258	155	*					
						End Boring at 155'					
					160	* Hard, Yellowish Brown (10YR 5/4) Silty CLAY, Trace Sand, Trace Gravel (CL)					
					165	ELN-82-03B					
					170						
					175						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling ½ hour

Depth to Water 6'DM

Depth to Cave In

GENERAL NOTES

Start 2/24/82 Complete 3/24/82

Crew Chief LS Rig 55-2

Drilling Method CS 0-10'
DM/WO 10-155'
DC(4") 0-10'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82-03B
Surface Elevation: 925.5
Job No.: C 10313
Sheet: 1 of 1

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-03A					
					50						
					100	Drilling from 90' - 166' performed on 3/25/82					
					150						
						End Boring at 166'					
					200						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/24/82 Complete 3/25/82
Crew Chief TO Rig SAMS-1
Drilling Method DM 0-166'

WB

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-03[redacted]

Surface Elevation 92[redacted]

Job No. C 10313

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
					50	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-03A					
					100	Drilling from 100' - 176' performed on 3/24/82 Drilling proceeded hard a 110'					
					150	Based on Cuttings Obtained by Driller, Well Installed in: Fine to Coarse SAND, Little Silt					
					200	End Boring at 176'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/23/82 Complete 3/24/8

Crew Chief TO Rig SA[redacted]2

Drilling Method DM 0[redacted]

ws

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82-04A
Surface Elevation: 921.4
Job No.: C-10313
Sheet: 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						16" TOPSOIL					
1	SS	18"	M	8		Stiff, Brown to Dark Brown (10YR 4/3) Silty CLAY, Trace of Fine Sand (CL)	(1.7)				
2	3"ST	14"	M	-	5	*	(1.5)		42.9	22.5	
3	SS	18"	M	5		**	(1.0)				
4	SS	14"	M	16	10	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Some Silt & Clay (SM)					
5	SS	7"	M	74	15	Encountered at 3' Seam of Very Fine to Fine Sand at 15'					
6	SS	17"	M	42	20	Less Silt, But More Gravel Encountered from 18' to 25'					
7	SS	12"	M	44	25						
8	SS	7"	M	36	30	Boring Completed to 30' on 2/23/82	( ) Pocket Penetrometer Reading, TSF				
					35	* Shelby Tube Hydraulically Pushed at 600 PSI					
					40	**Loose, Brown to Dark Brown (10YR 4/3) Fine to Medium Clayey SAND, Trace Gravel (SC)					
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-04A
Surface Elevation 921.4
Job No. C 10313
Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					50	Boring Completed from 30' - 153.5' on 3/26/82 *					
						Unit: SAMS-1 Chief: Tom O.					
9	SS	18"	M	44	55	Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					60						
					65	* Encountered a Layer of Cobbles from 47' to 53'					
					70						
					75						
10	SS	15"	M	50	80	Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Some Gravel, Trace Silt (SP)					
					85						
					90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-04A

Surface Elevation: 921.4

Job No. C-10313

Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					95						
					100						
11	SS	8"	M	238/8"	105	Very Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Little Silt, Trace Gravel, Occasional Cobbles (SP-SM)					
					110	Pushed a Cobble at 104.5'					
					115						
					120						
					125						
12	SS	NR	M	200+	130	No Recovery at 130'					
					135						

(Continued)

W-7

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: ELN-82-04A

Surface Elevation: 921.4

Job No.: C 10313

Sheet: 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					140						
					145						
					150						
13	SS	18"	W	78		Very Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Some Silt & Clay (SM)					
					155	End Boring at 153.5'					
					160						
					165						
					170						
					175						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling: ½ hour

Depth to Water: 32.0'

Depth to Cave In

GENERAL NOTES

Start: 2/23/82 Complete: 3/26/82

Crew Chief: JWG/JS Rig: 55-1

Drilling Method: CS 0-10'
FA 10-30'
DM/WO 30-T53.5'

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-04B
Surface Elevation 921.9
Job No. C 10313
Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-04A					
					50						
					100						
					150	Based on Cuttings Obtained by Driller, Well Installed in: Fine to Coarse GRAVEL and SAND, Trace Silt					
						End Boring at 165'					
					200						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 3/26/82 Complete 3/26/82
Crew Chief LF Rig SAMS-T
Drilling Method DM 0-165'

WB

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. ELN-82-04C

Surface Elevation 9[redacted]

Job No. C 10[redacted]

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					50	NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-04A					
					100						
					150						
					200	End Boring at 173'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 3/25/82 Complete 3/25/82

Crew Chief L.F. Rig SAMS-1

Drilling Method DM O-[redacted]

FIELD BORING LOG

BORING NO. NPM-89-01

PROJECT NO.: 6049- C4	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: Max Tinnin	DATE STARTED 10/17/89	COMPLETED 10/25/89
METHOD: Rotary	CASING SIZE: 9 in	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 111.0'	WATER LEVEL: 84 FT	TOTAL DEPTH: 111.0'
LOGGED BY: J. Buss	CHECKED BY: P. Bolmer	DATE: 11/22/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING
S#1	0 to 10	7-8 ft		Black to gray organic topsoil grading to gray silt (loess) -OL-ML moist-wet -few cuttings.	easy driving / few cuttings	Bkgd	6
S#2	10-20			Brown fine SAND wt silt and little med-crse sand SM		Bkgd	7
S#3	20-30			[redacted], TAN, SAND, MED-V FINE, DRY, MOD GRADED, SM			
S#4	30-40			LIGHT BROWN SAND, MEDIUM, SOME CRSE & FINE, DRY, POORLY GRADED, TR FINE GRAVEL, SP			
				RESUME DRIVING CASING @ 12:15PM, 10/25/89			
S#5	40-50			LIGHT BROWN SAND, MED-FINE, DRY, POOR GRADING, SOME FINE GRAVEL SP		BKGD	—
S#6	50-60			LIGHT BROWN SAND, MED-FINE, SLIGHTLY DAMP, POOR GRADING, GRAVEL AT 55-60FT., TR FINE GRAVEL, SP		BKGD	
S#7	60-70			LT BRN SAND, MEDIUM, SM FINE, [redacted] SL DAMP, POOR GRADING, GRAVELLY, SP. [redacted]	1ppm ABOVE	[redacted] BKGD	
S#8	70-80			GRAVEL, DENSE-VERY DENSE FROM 70-75', ROUNDED, WELL GRADED GW [redacted]	2ppm ABOVE	[redacted] BKGD	

FIELD BORING LOG

BORING NO. NPM-84-04

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: MAC TINNIN	DATE STARTED 10/17/84	COMPLETED 10/25/84
METHOD: ROTARY	CASING SIZE: 9 IN	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 111.0	WATER LEVEL: 84 FT.	TOTAL DEPTH: 111.0
LOGGED BY: D. BELAN	CHECKED BY: P. Belner	DATE: 11/28/84	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#9	80-90			GRAVEL, DENSE - VERY DENSE ROUNDED, WELL GRADED, GW [redacted]	3 ppm above	[redacted] BKGD	
S#10	90-100			GRAVELLY SAND, COARSE-MED, SOME FINE GRAVEL, WET, SL ODOR, LOOSE, SW (TO 93 FT.)	[redacted] 13 ppm above	BKGD.	
				GRAVEL, MEDIUM DENSE, ROUNDED - ANGULAR, WELL GRADED, WET, SL ODOR, GW	1 ppm		
S#11	100-110			GRAVEL, S.A.A. GW	1 ppm.		
S#12	110-111			GRAVELLY SAND, VERY COARSE-MEDIUM WET, LOOSE, SW	0.5 ppm		
				EOB @ 3:20 PM 111'			

FIELD BORING LOG

Boring No. PPM-91-01

Project No 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G RODRIGUEZ	Date started 10-25-91	completed 10-25-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 110'	∑ below ground 98.5	Total Depth 110'
Logged by RRR	Checked by DRP	Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	HNU ATR	LEL
S-1	0-10'			BROWNISH RED SILTY SAND, WGD, F, TR F GRAVEL, TR COBBLES	(SM)	0	0	0
S-2	10-20'			BROWN-RED SILTY SAND, WGD, M-F, LITTLE C SAND LITTLE F-C GRAVEL	(SM)	0	0	0
S-3	20-30			LT BROWN SAND, WGD, M, SOME F, LITTLE C, LITTLE F GRAVEL, TR C GRAVEL.	(SW)	0	0	0
S-4	30-40			COBBLE AND BOULDER ZONE W/ LITTLE F GRAVEL, F SAND.		0	0	0
S-5	40-50	40-47 47-50		SAME AS ABOVE COBBLES AND C GRAVEL W/ SOME F GRAVEL AND LITTLE F SAND, TR SILT	(SW) MAY BE PUSHING A COBBLE W/ CASING	0	0	0
S-6	50-60	50-57 57-60		SAME AS 47-50' LT BROWN SAND, PLD, F-M TR C, TR F GRAV, TR SILT	(SP) SO NOT GETTING A REPRESENTATIVE SAMPLE.	0	0	0
S-7	60-70'			LT BROWN SAND, WGD, F-M LITTLE C, LITTLE F GRAV. TR C GRAN	(SW)	0	0	0
S-8	70-80'	70-76' 76-80		BROWN GRAVELLY SAND, WGD, M-C, LITTLE F GRAV; F, SOME C LITTLE COBBLES LT BROWN SAND, WGD, M-C, LITTLE COBBLES. F, LITTLE F GRAVEL.	(SW)	0	0	0
S-9	80-90'			SAME AS 76-80 EXCEPT SOME F GRAVEL.	(SW)	0	0	0
S-10	90-100'			LT BROWN SAND, PLD, M LITTLE F, LITTLE C	(SP)	0	0	0
S-11	100-110'			LT BROWN-BROWN SANDY GRAVEL AND GRAVELLY SAND, WGD SAND: C, SOME M, TR F GRAVEL: F, LITTLE C	(SW) (GW)	0	0	0

B.O.E. = 110'

FIELD BORING LOG

BORING NO. RPM-89-01

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: Mac Tinnin	DATE STARTED 10/15/89	COMPLETED 10/16/89
METHOD: TH-60	CASING SIZE: 9.in	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 127	WATER LEVEL: 109.7	TOTAL DEPTH: 127
LOGGED BY: Jim Bliss	CHECKED BY: Y. Balmer	DATE: 11/22/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING PM
S#1	0-10ft			Gray Brown fn-med SAND wt/crse sand and frce gravel wood chips FILL moist SM-SP	easy advance TIP Bkgd-4	-2.5	10
S#2	10-20ft			~~crse~~ red-brown fn-med SAND wt/ zones of Crse Sand and grave blue plastic? at ~15ft FILL moist SP		1.0	9
S#3	20-30ft			light gray brown silty fine SAND wt little Med Sand and fine sandy ~~clay~~ SILT wet ML-SM	TIP Bkgd=1.9	-1.6	
S4	30-40ft			light gray brown fn-med SAND wt occasional gravel layers. boulder zone at 37-38 ft. SM moist		0.3	8
S5	40-50			light brown fine SAND wt med. Sand and gravelly zones boulder at ~45' moist-dry SM	TIP Bkgd=2.7	0.0	7.
S6	50-60			light gray brown fine-med SAND wt gravel zones SM		0.0	7

FIELD BORING LOG

BORING NO. RPM-89-~~02~~ 01

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: Mark Tinnin	DATE STARTED 10/15/89	COMPLETED 10/16/89
METHOD: TH-60	CASING SIZE: 9 in	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 121	WATER LEVEL: ~109.95 ft	TOTAL DEPTH: 120
LOGGED BY: J. Buss	CHECKED BY: P Beline	DATE: 11/22/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING PID
S#7	60-70			light brown medium-fine SAND Dry, trce Silt occasional gravel zones SM	Bkgd = 8-9	10	8
S#8	70-80			light brown fine SAND wt gravel and cobble and boulder zones dry SM	hard driving	12	8
S#9	80-90			light brown med fine SAND wt/ some crse sand and gravel dry. SM	hard driving	bkgd	
S#10	90-100			brown med fine SAND wt occasional gravel moist, becoming wet at ~95 ft. SM		bkgd	
S#11	100-110			brown med. fine SAND wt/ little crse sand and trce gravel. gravel zone at 105 ft SM			
S#12	110-120			brown crse-med SAND, little fn sand + gravel. gravel zones. ~~gravel~~ SM-SP	hard driving		
S#13	120-126			Gray Brown Gravel wt crse-med SAND (GP)			

FIELD BORING LOG

BORING NO. RFM 89-02

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: Max	DATE STARTED 10/11/89	COMPLETED 10/13/89
METHOD: TH-FC Rotary	CASING SIZE: 9in	TIP eV: E= 10.6	PROTECTION LEVEL: D
GROUND ELEV.: /	SOIL DRILLED: 115'	WATER LEVEL: 96 ft	TOTAL DEPTH: 115 ft
LOGGED BY: Tim Bliss	CHECKED BY: P. Bolmer	DATE: 11/27/89	

SAMPLE NO.	DEPTH IN FEET	~~BLOWS PER 6-INCHES~~ TIP	~~DEN.~~ pH	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10	-0.3	6	Black organic rich topsoil over silty clayey loess OL - ML-CL	fast, easy drilling		
S#2	10-20 15-20ft	1.3 (2.2 bkgd)	6	Brown clayey silt and silty clay with fine sand below 15 ft moist. ML-SM loess	"		
S3	20-30 ~~30-40~~	6.2 (bkgd 6)	9	Brown fine-med. Sand ~~Outwash~~ moist-dry some fine-med silty gravel zones (? till) SM dark mafic boulder at ~35 ft. at 30 ft	generally easy drilling some cobble + dense gravel zones.		
S4	30-40 ~~40-50~~	12.7 (bkgd=6.6)	9	similar to S3 SM	anvil housing for hammer breaking up.		
S5	40-50	9.5 (7.6 bkgd)	8	Brown fine-med SAND w/ fine + med angular to rounded gravel zones. SM-SP			
S6	50-60	22 (bkgd=7) (moisture?)	9	similar to S6, fine gravel zone at 55 ft SM			

FIELD BORING LOG

BORING NO. RPM-89-02

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 2	
DRILLING CONTRACTOR: MATHES	DRILLER: [illegible]	DATE STARTED 10/1/89	COMPLETED 10/13/89
METHOD: hammer/ [illegible]	CASING SIZE: 9"	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 115	WATER LEVEL: 96'	TOTAL DEPTH: 115'
LOGGED BY: Biggs	CHECKED BY: P. Balmer	DATE: 11/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	pH	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S7	60-70	60 ft	8.0	Boulders + cobbles at 60 ft (dolomitic) with some sand. dry GP-? Boulders	hard driving on boulders	9.9 (9.8 bkgd.)	
S8	70-80	73 ft	8.0	Brown fn-med SAND and gravel. dense, moist, SM	Capillary fringe ∇ @ ~82 ft	9.9 (9.8 bkgd)	
S9	80-90		8.0	Brown fn-Med SAND w/ some Crse Sand moist SM		8.6 (8.6 bkgd)	
S10	90-100		9	similar to S9 (no indication of ML in S9 or S10 SM moist		9 (8.6 bkgd)	
S11	100-110		8.0	brown med SAND w/ some fn + Crse Sand Trace fine gravel moist to wet. SM	↓ coarsening downward.	0.5 (bkgd = 0)	
S12	110-115		9.0	brown med-crse SAND wet. SM-SP		1.0 (bkgd = 0.5)	

*Note ① 40' casing lost down hole, reqd. redrill ~20 west for well installation

② RPM-89-01 + RPM-89-02 interchanged from SOP designations

LOG OF TEST BORING
APPENDIX B - 1

Project Olin Corporation
Badger Ammunitions Plant
Location Synthetic Acid Plant

Boring Number NAN 8101 A
Surface Elevation 911.82
Job Number 1724
Sheet 1 of 3

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
X	0	(0-10") Black, Silty Sand & Gravel (10"-24") Black, Sandy Clayey Silt (24"-42") Brown Clayey Silt	0	0	100	42	18
	-5	Dark Brown (10YR 3/3) Silty Clay (CL)					
	-10						
	-15						
X	-20	Brown (10YR 5/3) and Pale Brown (10YR 6/3) Very Gravelly Silty Sand (SW-SM)	41.5	52.2	6.3	NP	NP
	-25						
	-30						
	-35						
X	-40	Brown (10YR 4/3) Sandy Gravel (GW)	76.5	20.9	2.6	NP	NP

LOG OF TEST BORING
APPENDIX B - 2

Project Olin Corporation
Badger Ammunitions Plant
Synthetic Acid Plant

Boring Number NAN 8101 A
Surface Elevation 911.82
Job Number 1724
Sheet 2 of 3

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture / Depth			% Gravel	% Sand	% P200	LL	PI
	-50						
	-55						
	-60						
	-65						
X	-70	Pale Brown (10YR 6/3) Gravelly Fine Sand (SP)	3.4	94.5	2.1	NP	NP
	-75						
	-80						
	-85						

LOG OF TEST BORING
APPENDIX B - 3

Project. Olin Corporation.....
. Badger Ammunitions Plant.
n. Synthetic Acid Plant....

Boring Number..NAN 8101 A
Surface Elevation. 911.82.....
Job Number....1724.....
Sheet.....3.....of...3.....

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture / Depth			% Gravel	% Sand	% P200	LL	PI
	95						
X	100	Brown (10YR 5/3) Coarse Sandy Gravel (GP)	82.1	17.5	0.4	NP	NP
	105						
	110						
	115						
X	120	Brown (10YR 5/3) Gravelly Medium to Fine Sand (SW)	10	89.4	0.6	NP	NP
	125						
X	130	Brown (10YR 5/3) Very Gravelly Sand (SW)	34.7	63.7	1.6	NP	NP
		(Groundwater level at 131.5 feet)					

LOG OF TEST BORING
APPENDIX B - 4

Project Olin Corporation
Badger Ammunitions Plant
Location Synthetic Acid Plant

Boring Number NAM 8102 B
Surface Elevation 914.54
Job Number 1724
Sheet 1 of 3

By SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
		(0-10") Brown Silty Clay (10"-24") Light Brown Silty Sand with Gravel					
X	-5	Dark Yellowish-Brown (10YR 3/4) Silty Clay (CL)	0	1.9	98.1	48	23
	-10						
X		Brown (10YR 5/3) Very Gravelly Silty Sand (SW-SM)	44.2	48.6	7.2	NP	NP
	-15						
X	-20	Yellowish-Brown (10YR 5/4) W Slightly Silty, Very Sandy Gravel (GW-GM)	50.2	44.6	5.2	NP	NP
	-25						
X	-30	Dark Grayish-Brown (10YR 4/2) Very Sandy Gravel (GW)	62	36	2	NP	NP
	-35						
X	-40	Brown (10YR 5/3) Very Gravelly Sand (SW)	43.5	55.3	1.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 5

Project. Olin Corporation .....
. Badger Ammunitions Plant
Location. Synthetic Acid Plant ...

Boring Number. NAM 81
Surface Elevation. 9
Job Number. 1724
Sheet .....2.....of...3...

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
	% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
X		-50	Brown (10YR 5/3) Gravelly Sand (SW)	18	81.4	0.6	NP	NP
		-55						
		-60						
		-65						
		-70						
		-75						
X		-80	Brown (10YR 5/3) Gravelly Sand (SW)	23.1	76.5	0.4	NP	NP
		-85						

LOG OF TEST BORING
APPENDIX B - 6

Project..Olin Corporation.....
..Badger Ammunitions Plant
..tion..Synthetic Acid Plant....

Boring Number..NAM 8102 B....
Surface Elevation..914.54....
Job Number..1724.....
Sheet....3.....of..3.....

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture ↓	Depth		% Gravel	% Sand	% P200	LL	PI
	95						
X	100	Brown (10YR 5/3) Gravelly Sand (SW)	24	75.4	0.6	NP	NP
	105						
	110						
	115						
X	120	Brown (10YR 5/3) Medium to Fine Sand (SP) Slightly Gravelly	4.3	95	0.7	NP	NP
	125						
	130	(Groundwater level at 134.38 feet)					

LOG OF TEST BORING
APPENDIX B - 7

Project. Olin Corporation
Badger Ammunitions Plant
Location. Synthetic Acid Plant

Boring Number. NAN 8103 B
Surface Elevation. 915.06
Job Number. 1724
Sheet. 1 of 4

R. J. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
		(0-10") Black Sandy Silt and Gravel					
		(10"-33") Light Brown Silty Sand and Gravel					
X	-5	Dark Yellowish Brown (10YR 3/4) Silty Clay (CL)	0	3	97	40	17
	-10						
X		Dark Yellowish-Brown (10YR 3/4) Sandy Silty Clay with Trace Gravel (CL)	1	23	76	40	19
	-15						
X	-20	Dark Yellowish-Brown (10YR 3/4) Clayey Sandy Gravel (GW-GC)	75.7	20.1	4.2	NP	NP
	-25						
X	-30	Brown (10YR 4/3) Gravelly Medium To Coarse Sand (SW)	14.4	84.6	1	NP	NP
	-35						
X	-40	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	18.5	81.3	0.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 8

Project..Olin Corporation.....
..Badger Ammunitions Plant
Location.Synthetic Acid Plant....

Boring Number....NAN 8103 B...
Surface Elevation..915.06.....
Job Number...1724.....
Sheet.....2.....of...4.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture ↓	Depth		% Gravel	% Sand	% P200	LL	PI
X	-50	Brown (10YR 5/3) Gravelly Sand (SW)	21.4	78.4	0.2	NP	NP
	-55						
	-60						
	-65						
	-70						
	-75						
X	-80	Brown (10YR 5/3) Gravelly Medium To Coarse Sand (SW)	18.3	81.3	0.4	NP	NP
	-85						

LOG OF TEST BORING
APPENDIX B - 9

Project..Olin Corporation.....
..Badger Ammunitions Plant
..ion..Synthetic Acid Plant....

Boring Number..NAN 8103 B....
Surface Elevation..915.06
Job Number.....1724.....
Sheet.....3.....of.....

. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture		Depth		% Gravel	% Sand	% P200	LL	PI
		95						
X		100	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	5.6	94.2	0.2	NP	NP
		105						
		110						
		115						
X		120	Brown (10YR 5/3) Gravelly Sand (SW)	22.1	77.5	0.4	NP	NP
		125						
X		130	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	17.5	81.3	1.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 10

Project Olin Corporation
Badger Ammunition Plant
Location Synthetic Acid Plant

Boring Number NAN 8103 B
Surface Elevation 915.06
Job Number 1724
Sheet 4 of 4

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-61c

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture ↓	Depth		% Gravel	% Sand	% P200	LL	PI
		(Groundwater level at 135.0 feet)					
X	140	Grayish Brown (10YR 5/2) Coarse Very Sandy Gravel (GP)	54	45.9	0.1	NP	NP
	145						
	150						
	155						
	160						
	165						
	170						
	175						

LOG OF TEST BORING
APPENDIX B - 11

Project.. Olin Corporation ... !..
...Badger Ammunitions Plant
tion. Synthetic Acid Plant....

Boring ber...NAN 8104 B.....
Surface elevation. 925.11.....
Job Number....1724.....
Sheet.....1.....of....4..

E. ARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
		(0-10") Brown Sandy Clay (10"-24") Tan Silty Sand and Gravel					
X	-5	Brown (10YR 5/3) Very Sandy Gravel (GW)	53.3	46.4	0.3	NP	NP
X	-10	Brown (10YR 5/3) Coarse Very Sandy Gravel (GP)	64	35.8	0.2	NP	NP
X	-15	Brown (10YR 5/3) Very Gravelly Medium to Coarse Sand (SW)	25.2	74.7	0.1	NP	NP
X	-20	Grayish-Brown (10YR 5/2) Very Gravelly Medium to Coarse Sand (SW)	44.6	55.2	0.2	NP	NP
	-25						
X	-30	Brown (10YR 5/3) Very Gravelly Medium to Coarse Sand (SW)	31.5	67.9	0.6	NP	NP
	-35						
X	-40	Brown (10YR 5/3) Very Gravelly Sand (SW)	27.2	72.6	0.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 12

ject...Olin Corporation.....
...Badger Ammunitions Plant
ion..Synthetic Acid Plant...

Boring Number..NAN 8104 B.....
Surface Elevation..925.11.....
Job Number...1724.....
Sheet....2.....of...4.....

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth			% Gravel	% Sand	% P200	LL	PI
X	-50		Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	39.8	60	0.2	NP	NP
		-55						
		-60						
		-65						
		-70						
		-75						
X	-80		Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	28.9	70.9	0.2	NP	NP
		-85						

LOG OF TEST BORING
APPENDIX B - 13

Project. Olin Corporation.....
. Badger Ammunitions Plant.
ion Synthetic Acid Plant.....

Boring Number..NAN 8104 B.....
Surface Elevation. 925.1[illegible]
Job Number..1724.....
Sheet.....3.....of.....

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture / Depth			% Gravel	% Sand	% P200	LL	PI
	95						
X	100	Brown (10YR 5/3) Very Sandy Fine Gravel (GW)	58.3	41.6	0.1	NP	NP
	105						
	110						
	115						
X	120	Brown (10YR 5/3) Very Gravelly Sand (SW)	31.8	67.7	0.5	NP	NP
	125						
	130						

LOG OF TEST BORING
APPENDIX B - 14

Project ...Olin Corporation .....
...Badger Ammunitions Plant
L ...on..Synthetic Acid Plant ...

Boring Number....NAN 8104 B..
Surface Elevation 925.11.....
Job Number..1724.....
Sheet....4.....of..4.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture		Depth		% Gravel	% Sand	% P200	LL	PI
X		140	Brown (10YR 5/3) Very Gravelly Sand (SW)	31.2	68.2	0.6	NP	NP
		145	(Groundwater level at 145.0 feet)					
		150						
X		155	Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	38.6	61	0.4	NP	NP
		160						
		165						
		170						
		175						

FIELD BORING LOG

Boring No. OPB-9

Project No 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller E. RODRIGUEZ	Date started 10-29-91	completed 10-29-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 76'	∑ below ground —	Total Depth 76'
Logged by KRR	Checked by DRP	Date 10/31/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-10'			BROWN SILTY SAND, WGD, C, SOME M, SOME F, LITTLE F GRAVEL, LITTLE COBBLES	(SM)	JAR B / AIR K	G
S-2	10-20	10-14'		LT BROWN SAND, WGD, SOME M, SOME F GRAV, SOME C GRAVEL	(SW)		
		14-20'		GRAVEL AND COBBLE ZONE W/ SOME M-C SAND			
SPOON #1	20-21.4	30/50/50	.4'		ANALYTICALS		
~~NO SAMPLE S-3~~	20-30			SAME AS 14-20'			
S-4	30-40	30-34		SAME AS ABOVE			
		34-40		LT BROWN GRAVELLY SAND, WGD, M, SOME F, SOME C, GRAVEL: F, SOME C LITTLE COBBLES	(SW)		
S-5	40-50			LT BROWN SANDY GRAVEL, WGD, F GRAV, SOME C GRAV, SAND: F, SOME M, LITTLE COBBLES OCCAISONAL COBBLE ZONES. QTZITE BEDROCK AT 59'	59 QUARTZITE		
				B.O.E = 60'			

1st attempt

FIELD BORING LOG

Boring No. OPB9101

Project No 685909	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller T. CRANK	Date started 10.23.91	completed 10.23.91
Method HSA 4¼"	Casing Size ——	HNU 11.7 (10.2) #1	Protection Level D
Ground El	Soil Drilled 17	∑ below ground ——	Total Depth 17
Logged by ES/LC	Checked by DRP	Date 10/24/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU CAR	Monitoring HNU AIR	Monitoring LEL
0750	S-1	0-2	5/12/8/11	2.0/1.8	0-0.3 gray silty sand and gravel, completed from roadway 0.3-0.5 yellow silty sand and gravel, dense 0.5-0.7 grey violet silty clayey sand with gravel. slightly plastic in part 0.7-1.0 orange fine to coarse sand with gravel loose, dry 1.0-1.8 black silty clay very dense with gravel. slightly plastic	ANALYTICAL SAMPLE 09101002	BKG	BKG	
0805	S-2	4.5-6.5	2/9/9/6	2.0/1.7	brown silty clay, plastic, dense, no horizontal partings becoming sandy 6.0-6.5 and mottled dark brown.	ANALYTICAL SAMPLE 09101006	BKG	BKG	
	S-3	9.5-11.5	50/2"	0.1/0	NO RECOVERY	BOULDERY DRILLING NO SAMPLE	—	—	
0825	S-4	14.5-16.5	26/48 42/50/4"	1.9/1.6	brown sandy gravel loose fine to coarse sand (40%) with rounded fine to coarse gravel. dry SW AUGER REFUSAL 17.0' bgs	BOULDERY DRILLING Analytical Sample 09101016	BKG	BKG	

2nd redrill

FIELD BORING LOG

Boring No. OPB9

Project No. 685303	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller T. CRANK	Date started 10-23-91	completed 10-23-91
Method HSA 4 1/4"	Casing Size —	HNU 11.2/10.2 # 1	Protection Level D
Ground El	Soil Drilled 20	∇ below ground NA	Total Depth 20
Logged by ES/LL	Checked by DRP	Date 10/24/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BR	Monitoring HNU ATR	Monitoring LEL
1040	S-1	0-2	3/5/5/11	2.0/1.6	brown sand with orange mottling 0-0.5 fine to coarse with 40% gravel. Fill 0.5-1.6 brown silty gravelly fill, dense, occassional horizontal partings, roots, metal debris in spoon tip	ANALYTICAL SAMPLE	BKG	BKG	
1050	S-2	4-6	3/4/5/5	2.0/2.0	brown silty clay plastic, dense, no gravel	ANALYTICAL SAMPLE	BKG	BKG	
	S-3	9-11	15/50/5"	0.9/0.3	gray loose sandy gravel. poor recovery	Reference Sample	BKG	BKG	
1100	S-4	14-16	25/36 38/42	2.0/1.5	brown sandy gravel loose dry fine to coarse sand with rounded gravel and broken cobble chips	Analytical Sample	BKG	BKG	
1110	S-5	19-21	50/5"	0.4/0.2	brown sandy gravel poor recovery	Reference Sample			
					AUGER Refusal at 20'				

FIELD BORING LOG

Boring No. OPB-91-02

Project No 6853-03	Project Name BHP		Page 1 of 2
Contractor MATHES	Driller Keith Braymeyer	Date started 10-10-91	completed 10-10-91
Method HSA/CME 75	Casing Size —	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 68'	▽ below ground	Total Depth 68'
Logged by RHA	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	Soil Spec
08:42	S-1 09102009	0-1.5	2/2/4	1.5/1.3	Tan fine Sand; 1" thick Clayey silt layer in middle of spoon; Trace (FINE) coarse sand and silt, dry. SP	Analytical sample	Bkg	Bkg	Bkg	Bkg
08:50	S-2 09102007	5-6.5	2/4/4	1.5/1.5	Brown to Black Clayey Silt; little fine sand; trace coarse sand and organics, dry top soil. OL	Analytical Sample	Bkg	Bkg	Bkg	Bkg
08:57	S-3 09102012	10-11.5	2/6/8	1.5/1.5	Gray (FINE) clayey silt, mottled; dry. CL	Analytical Sample	Bkg	Bkg	Bkg	Bkg
09:05	S-4	15-16.5	2/3/4	1.5/1.5	Gray silty clay, slightly mottled, soft, damp; trace (FINE) medium sub rounded (purple) gravel and coarse sand. CL	Reference	Bkg	Bkg	Bkg	Bkg
09:15	S-5 09102022	20-21.5	11/6/5	1.5/1.5	Tan to brown fine Sand, mottled; little clay; trace fine gravel; loose, wet. SC	Analytical	Bkg	Bkg	Bkg	Bkg
09:24	S-6	25-26.5	2/3/4	1.5/1.4	Bottom 0.8' - Tan to Brown fine Sand; some medium sand; trace coarse sand and fine to medium subangular gravel; Top 0.6' - Tan fine sand; little medium sand; trace coarse sand, (FINE) damp. SP	Reference	Bkg	Bkg	Bkg	Bkg

FIELD BORING LOG

Boring No. OPB4		Page 2 of 7	
Project No 6853-03	Project Name BAAP		
Contractor MATHES	Driller Keith Bunselmeyer	Date started 10-10-91	completed 10-10-91
Method HSA/CME 75	Casing Size —	HNU 11.7/(10.2)	Protection Level D
Ground El	Soil Drilled 68'	∇ below ground	Total Depth 68'
Logged by RHA	Checked by DRP	Date 10/10/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL	
09:33	S-7	30-31.5	4/5/7	1.5/1.5	Tan fine Sand; trace coarse sand. 1/4" thick gray clay lense 0.9' from bottom of spoon; dry. SP	Reference	Bkg	Bkg	Bkg	Bk
09:46	S-8	40-41.5	WOH/1/3	1.5/1.0	Bottom 0.25' – Orange to Brown medium to fine sand; trace fine gravel, coarse sand and silt. wet; Top 0.75' – Olive medium sand; little coarse sand; trace fine to medium subrounded gravel and silt; damp. Tan fine sand in shoe. SW	Reference	Bkg	Bkg	Bkg	Bkg
10:00	S-9	50-51.5	5/6/6	1.5/1.5	Bottom 0.3' – Brown Silty Clay, soft; Top 1.2' – Tan to white fine Sand; little medium Sand, trace coarse sand and silty clay lenses (thin 1/8"); dry CL/SP	Reference Difficult drilling from 55-60' – Rig chattering.	Bkg	Bkg	Bkg	B
10:14	S-10 09102062	60-61.5	12/19/23	1.5/1.0	Shoe contains a cobble of what appears to be anorthosite. Tan fine ~~and silt~~ and medium Sand; trace fine to coarse subrounded gravel (white quartz and pink quartzite; dry. SP	Analytical Auger refused at 68' will confirm w/split spoon as driller pulled plug, 8' of sand heaved in. See log book for notes.	Bkg	Bkg	Bkg	

FIELD BORING LOG

Boring No. OPB9103

Project No. 585303	Project Name USATHAMA RSAAP		Page 1 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-10-91	completed 10-10-91
Method HSA 4¼ ID	Casing Size —	HNU 11.7 (10.2) ÷ 3	Protection Level D
Ground El	Soil Drilled 99'	∑ below ground 92.5	Total Depth 101'
Logged by SANDIN	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU AIR	Monitoring LEL
~800	S-1 091035m2	0-2	3/3/9/12	2.0/1.7	med green to brown clay moderately plastic near surface becoming friable and very dense with depth. grass and reed roots in upper foot. some orange mottling in friable clay. OH/CL	ANALYTICAL SAMPLE		BKG	
c 315	S-2 091036006	4-6	3/6/7/12	2.0	GRAY TO BROWN mottled silty clay to 5.0. 5.0-6.0 reddish orange fine to medium sand, damp, ML	ANALYTICAL SAMPLE		BKG	
c 330	S-3	9-11	3/5/6/5	2.0/1.8	Brown sand, fine well sorted with occasional tan mottling loose, wet. SP	ANALYTICAL SAMPLE		BKG	
	S-4	14-16	1/2/2/3	2.0/1.5	Brown to reddish orange fine sand to silty sand. one large rounded gravel, trace small rounded gravel. SP	REFERENCE SAMPLE		BKG	
0845	S-5	19-21	1/2/3/2	2.0/1.9	19-20.1 light brown fine sand, well sorted. wet, loose SP 20.1-20.8 brown silty sand. sl. plastic	ANALYTICAL		BKG	

FIELD BORING LOG

Boring No. UPB91

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRANK	Date started 10/10/91	completed 10-10-91
Method HSA 4¼ ID	Casing Size —	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 99	∇ below ground 92.5	Total Depth 101
Logged by E.S.	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
S-6	24-26	2/4/4/6	2.0 / 2.0	tan to orangebrown mottled Fine to medium sand. well sorted, loose wet. coarser texture than S-5 SP	REFERENCE SAMPLE		BKG	
S-7	29-31	1/1/2/5	2.0 / 1.7	tan to light brown sand, fine well sorted to very fine silty sand damp, loose SM	REFERENCE SAMPLE		BKG	
S-8	39-41	9/13/18/25	2.0 / 2.0	brown gray clayey silt or sandy silt alternating with fine sand. silt is dense and moderately plastic. wet in places SC	REFERENCE SAMPLE Geologic change		BKG	
S-9	49-51	20/42/40/47	2.0 / 2.0	light tan fine to coarse sand and rounded gravel. loose, dry. (Till ?) ES SP	Reference Sample		BKG	
0945 S-10	59-61	2/12/20/28	2.0 / 2.0	tan fine sand trace coarse sand and fine gravel. loose, dry SP	Reference Sample		BKG	
1000 S-11 ES. 091030T1	69-71	28/37/45/50	2.0 / 2.0	tan very fine sand loose dry, very well sorted with areas of dense silt at SC 69.2-69.3, 70.0-70.1, and 70.5-70.6 Angular contact slump features	Analytical Sample 09103071		BKG	

FIELD BORING LOG

Boring No. OPB9103

Project No 685503	Project Name USATHAMA IRAP		Page 3 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-10-91	completed 10-10-91
Method HSA 9¼ ID	Casing Size —	HNU 11.7 (10.2) 8.3	Protection Level D
Ground El	Soil Drilled 99	∑ below ground 92.5	Total Depth 101
Logged by E. S.	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU ATR	Monitoring LEL
S-12	79-80	18/50	1.0 / 0.3	loose Sand and fine to medium rounded gravel SP	Reference Sample			
S-13	89-90	17/37/50 For 6"	1.5 / 1.5	LOOSE FINE SAND W/ SMALL PERCENT OF ANGULAR TO ROUNDED GRAVEL, DRY SP	Reference Sample			
S-14 0910B101	99-101	2/3/4/1 15	2.0 / 2.0	Brown Fine to coarse sand, loose, saturated trace gravel SP	Analytical Sample			
				BOB 99', augers 101' spoon				
				Water level in augers 92.5' b.g.s.				

FIELD BORING LOG

Boring No. OPB[redacted]

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 3
Contractor MATNES	Driller T. CRANK	Date started 10-10-91	completed 10-11-91
Method HSA 4¼"	Casing Size ——	HNU 11.7 (10.2) @ 5	Protection Level D
Ground El	Soil Drilled 89.5	ft below ground 89.5	Total Depth 91.5
Logged by E.S.	Checked by DRP	Date 10/11/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
							TAR / AIR	
1620	S-1 09104002	0-2	2/5/7/13	2.0 / 1.2	Gray silt with organics (roots) and one med size gravel, dense, low plasticity, friable., ML	ANALYTICAL SAMPLE 09104002	BKG	
1630	S-2	4.5-6.7	3/3/5/6	2.0 / 2.0	Gray slightly silty clay, some orange/red brown mottling, highly plastic CL	ANALYTICAL SAMPLE 09104006	BKG	
1635	S-3	9.5-11.5	2/3/4/5	2.0 / 2.0	Gray slightly silty clay, plastic with irregular fine sand lense 10.6 - 10.9 bright orange red mottled (sand) CL/SM	ANALYTICAL SAMPLE 09104011	BKG	
1640	S-4	14.5 - 16.5	13-20-20-24	2.0 / 2.0	Tan fine sand, well sorted, loose, dry alternating with brown friable dense silty clay SP/CL	Reference Sample	BKG	
1650	S-5	19.5 - 21.5	4/13/21/29	2.0 / 1.0	tan sand with rounded gravel, loose dry SP	Analytical Sample 09104021	BKG	

FIELD BORING LOG

Boring No. OPB9104

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-10-91	completed 10-11-91
Method HSA 4¼"	Casing Size —	HNU 11.7/10.2 ppm	Protection Level D
Ground El	Soil Drilled 89.5	∑ below ground 89.5	Total Depth 91.5
Logged by ES	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-6	24.5 - 26.5	8-29-38-30	2.0/2.0	tan fine sand with 30% rounded gravel loose, dry SP	Reference Sample		SKG	
S-7	29.5 - 31.5	1-17-24-40	2.0/2.0	29.5-30.1 fine to medium sand with small gravel. loose dry SP 30.1 – 31.5 fine sand well sorted, dry, some brown mottling SP	Reference Sample		SKG	
S-8	39.5 - 41.5	14-18-24-36	2.0/2.0	sand tan fine to coarse. with trace small gravel. coarser towards bottom. loose, dry. SP	Reference Sample		SKG	
S-9	49.5 - 51.5	9-12-16-18	2.0/2.0	tan sand fine loose damp well sorted. silty sand tense at 50.8 with bedding @ 45° to vertical irregular top contact slump or ice melt feature? SP/CL	Reference Sample		BKG	
S-10	59.5 - 61.5	10-17-20-28	2.0/2.0	silty sand, silty clay grey with occassional orange red mottling. laminations are at ~45°. slump feature appearance	Reference Sample		BKG	

FIELD BORING LOG

Boring No. DPB9[redacted]

Project No 6853 [redacted]	Project Name USATHAMA BAAP		Page 3 of 3
Contractor MATTIES	Driller T. CRANK	Date started 10-10-91	completed 10-11-91
Method HSA 4¼"	Casing Size ——	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 89.5	∑ below ground 89.5	Total Depth 91.5
Logged by E.S.	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU ATR	Monitoring LEL
S-11	10-17-24-32	Depth 69.5-71.5	2.0/2.0	tan to light brown sand very fine to fine well sorted, angled lamina and slumped appearence. damp, loose SP	Reference Sample		BKG	
S-12	79.5-81.5	1-7-14-17	2.0/2.0	tan v. fine sand loose dry well sorted SP	Reference Sample		BKG	
10/11/91 0800 S-13	89.5-91.5	7-8-10-20	2.0/2.0	light brown v. fine sand to silty sand non plastic, wet. SM	Analytical Sample 09104091		BKG	
				BOB AUGERS 89.5 LAST SPLIT SPOON 91.5				
				WATER LEVEL MEASURED IN AUGERS 89.5' bgs				

FIELD BORING LOG

Boring No. OPB-11-05

Project No 6853-03	Project Name BAAP		Page 1 of 3
Contractor MOTHES	Driller Keith Bumstead	Date started 10-10-91	completed 10-11-91
Method HSA/Cont 75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 93	& below ground Mix	Total Depth 93
Logged by RWA	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATP	Monitoring LEL *NA	Spl. Spl.
15:23	S-1 0910SC02	0-1.5	2/2/5	1.5/1.3	Bottom 0.7' — Brown Silty Clay, soft, organics; trace fine gravel; Top 0.6'- Brown to Black clayey Silt; organics, trace fine sand; dry - Top soil. OL	Analytical	Bkg	Bkg		Bk
15:32	S-2 0910SC07	5-6.5	1/3/7	1.5/1.5	Bottom 0.2'- Tan medium Sand; little fine sand, loose; Top 1.3' Grey silty Clay, mottled, soft; trace silt. dry SP/CL	Analytical	Bkg	Bkg		Bkg
15:40	S-3 0910SC12	10-11.5	3/4/10	1.5/1.2	Bottom 0.3'- Brown silty clay, soft, L. middle 0.3-0.7'- Brown fine sand; trace silt and fine rounded gravel; U. middle 0.7-1.0 - Brown fine sand, some silt; trace clay; Top 1.0-1.2'- Brown fine sand; little silt; trace coarse sand; dry. CL/SC	Analytical	Bkg	Bkg		Bkg
15:47	S-4	15-16.5	12/14/22	1.5/1.5	Bottom 0.7'- White fine Sand; trace medium Sand; Top 0.7-1.5'- Brown fine Sand; little medium sand and silt; trace clay; dry. SP/SM	Reference	Bkg	Bkg		Bkg

* LEL battery went dead.

Bkg. = Background - 0 ppm

FIELD BORING LOG

Boring No. OPB-91-0

Project No 6853-03	Project Name BAAP		Page 2 of 3
Contractor MATHES	Driller Keith Bumgarner	Date started 10-10-91	completed 10-11-91
Method HSA/CME75	Casing Size 4.25"	HNU 11.7 (10.7)	Protection Level D
Ground El	Soil Drilled 93	∑ below ground Dry	Total Depth 93
Logged by RHA	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL	SPL
15:55	S-5	20-21.5	10/18/19	1.5/1.3	Bottom 0.4' - Tan to brown fine sand; some medium sand; trace silt; Top 0.4-1.3' - Tan to brown fine sand; little silt; dry. SP	Analytical	Bkg	Bkg	Na	Bkg
09105022										
16:00	S-6	25-26.5	12/25/32	1.5/1.5	Tan fine sand, curves, trace fine to medium purple gravel, rounded, and clay, dry. SP	Reference	Bkg	Bkg		Bkg
16:05	S-7	30-31.5	10/17/23	1.5/1.4	~~Tan~~ (PM) Bottom 0.4' - Tan to brown medium and fine sand; some silty fine sand in thick lenses (2"): Top 0.4 - 1.4 - Tan fine sand; dry. SP/SM	Reference	Bkg	Bkg		
16:22	S-8	40-41.5	13/19/33	1.5/1.5	White fine sand; Brown clayey fine sand lense (2") in middle of spoon.; trace coarse sand and fine rounded gravel; dry. SP/	Reference	Bkg	Bkg		Bkg
16:40	S-9	50-51.5	16/27/43	1.5/1.5	Bottom 0.5'- Tan medium and fine sand; trace coarse sand, Top 0.5-1.5' Tan fine sand; trace medium and coarse sand; dry. SP	Reference	Bkg	Bkg		Bkg
16:53	S-10	60-61.5	12/23/36	1.5/1.5	Tan fine Sand; little medium sand; trace coarse sand) dry SP	Reference	Bkg	Bkg		Bkg

FIELD BORING LOG

Boring No. OPBA1-05

Project No 2853-03	Project Name BAAP		Page 3 of 3
Contractor MATHES	Driller Keith Russell/Lawyer	Date started 10-10-91	completed 10-11-91
Method HSA/CME75	Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 93	⚓ below ground None	Total Depth 93'
Logged by RitA	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU AIR	Monitoring LEL	Sa... Sp...
17:12	S-11	70-71.5	7/29/37	1.5/1.5	Tan fine sand; trace silt, fine to medium subangular gravel; dry, loose, SP	Reference	BKg	BKg	NA	DKg
17:41	S-12	80-81.5	39/58/100	1.5/	Tan to brown medium sand, (RHA) little some fine sand; little coarse sand and fine to medium subrounded gravel; dry. GW	Reference	BKg	BKg		(DKg)
					10-11-91					
0	S-13	90-91.5	28/52/55	1.5/1.5	Bottom 1.3' - Tan Fine Sand; little silt; trace clay; Top 1.3-1.5' - Brown silty clay; little fine sand, soft; dry SM/CL	Analytical	BKg	BKg	BKg	BK
	0710SC92									
	~~S-14~~	(RHA) ~~100/100~~		1		Auger refusal at 93' bgs				
						T.D. 93'				

FIELD BORING LOG

Boring No. DPB-91-06

Project No 6953-03	Project Name USATHAMA			Page 1 of 1
Contractor MATHES	Driller K. BUNKEMEYER	Date started 10/23/91	completed 10/23/91	
Method HSA	Casing Size 4 1/4" I.D	HNU 11.7/10.2		Protection Level D
Ground El	Soil Drilled 10'	∇ below ground		Total Depth 12'
Logged by WCLA	Checked by DRP	Date 10/23/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-2'	6-10-10-18	1.5'/2.0'	Black organics over brown SILT, cobbles, gravel, some to little medium to course Sand, ~~poorly~~ well-graded, non-plastic, massive, medium dense, dry	Analytical	JAR/ATK BKG	
S-2	5-7'	15-15-14-20	1.0'/2.0'	Brown medium SAND, and COBBLES/GRAVEL, Some to little course Sand, and Silt, trace fine sand, ~~poorly~~ well ~~SED~~ graded, non-plastic, massive, medium dense, dry	ANALYTICAL	BKG	
S-3	10-12'	16-40-44-45	/2.0	Brown fine to medium SAND and COBBLES/gravel, little course Sand and silt, ~~poorly~~ well graded, non-plastic, massive, very dense, dry	ANALYTICAL	BKG	
				Terminated boring at 12' depth bgs			

FIELD BORING LOG

Boring No. OPB-91-07

Project No 6853-03	Project Name USATHAMA - BAAP		Page 1 of 1
Contractor MATHES	Driller K. BUNSELMEIER	Date started 10/22/91	completed 10/23/91
Method HSA	Casing Size 4 1/4"	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 10'	⚓ below ground	Total Depth 12'
Logged by W. CHILDS	Checked by DRP	Date 10/23/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
						GAR ATK	
S-1	0-2'	2-7-5-5	1.1/20	Brown organics over brown FINE SAND, COBBLES/GRAVEL, little silt, medium sand, trace course sand, well graded, non-plastic, moist, medium dense, dry	ANALYTICAL	BKG	
S-2	5-6.3'	13-17-50/4"	0.8/1.3	Brown medium SAND, COBBLES/GRAVEL, some silt and fine sand, little course sand, well graded, non-plastic, very dense, dry	ANALYTICAL	BKG	
S-3	10-11	5/75	0.8/1.0	Brown medium SAND, COBBLES/GRAVEL, Some course sand and silt, little silt, well graded, non-plastic, very dense, dry	ANALYTICAL	BKG	
				TERMINATED boring at 12.0' depth bgs			

FIELD BORING LOG

Boring No. OPB-91-06

Project No	Project Name USATHAMA - BAAP			Page 1 of 1
Contractor MATHES	Driller K. BUSSEMEYER	Date started 10/23/91	completed 10/23/91	
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D	
Ground El	Soil Drilled 10'	∑ below ground	Total Depth 12'	
Logged by WCHILDS	Checked by DRP	Date 10/24/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-2'	4-6-6-5	1.3/2.0	Brown fine to med SAND some gravel and silt little course sand, well graded, non-plastic, medium dense, dry	ANALYTICAL	TAR ATR BKG	
S-2	5-7'	10-16 20-23	1.4/2.0	Brown fine to course SAND and GRAVEL, some silt, well-graded, non-plastic dense, dry	ANALYTICAL	BKG	
S-3	10-11	27-75	0.8/1.0	Tan fine to course SAND and GRAVEL, little silt, well-graded, non-plastic very dense, dry	ANALYTICAL	BKG	
				Terminated boring at 17.0' depth bgs			

FIELD BORING LOG

Boring No. OPB-91-09

Project No	Project Name USATHAMA - BAAP		Page 1 of 1
Contractor MATHES	Driller K. RUSSELL	Date started 10/23/91	completed 10/23/91
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 16'	∑ below ground	Total Depth 12'
Logged by WCHILDS	Checked by DBP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATK	Monitoring LEL
S-1	0-2'	2-4-3-3	1.3/2.0	Brown fine to medium SAND and GRAVEL, some silt, trace course sand, well graded, non-plastic loose, dry	ANALYTICAL		BKG	
S-2	5-5.7'	45-50/3"	.5/.7	Brown fine SAND and GRAVEL, some medium sand, little silt, trace course sand, well graded non-plastic, very dense, dry, rock fragment in tip	ANALYTICAL		BKG	
S-3	10-12	15-15-13-13	1.7/2.0	0.0-1.0 Brown fine to medium SAND and GRAVEL, some silt little course sand, well graded, non-plastic, dense, dry 1.0-2.0 Tan medium SAND, some to little fine and course sand, Poorly graded, non-plastic medium dense, stratified	ANALYTICAL		BKG	
				Terminated boring at 12.0' depth BGS				

FIELD BORING LOG

Boring No. OFB-91-

Project No	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller K. BOLKEMEYER	Date started 10/23/91	completed 10/23/91
Method HSA	Casing Size 4¼"	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 8'	∑ below ground	Total Depth 8'
Logged by WCHILDS	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
S-1	0-2	2-4-6-7	1.5/2.0	Black organics over brown SILT, some fine Sand, trace fine gravel, poorly graded Slightly plastic, med. dense, moist	ANALYTICAL		BKG	
S-2	5-7	17-30 11-16	0.8/2.0	Brown/tan fine to medium SAND and fine GRAVEL, some course sand, trace silt, well graded, non-plastic, dense dry	ANALYTICAL		BKG	
				Refusal at 8', 8', and 6'				
				Terminate 3rd attempt at 6' bgs				

FIELD BORING LOG

Boring No. OPB9111

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller T. CRANE	Date started 10-23-91	completed 10-23-91
Method HSA 4 1/4"	Casing Size —	HNU 11.7 (10.2) ppm /	Protection Level D
Ground El.	Soil Drilled 9.5	∑ below ground —	Total Depth 11.5
Logged by ES/LL	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATP	Monitoring LEL
.605 S-1	0-2	1/8/7/6	2.0/2.0	brown silty gravelly fill, 30% fine-coarse sand, dense, slightly plastic in places	Analytical Sample 09111002	Bkgn	Bkgn	
S-2	4.5-6.5	2/3/2/1	2.0/0.5	brown silty gravelly sandy fill. asphalt pieces, round to angular gravel, moist,	Analytical Sample 09111006	Bkgn	Bkgn	
S-3	9.5-11.5	26/22/27/50	2.0/2.0	brown sand with 30% gravel and one silty clay clast. loose, dry, quartzite chips	Analytical Sample 09111011	Bkgn	Bkgn	
				TOB 9.5 augers 11.5 last spoon				

S

FIELD BORING LOG

Boring No. OPB91

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller T. CRANE	Date started 10-23-91	completed 10-23-91
Method HSA Q"/Q"	Casing Size ——	HNU 11.7 (10.2) ~~11~~ 7	Protection Level D
Ground El	Soil Drilled 9.5	∑ below ground NA	Total Depth 10.0
Logged by ES/LC	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
1500 S-1	0-2	2/4/4/6	2.0 / 1.8	0-0.4 brown silty sandy topsoil with organics (roots) and gravel, crumbly texture 0.4-1.8 brown/gray silt, dense, moist, trace gravel, occasional sand, parts along horizontal plane	ANALYTICAL SAMPLE 09113002	BKG	BKG	
1510 S-2	4.5-6.5	1/2/3/4	2.0 / 2.0	brown silt, orange mottling, dense, damp, moderately plastic with trace sand and some clay.	ANALYTICAL SAMPLE 09113006	BKG	BKG	
1525 S-3	~~4.5-11.5~~ 9.5-11.5	50/4"	0.3 / 0.2	brown sand, loose dry, fine gravel poor recovery	ANALYTICAL SAMPLE 09113011	BKG	BKG	
				BOB 9.5 AUGERS 10 SPOON				

FIELD BORING LOG

Boring No. OPB9113

Project No 685303	Project Name USATHAMA BAAP		Page 1 of 1
Contractor MATHES	Driller T. CRANK	Date started 10-23-91	completed 10-23-91
Method HSA 4¼"	Casing Size ——	HNU 11.7 (102) ppm	Protection Level D
Ground El	Soil Drilled 8, 9, 9	∑ below ground ——	Total Depth 9.0
Logged by E.S/L.C.	Checked by DRP	Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU TAR	Monitoring HNU ATR	Monitoring LEL
S-1	0-2	2/9/9/11	2.0/0.6	brown silty topsoil with organics. trace gravel, moist, dense	ANALYTICAL SAMPLE 09113002			
S-2	4.5-6.5	10/7/5/6	2.0/1.6	brown silty gravelly sand, dense, slightly plastic in part	ANALYTICAL SAMPLE 09113006			
				AUGER REFUSAL at 8.0 feet				
				move east 10 feet try again — auger refusal at 9 feet				
				move another 10 ft east — auger refusal at 9 feet				
				no additional samples taken				
				BOB 1. 8.0 2. 9.0 3. 9.0				

REDRILL

FIELD BORING LOG

BORING NO. OPB-RG-01

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: MAL TINNIN	DATE STARTED 11-13-89	COMPLETED 11/13/89
METHOD: Hammer	CASING SIZE: 9"	TIP eV: 10.02 eV	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 73'	WATER LEVEL: None	TOTAL DEPTH: 73.00
LOGGED BY: NADIA GUICESSOK	CHECKED BY: P. Balmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-10'			BROWN-GREY SILTY CLAY, M GRAVEL, M-~~FINE~~ SAND F-COARSE SAND WET GRADING TO GREY-BROWN F. SAND, SOME SILT, SOME GRAVEL AND SILT LAYERS MOIST. GM	1'/min		
S-2	10'-20'			LT. BROWN F. SAND SOME SILT, SOME GRAVEL. DRY. BOULDERS AT 14', & 17'. SM	1'/@ 1.25 min		
S-3	20'-30'			LT BROWN-TAN VF. SAND SOME SILT, SOME GRAVEL BOULDER AT 23' 26' SP	1'/1.5 min		
S-4	30'-40'			TAN VF SAND SOME AND SILT SOME GRAVEL BOULDERS AT 31' 35' 38' GM	1'/1.5 min		
S-5	40'-50'			TAN F SAND SOME SILT SOME GRAVEL - BOULDERS AT 43'-48' SM	1'		
S-6	50'-60'			TAN F SAND SOME SILT, SOME GRAVEL - BOULDER AT 56' SM	1'		
S-7	60'-70'			TAN F. SAND SOME SILT SOME GRAVEL SM BEDROCK AT 66'	1'		

DOB 73'

ABANDONED

FIELD BORING LOG

BORING NO. SPB8901

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF
DRILLING CONTRACTOR: MATHES	DRILLER: ED Clark	DATE STARTED 10-11-89 COMPLETED 10/11/89
METHOD: HSA	CASING SIZE: 4.25"ID	TIP eV: 10.6
GROUND ELEV.:	SOIL DRILLED: 18'	WATER LEVEL: NA
LOGGED BY: D.LARUE	CHECKED BY: P. Bolmer	DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 008901-000	0.0 - 2.0	4/6/7/10	2.0 / 1.5	LT. GREY TO GREY/BROWN FINE SANDY SILT. DRY, NON-PLASTIC. DENSE (SM) PH -4, RAD - 0	S-1 ANALYTIC. SAMPLE TAKEN 0.0 - 2.0 COBBLES 0 - 5.0'		21
S-2 008901-005	5.0 - 6.5	5/55/70	1.5 / 1.4	DK BROWN W/ORANGE BROWN MOTTLED SILTY SAND, DRY TO MOIST, NON PLASTIC, DENSE (SM) PH - 3 to 4 RAD - 0	S-2 ANAL. TAKEN 5.0' TO 6.5' COBBLES 5.0' - 9.0'		21
S-3 008901-010	10.0 - 12.0'	26/50/84/56	20 / 1.6	LT. BROWN SANDY QUARTZITE GRAVEL. DRY, NON-PLASTIC (GP) pH - 7 rad - 0 VERY DENSE (SAMPLE COMING UP AS GRAVEL, BUT ACTUAL ROCKS ARE PROBABLY MUCH BIGGER) QUIT AFTER 3rd sample due to rough drilling conditions, and are planning to move to new spot.	S-3 ANAL. TAKEN 10.0' - 12.0 BOULDERS @ 10.0 - 15.0		21

FIELD BORING LOG

BORING NO. CPE-2-02

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-14-89	COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: -none-	TOTAL DEPTH: 66'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN TIP	MONITORIN LEL
S-1 08902000	0'-2'	1/1/1	2.0 / 1.4	Tan, med. grained clean sand. Well sorted. Non-plastic. very loose, dry (SP) pH-6	S-1 Analytical	-3 / -3	-2.
S-2 08902005	5'-7'	4/4/2/4	2.0 / 2.0	5'-6': Med brown to orange to grey med gr. sand. Well sorted. Non plastic, very loose, moist. (SP) 6'-7': Grades in to med. brown to dark grey silty clay. Moderate plasticity, moist to saturated. (ML/CL) pH-6 *change at 6.0'	S-2 Analytical	-4 / -4	
S-3 08902010	10'-12'	8/12/11	1. / 1.3	0 to 11.5: Dk. brown to dk. grey silty clay. Low plasticity. medium dense, damp. (ML/CL) 11.5-12.0: dark grey fine grained gravelly sand. Mottling. Non plastic, semi-saturated. (GM) pH-6 *change at 11.5	S-3 Analytical	-4 / -4	

FIELD BORING LOG

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	BORING NO. EPB-89-02	PAGE 2 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-14-89	COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: None	TOTAL DEPTH: 66'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-4 Reference	15'-17'	1/2/3/3	2.0 / 2.0	15-15.1: Dark grey fine gr sand. Low plasticity, very loose, damp. (SP) 15.1 to 17.0: Lt. grey silty clay. Orange mottling. Hi plasticity, moist. Last 4" are saturated. pH-6 CL * change at 15.1	Reference sample	-4 / -4	29
S-5 08902020	20'-22'	2/3/5/6	2.0 / 2.0	Lt. grey silty clay. Heavy mottling and organics. Hi plasticity, loose, moist. Top 3" semi-saturated OH * perched water zone at 15.6 to 20.3'	S-4. Analyt. (590)	-4 / -4	
S-6 Reference	25'-27'	5/6/7/8	2.0 / 2.0	Dark grey silty clay. Med. plasticity, loose, moist. Trace organics and angular gravel pieces. 2 med. grained tan well sorted sand lens. (SC/CL) pH-6 * change at 29' (approx) from clay to sand	Reference sample	-4 / -4	

-2-

FIELD BORING LOG		BORING NO. CPB-89-02	
PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 3 OF 4	
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-14-89	COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: None	TOTAL DEPTH: 66'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-7 Reference	30'-32'	9/17/24/25	2.0 / 2.0	Tan, med. to fine grained clean sand. Mottled. No plasticity, med. dense, damp to dry. Trace heavy mineral, and trace angular gravel pH-6 (SP) *change at 29.0	Reference sample	-4 / -4	21
S-8 Reference	40'-42'	9/21/27/40	2.0 / 2.0	Med. brown to tan fine to med. gr. sand. Mottled with some organics. No plasticity, dense, damp. (SP) pH-6	Reference sample	-4 / -4	
S-9 Reference	50'-52'	10/17/19/21	2.0 / 2.0	Tan, med. to fine grained clean ~~sand silt~~ gravelly sand. Orange mottling. Poorly sorted, no plasticity, medium dense, damp. Some med. brown sandy silt lens. Located above orange mottled area. (SW) pH-6	Reference sample	-4 / -4	

FIELD BORING LOG

BORING NO. CPE-SC2

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-14-89	COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: MCO D
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: None	TOTAL DEPTH: 66'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-10 reference	60'-62'	10/13/16/17	2.0 / 2.0	60-61 Tan to medium brown medium to fine gr. sand. well sorted. Non plastic, med. density, damp to dry. (SP) 61-61.5 Med. brown sandy gravel layer. Gravel size approx ½-1". Damp to dry. (GM) 61.5-62: Tan, med gr. clean gravelly sand. No plas., Poorly sorted, damp to dry. A few very clean med gr sand lens. Very well sorted. (GM) pH-6	Reference sample	-4 / -4	21
S-11 03902064	64'-66'	9/20/50/105	2.0 / 1.2	Med. brown sandy gravel. Poorly sorted. Dense, damp to moist. Tite gravel. Unable to drill thru. pH-6 (GW)	S-5 Analytical	-4 / -4	
				T.D @ 66.0'			

FIELD BORING LOG

BORING NO. CPB-89-3

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-12-89	COMPLETED 10/13/89
METHOD: HSA	CASING SIZE: 4.25-ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: NA	TOTAL DEPTH: 77.6'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 08903000	0-2'	1/2/3/4	2.0 / 1.7	Dk. brown silt with minor amounts of very fine sand. Mod plasticity, loose, fairly moist. Some mottling (SM) pH-6 *Change at 2.0	S-1 Anal taken No trouble advancing	-.46 / -.47	21.6
S-2 08903005	5'-7'	3/7/11/15	2.0 / 1.9	Lt. grey with orange mottling clayey silt. Moderate plasticity, medium dense. Moist (CL to ML) pH-5 *change at 10.0	S-2 Anal. taken No problems	0-3 / 12	
S-3 08903010	10'-12'	2/2/3	1.5 / 1.3	Lt. brown, medium to fine gr. sand with trace silt. Well sorted. Some mottling. Non-plastic, loose, damp (SP) pH-6	S-3 Anal. taken	3 / 12	
S-4 ~~08903015~~ reference sample	15'-17'	3/4/5/6	2.0 / 2.0	Tan to medium brown, med. to fine grained sand. Trace silt. Well sorted. Mottled (orange). Non-plastic, loose, dry to damp pH-6 (SP)	Reference sample	-5 / -5	
S-5 08903020	20'-22'	3/4/3/8	2.0 / 2.0	Lt. brown to orange, medium to fine grained sand. silty-clay lens at 21.0' to 21.5'. Trace silt. Well sorted. Some mottling. Non plastic, loose, damp. pH-6 (SP)	S-4 Anal. taken smooth drilling	-5 / -5	

*Tip readings taken with background reading as zero or sample reading

FIELD BORING LOG

BORING NO. OPB6403

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Nieves	DATE STARTED 10-12-89	COMPLETED 10 12 89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: NA	TOTAL DEPTH: 77.6'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-6 Reference	25'-27'	2/5/5/7	2.0 / 1.8	Tan, med. to fine grained clean sand. well sorted. Non-plastic, loose, damp. Traces of heavy mineral (hornblend?) PH-6 rad-0 (SP)	Reference taken	-5 / -5	21.0
S-7 Reference	30'-32'	4/5/5/5	2.0 / 2.0	Med. to dark brown, med. gr. clean sand. Mod. to well sorted. Non-plastic, loose. (SP) damp. Traces of heavy min. At: 31.5', enter into a dark brown silty clay with a gravel lens on top. Mod to good plasticity (CH-OH), loose, saturated. PH-6 *change at 31.5'. * Perched water zone at 31.5'	Reference sample. Perched water zone at 31.5	-5 / -5	
S-8 Reference	32'-34'	8/16/15/15	2.0 / 1.8	Lt. brown silt. Lo plasticity, medium dense, damp to moist. Tan, fine to med. gr. sand lens at 32.2' to 32.3' and 33.2 to 33.3'. well sorted, damp. Some mottling (ML/CL) PH-7 rad 0	Reference sample	-5 / -5	
S-9 Reference	40'-42'	9/10/10/15	2.0 / 2.0	Med. brown, medium to fine grained sand with trace of silt. Well sorted. Non-plastic, med. dense, damp. Organic layers (2mm thick) at several intervals in sample. slight mottling. V. fine sand lens @ 41.8 (.5" thick) PH-7 (SP)	Reference sample	-5 / -5	

FIELD BORING LOG

BORING NO. OPBS-03

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark	DATE STARTED 10 12 89	COMPLETED 10/12 89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: NA	TOTAL DEPTH: 77.8'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-10 Reference	50'-52'	13/15/18/19	2.0 / 1.8	Tan to med. brown, medium grained sand. Trace of silt. Moderate to well sorted, non plastic, medium dense, damp. Alternating sand and silt lens. Sand lens are med. gr. well sorted, non plastic. damp pH - 6 (SP) *small perched water zone at 48' to 50'. Well saturated sandy silt, dark brown, mod. plasticity. *another small perched water zone at 56'-58'	Reference sample	-5 / -5	
S-11 Reference	60-62'	16/23/37/48	20 / 20	60.0 to 60.2: Med. brown med. gr. sand with gravel layer at base. Non-plastic. dense dry to moist. (SP) 60.2 to 61.0: Tan, med. gr clean sand, well sorted. Non plastic, dense, dry. Traces hornblende. (SP) 61.0-62.0: Tan, med. grained clean, gravelly sand. Poor sorting. Mottling top 1". No plasticity. Grades to finer grained sand to base. Dry to moist. (SP) pH - 6	Reference sample		

FIELD BORING LOG

BORING NO. OPBS#03

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10/12/89	COMPLETED 10/12/89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: NA	TOTAL DEPTH: 77.8'
LOGGED BY: D. LaRue	CHECKED BY: P. Palmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	70'-72	8/17/15/27	2.0 / 2.0	70.0 to 70.5 Tan, med. grained gravelly sand. Moderate to poorly sorted. Mottled. Non plastic, dense, damp (SP) 70.5 to 72.0: med. brown silt mottled, moderate plasticity, med. dense. Moist to semi saturated. (ML-CL) pH - 7.0 *change at 70.5 *small perched water zone at 70.5		-5 / -5	21.0
S-13	77'-78'	61/stopped	1.0 / .8	Sandy gravel (tan) for .5', then tan shale bedrock. Dry. (GP) pH - 8 *Hit bedrock at 77.8. Stopped drilling.	Drilling difficult		
				B.O.B. @ 77.8'			

FIELD BORING LOG

BORING NO. OPB-8904

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 6
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 08904000	0-2'	4/3	2.0 / 1.5	Med. brown sandy silt. Poorly sorted. low plasticity, loose. damp to moist. Roots, mottled. (ML/CL) pH-6	S-1 Analytical	-4 / -2	21 c
S-2 08904005	5'-7'	2/4/6/7	2.0 / 1.9	Lt. brown to lt. grey with orange mottling silty clay. Trace organics. low density high plasticity, moist. (ML/CL) pH-6	S-2 Analytical	-2 / -1.5	
S-3 08904010	10'-12'	2/9/7/8	2.0 / 1.9	10.0 to 11.0: Lt. grey with orange mottling silty clay. Trace organics. Low density, mod. plasticity, moist (ML/CL) 11.0 to 11.3 orange brown (iron stained) med. to fine gr. silty sand. Mod. sorting, low density, damp. layer of gravel at base. ( ) 11.3 to 12.0 Tan to lt. grey silty clay. Moderate to hi plasticity, moist. (SM) pH-6 *change at 11.0 } PID kick *change at 11.3 }	S-3 Analytical	-2 / -.3	
S-4 Reference	15'-17'	6/15/20/38	2.0 / 2.0	15.0 to 15.5 Med. brown with orange mottling, med. to fine gr. sand. Moderate sorting, med. dense to dense, damp to moist. (SP) ~~over~~ next page	Reference sample	-3 / -3	

FIELD BORING LOG

BORING NO. [illegible]

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4 25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D.
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'	TOTAL DEPTH: 97.0'
LOGGED BY: O. LaRue	CHECKED BY: P. Brabaer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-4 continued				15.5 - 17.0 Med. brown silty sand. Poor sorting, moist. Mottled. Trace organics. (SM) pH - 6	Reference Sample		
S-5 0890404020	20 - 22	10/20/25/40	2.0 / 2.0	20.0 to 20.5 Med. brown silty sand. Poor sorting, no plasticity. dense, damp. (SM) 20.5 to 22.0 Tan, med. to fine grained clean sand. Well sorted. no plasticity, damp. (SP) * Color at 21.7 is med. brown w/orange mottling. Trace more silt. pH - 6 * Change at 20.5	S-4 Analytical Sample	-3 / -3	
S-6 Reference	25 - 27'	7/13/21/22	2.0 / 2.0	25.0 to 26.0 Tan, med. gr. clean sand. Well sorted, no plasticity moderate density, damp. Gravel layer at 26.0 (1" thick). 26.0 to 27.0 Same type sand; ~~ee~~ size decreases to fine grained. Clean, damp, no plasticity. Contains small silt lens' med. brown in color. (SP) pH - 6	Reference Sample	-3 / -3	

FIELD BORING LOG

BORING NO. OPBECHC4

PROJECT NO.: 6049-C4	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 I.D.	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-7 Reference	30'-32'	10/25/33/42	2.0 / 2.0	Tan, med. to fine gr. sand. Clean, dense, no plasticity, damp. Sand lens at 31.5 is med gr. Few traces of gravel at 30.7'. Some mottling. (SP) pH-6	Reference Sample	-3 / -2.1	
S-8 Reference	40-42'	12/23/24/30	2.0 / 2.0	40.0 to 41.0 Tan, med. to fine gr. sand. Clean, dense, no plasticity, damp. Gravel layer at base. (SP) 41.0 to 41.5 Tan, silty sand. Mod. sorting, no plasticity, semi-saturated. (SM) 41.5 to 42.0 Mod. brown, med. to large grained sand. Sub-angular to sub-rounded grains, No plasticity, damp (SP) pH-6 * Small perched zone at 41.0	Reference Sample	-3 / -3	
S-9 Reference	50'-52'	8/40/42/37	2.0 / 1.3	50.0 to 50.5 Tan, med-gr sand, well sorted, damp, no plasticity, dense. (SM) to 51.0: orange, sandy gravel poor sorting, damp. to 52.0: Tan sandy gravel. Damp pH-6	Reference Sample	-3 / -3	

FIELD BORING LOG

BORING NO. CPB-924

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'	TOTAL DEPTH: 97.0'
LOGGED BY: D LaRue	CHECKED BY: P. Bclmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				*change at 50.5			
S-10 08904060	60-62'	7/20/23/22	2.0 / 2.0	Tan, med. gr. sand with trace gravel. Moderate sorting, dense, no plasticity. Saturated (SP) * perched water zone from 60.0' to 66.0'	S-5 Analytical	-4 / -4	
S-11 Reference	65'-67'	10/27/36/33	2.0 / 1.3	65.0 to 66.0 Med. brown silty sand, fine grained. Trace fines. Slightly mottled. Lo to no plasticity, dense, saturated. Gravel layer at 65.8 to 66.0 (SM) 66.0 to 67.0 Tan, med. gr. gravelly sand. Poor sorting, dense, damp (SW) pH-6 *change at 66.0	Reference sample	-4 / -4	
S-12 Reference	75-77'	13/25/31/39	2.0 / 1.3	Med. brown, med. gr. sand. Traces of gravel. Well sorted, dense, no plasticity, damp to moist. Traces heavy mineral. Alternating med. gr. sand with fine gr. sand lens. (SP/SW) pH-6	Reference sample	-4 / -4	

FIELD BORING LOG

BORING NO. OPBG904

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 920	WATER LEVEL: 93.3'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LeBar	CHECKED BY: P. Bolmer	DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-13 Reference	85'-87'	14/27/36/45	2.0 / 1.5	85.0 to 86.0 Med. brown, med. gr sand with traces of gravel. Well sorted, dense, no plasticity. damp to moist. 86.0 to 87.0 Med. brown, silty sand with tan, med. gr. sand lens. Poorly sorted, damp, lo plasticity. Mottling from 85.0 to 86.0. pH-6 (SP/SM)	Reference sample	.4 / .4	
S-14 08904095	95'-97'	15/32/40/62	2.0 / 1.3	95.0 to 96.0 Med. brown to tan, med. gr. sand. Well sorted. Dense no plasticity, moist. trace heavy mineral. SP 96.0 to 96.5 Tan, fine gr. silty sand. moist to semi-saturated. SM 96.5 to 97.0 Med. brown gravelly sand (angular gravel). Poorly sorted, dense, no plasticity. Saturated. sandy gravel at 97.0'. GM * change at 96.0 + water at 93.3' T.D. @ 97.0	S-6 Analytical Sample	.4 / .4	

1 water level may be affected by seepage from perched zones above.

FIELD BORING LOG

BORING NO. OPE-5905

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-15 89	COMPLETED 10/16/89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10 6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none	TOTAL DEPTH: 95.5
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 08905000	0-2	1/2/3/5	2.0 / 1.8	Dark brown sandy silt Poorly sorted, moderate plasticity, loose, damp Roots. Grades to med. brown silty sand. Well sorted, no plasticity, damp. (SM) pH-6	S-1 Analytical	-3 / -2.1	21
S-2 08905005	5-7	3/4/4/3	2.0 / 1.3	Top 7" - Dark brown med. to fine gr. sand. Mod. sorting, no plasticity, loose, damp. (SP) pH-6	S-2 Analytical	-3 / -3	
S-3 08905010	10-12	2/4/4	1.5 / 1.1	Alternating lens of med. brown to tan, med to fn gr sand. Well sorted, no plasticity, loose, damp to dry. Contains dk brown sandy silt lens. Mod. plasticity, damp. Gravelly silt lens at 11.5': pH-6 SP	S-3 Analytical	-3 / -3	
S-4 Reference	15-17'	2/4/6/10	2.0 / 1.6	Top 5" med. brown silty sand alternating with med. brown sandy silt. (Mostly sand) Poorly sorted, no plasticity, loose, damp. (SM) At 15.5, it grades into			

FIELD BORING LOG

BORING NO. CFE-5905

PROJECT NO.: 6049- C4	PROJECT NAME: USATHAMA- BAAP			PAGE 2	OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark		DATE STARTED 10-15-89		COMPLETED 10/16/89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6		PROTECTION LEVEL: Mod D	
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: None		TOTAL DEPTH: 95.5	
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89			

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-4 cont.				a tan, med. gr. gravelly sand. Poorly sorted, loose, damp. Gravel looks like till (SW) pH-6			21
S-5 08905020	20-22	5/8/13/13	2.0 / 1.8	Alternating layers of med. brown, fine gr. gravelly sand, Poorly sorted, no plas., mod. dense, dry, with tan, med. gr. clean sand. Well sorted. No plasticity, dry, with med. brown/orangish sandy silt lens. mod. to good plasticity, damp. (SW/SM) pH-6	S-4 Analytical	-4 / -2.9	
S-6 Reference	25-27	3/4/6/8	2.0 / 2.0	Tan, med. to fine grained clean sand. Well sorted no plasticity, loose, dry. Trace of gravel thruout. (25.4 to 25.5 - med. brown sandy silt lens. No plas., damp.) Trace of several other small silt lens. (SP) pH-6	Reference sample	-4 / -3.2	

FIELD BORING LOG

BORING NO. OPB8905

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-15-89	COMPLETED 10-15-89
METHOD: HSA	CASING SIZE: 4.25"	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 95.5'	WATER LEVEL: none	TOTAL DEPTH: 95.5
LOGGED BY: D. LaRue	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-7 Reference	30-32	4/5/8/11	2.0 / 2.0	Tan, med. to fine grained sand, trace gravel. mod sorting, no plasticity. loose to medium dense dry. [From 30-31 gravel size is ~3mm. From 31-31.6, gravel size decreases to lg. gr sand. From 31.6-32- gravel size increases significantly to ~1/2". pH-6 (Gw/Sw) *change between 32' & 40'	Reference sample	-4 / -3.4	
S-8 Reference	40'-42'	7/11/15/19	2.0 / 2.0	Tan, med. gr. clean sand. mod. sorting, no plas., med. dense, dry. Trace silt lens (med. brown) (SP) Trace heavy mineral pH-6	Reference sample	-4 / -4	
S-9 Reference	50'-52'	7/11/20/26	2.0 / 2.0	Tan, med. gr. clean sand, mod. sorted, med dense, no plasticity, dry. Lite motteling at 51.5'. Gravel layer at 51.5. To 52: med. brown silty clay. mod. plasticity, damp. pH-6 *change at 51.5'. (SP/ML	Reference sample	-4 / -4	

FIELD BORING LOG

BORING NO. CPBS405

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-15-89	COMPLETED 10-16 89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: None	TOTAL DEPTH: 95.5
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-10 Reference	60'-62'	7/16/18/35	2.0 / 2.0	Tan, med. gr. clean sand. Well sorted, non plastic, dense, dry. Last 6" see mottling (orange) (SP) pH-7	Reference Sample	-4 / -4	21
S-11 Reference	70'-72'	9/23/29/38	2.0 / 2.0	Tan, med. to fine gr. clean sand. Well sorted non plastic, dense, dry. Some mottling. *Last 1' is somewhat finer grained and more dense than first foot. (SP) pH-6	Reference Sample	-4 / -4	
S-12 Reference	80'-82'	14/38/62/91	2.0 / 2.0	Top 5". Tan, sandy gravel (~½"). Poorly sorted, no plasticity, dense, dry. 80.5 to 81.5: Tan, clean med. gr. sand. Well sorted, no plas, dry. Mottling to 82.0: Tan, med. gr. gravelly sand. Poorly sorted. Dense, no plas. dry. SP pH-6	Reference Sample	-4 / -4	

FIELD BORING LOG

BORING NO. CPB-E96S

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10.15.89	COMPLETED
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none	TOTAL DEPTH: 95.5
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-13 Reference	90-92'	141/43	2.0 / .9	Tan, sandy gravel with dominant sandstone. Some till. Very dense, dry. pH-8 SP	Reference sample Drilling difficult	.4 / -4	21
S-14 Reference	95-95.5	132-stop	0	Spoon refusal. Nothing in sample but few quartzite chunks.	Reference sample. Tip of spoon cracked.		
				T.D. 95.5			

FIELD BORING LOG				BORING NO. OPB-89-0
PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark		DATE STARTED 10/26/89	COMPLETED 10/26
METHOD: Augers	CASING SIZE: 4 1/4" ID	TIP eV: #11 106		PROTECTION LEVEL: D
GROUND ELEV:	SOIL DRILLED: 15 ft.	WATER LEVEL: —		TOTAL DEPTH: 7ft
LOGGED BY: Buss	CHECKED BY: P. Bolmer	DATE: 11/20/89		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				boring advanced 3ft into dense boulders, relocate after refusal. drill 3 addl ft. refusal again, relocate ~25' east, refusal at 2 ft. 8ft of drilling before setting up on final.	difficult drilling in boulders		
S#1	0-2	6 7 8 11	4/24	Black organic over med fine sand wt/ gravel cobbles and silt. SP	difficult drilling in boulders.	Bkgd	
S#2	2-4	6 36 10 32	6/24	Brown to Back med-fn Sand wt/ gravel, cobbles and silt layers SP		Bkgd.	
S#3	5-7	8 14 15 16	13/24	Brown to gray med-fn SAND wf crse Sand and gravel + cobbles. FILL SP			
				7ft EOB			

Total footage for this boring = 7+2+3+3 = 15ft

FIELD BORING LOG

BORING NO. OPB-89-05

PROJECT NO.: 6049- 14	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10/25	COMPLETED 10/25
METHOD: Augers	CASING SIZE: 4¼" ID	TIP eV: #11 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 12 ft	WATER LEVEL:	TOTAL DEPTH: 12 ft
LOGGED BY: Buss	CHECKED BY: P Balmer	DATE: 11/2c/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-2	8 21 26 31	6/24	Black to brown fn-crse SAND with silt + gravel FILL Dry/SP Cobble in tip of spoon. boulder at 3 ft. rig pulled forwar ~3 ft for 2nd attempt.	difficult drilling with many boulders.	Bkgd.	
S#2	5-7	24 23 47 39	8/24	Brown Crse-fn SAND wt gravel some silt. FILL dry SP		Bkgd	
S#3	10-12	16 46 63 66	18/24	Brown to gray crse-med SAND wt/ gravel FILL SP Dry. 12 ft. BoE		Bkgd	

FIELD BORING LOG

BORING NO. OPB-89-08

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark	DATE STARTED 10/26	COMPLETED 10/26
METHOD: Augers	CASING SIZE: 4¼" ID	TIP eV: #11 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 9.0'	WATER LEVEL: None	TOTAL DEPTH: 9.0'
LOGGED BY: Buss	CHECKED BY: D. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-2	4 6 7 5	15/24	Brown Crse-Fine SAND wt/ gravel, FILL moist SP		Bkgd	
S#2	5-7	13 17 24 25	18/24	light brown Crse-Fine SAND wt/ gravel, fill. dry-moist SP		Bkgd	
S#3	7-9	32 60 100	18" / 18	oily odor in casing, TIP is up to 6 ppm 0.9=Bkgd. brown med-Fn SAND wt little silt and some gravel dry TIPs BKgd SP	*	Bkgd.	

FIELD BORING LOG

BORING NO. OP3-89-10

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: ED CLARK	DATE STARTED 10-26-89	COMPLETED 10-26-89
METHOD: HSA	CASING SIZE: 4¼" ID	TIP eV: 10.03 eV	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 9'	WATER LEVEL: NA	TOTAL DEPTH: 9'
LOGGED BY: NJG	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-2'	3 4 12 27	19"/24	BROWN SILTY V.F. SAND. ORGANICS AT TOP - MOIST. SM		BKGD	
S-2	5'-7'	6 24 8 11	11"/24	BROWN COARSE-F. SAND AND W/ GRAVEL DRY-MOIST SW		BKGD	
S-3	7-9	15 32 25 18	18"/24	BROWN COARSE-F. SAND W/ GRAVEL DRY-MOIST SW		BKGD	
				BOH 9'			

AD-A280 436 ' REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT 8/9
BARABOO WISCONSIN VOLUME 1 APPENDICES A THROUGH D(U)
ABB ENVIRONMENTAL PORTLAND ME 1991 XA-USATHAMA
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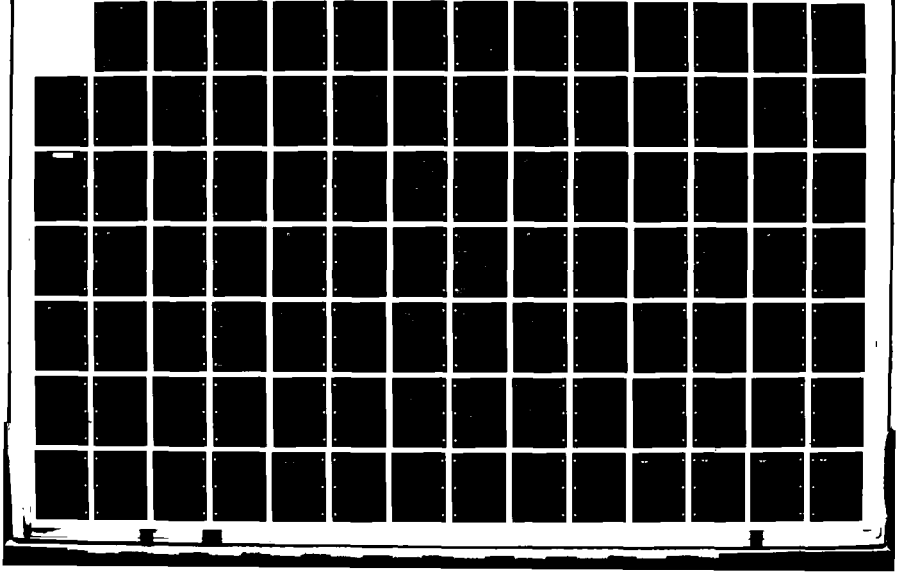

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FIELD BORING LOG

BORING NO. OPB-89-11

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10/26	COMPLETED 10/26
METHOD: Augers	CASING SIZE: 4 1/4" ID	TIP eV: #11 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 10.5	WATER LEVEL: N/A	TOTAL DEPTH: 10.5
LOGGED BY: Bass	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-2	1 4 4 6	12/24	4" Tan sand and gravel, roadway fill, over brown silty clay with crse sand + gravel dry-moist. SP		Bkgd	20?
						Bkgd	
S#2	5-7	1 1 3 6	19/24	Reddish Brown silty clay with little gravel + fine sand. FILL moist-wet MH-CL			
S#3	10-10.5	100/5"	0/5"	No Sample recovery, oil odor, TIP = ~30 ppm		30 ppm	
				- attempt sample collection by removing bottom plug + scraping sidewalls.			
			18/24	- brown silty fn-med sand w/ gravel, wet at upper surface of spoon SP	Spoon + Auger Refusal at 10 ft.	20 ppm	
				- TIP = 20 ppm			
				VOA + Inorganic sample collected.			

FIELD BORING LOG

BORING NO. ~~SB~~ OPB-89-12

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark	DATE STARTED 10/25/89	COMPLETED 10/25/89
METHOD: Augers	CASING SIZE: 4.1/4" ID	TIP eV: #11	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 13ft	WATER LEVEL: N/A	TOTAL DEPTH: 13ft
LOGGED BY: Buss	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-2	5 7 4 5	24/24	Gray Silt, dry wt/ occasional crse Sand + fn gravel, (loess, fill?) SM	Bkgd = ~0.5ppm	Bkgd	
S#2	5-7	2 3 4 4	24/24	Gray to brown silt and clay moist-wet some iron staining CL-ML Loess		Bkgd	
S#3	10-12	8 9 25 100/3"	10/24	very rust colored Crse to med Sand and gravel (angular) little fine sand and silt. SP-SM		Bkgd	
				EOB = 13 ft, Auger refusal.			

FIELD BORING LOG

BORING NO. OPB-89-13

PROJECT NO.: 6049-64	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: EO CLARK	DATE STARTED 10-26-89	COMPLETED 10-26-89
METHOD: HSA	CASING SIZE: 4¼" ID	TIP eV: 10.02 eV	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 7.0'	WATER LEVEL: NA	TOTAL DEPTH: 7.0'
LOGGED BY: NSG	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-2'	3 4 4 5	20"/24	BROWN SILTY F. SAND TR GRAVEL MOIST. GRASS & ROOTS AT TOP ~~6~~ 5M		BKGD	
S-2	5'-7'	6 6 16 17	12"/24	INTERBEDDED BROWN COARSE-F SAND w/ GRAVEL, TR SILT AND MED-F. BLACK ~~SEED~~ - TAN SAND. MOIST - D24 SP		BKGD	
				BOB 7'			

FIELD BORING LOG

BORING NO. CAM-89-01

...T NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 1	OF 1
...ING CONTRACTOR: MATHES	DRILLER: MA.. ...	DATE STARTED 11-..-89	COMPLETED 11/13/89
METHOD: HAMMER	CASING SIZE: 9"	TIP eV: OVA 2V	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 88.0'	WATER LEVEL: 66.8'	TOTAL DEPTH: 88.0'
LOGGED BY: NSC	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-10'			BROWN SANDY SILT MOIST SM	1'/1min	DIGS	
S-2	10'-20'			BROWN-TAN SAND AND SILT, TR GRAVEL, BOULDERS AT 14' AND 17' DRY SP	1'/min	DIGS	
S-3	20'-30'			TAN ~~F-SAND~~ F-MED SAND AND GRAVEL, TR SILT BOULDERS AT 24 & 29, DRY SP	1'/an 1.5 min	NA	
S-4	30-40			TAN F-SAND AND GRAVEL TR SILT. BOULDERS AT 34' DRY SP	1'/1.5 min	NA	
S-5	40'-50			TAN F. SAND & GRAVEL TR SILT BOULDER AT 148' DRY SP	1'/2 min	NA	
S-6	50-60'			SAME AS S-5 BOULDER AT 151' & 157' SP	1'/2min	NA	
S-7	60-65'			BROWNISH TAN F SAND AND GRAVEL SP	1'/2min	NA	
S-8	65'-70			GREY GRAVEL . LIMESTONE, SOME SHALE TR. QUARTZITE POSSIBLE BEDROCK	1'/4min	NA	
S-9	75'-80'			GREY-BLACK COARSE SAND WET ~~DRILLED SOFT THEN~~	DRILLED SOFT THEN BACK INTO HARD ROCK	NA	
S-10	80'-88'			GREY SANDY WATER, BLACK GRAVEL SIZE PIECE OF SHALE.	1'/5 min	NA	

FIELD BORING LOG

BORING NO. OPM-89-02

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES	DRILLER: MAX TINDIP	DATE STARTED 11-7-89	COMPLETED 11-8-89
METHOD: HAMMER	CASING SIZE: 9"	TIP eV: 10.02 ± ✓	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 113	WATER LEVEL: 97.6	TOTAL DEPTH: 118
LOGGED BY: NSG	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
	0-10'			BROWN VF SAND, SOME SILT, SOME CLAY, LOESS MOIST - WET SM	ADVANCED QUICKLY ± 1'/25 min		
	10-20'			GREYISH-BROWN SILTY CLAY SOFT WET ML	ADVANCED APPROX 1'/1.5 min		
	20-30'			LT BROWN SILTY VF SAND MOIST ML	"		
	30-40'			LT BROWN SILTY VF SAND DRY ML	"		
	40-60			LT BROWN-TAN F SAND, SOME SILT, SOME GRAVEL SM	ADVANCED @ 1'/5 min		
	60-80			SAME AS ABOVE SM	± 1 FT/min		
	80-100			LT BROWN-TAN F SAND SOME SILT SOME GRAVEL WET SM ∇ ≈ 97.5	± 1 FT/min		
	100-110			BROWN-TAN SAND AND GRAVEL SP			
	110-118			BROWN GRAVEL + SAND (WITH BOULDER) SP QUARTZITE GRAVEL (BOULDER (MAYBE))	± 1 FT/3min		

FIELD BORING LOG

BORING NO. OPM-89-02

[redacted] NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: M. TINNIN	DATE STARTED 10/27/89	COMPLETED 10/ /89
METHOD: ROTARY	CASING SIZE: 9"	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH:
LOGGED BY: D. BELAN	CHECKED BY:	DATE:	ABANDONED 11/1/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10			DK BROWN/GRAY TOPSOIL, GRADING TO BROWN/GRAY SILT (LOESS), DRY-DAMP, TO ~8 FT, W/SOME COLD-BROWN CLAY, SOFT, MOD PLASTIC W LITTLE SAND, DRY, 0 [redacted] TIP READING	OL-CL	BKGD	
				8-10 FT - GRAY CLAY, MOD HIGHLY PLASTIC, [redacted] DAMP, MOIST, CLEAN, CH-CL		BKGD	
S#2	10-20			GRAY CLAY, MOD HIGHLY PLASTIC, DAMP, CLEAN, CL-CH		0.5 ppm	
S#3	20-30			GRAY CLAY, MEDIUM TO DARK, MOD PLASTIC, DAMP, CLEAN, CL TO 24 FT		1 ppm	
				24-30 FT. MEDIUM BROWN SAND, MEDIUM GRAINED, LOOSE-MED. DENSE, POORLY GRADED, NO ODOR, W/LITTLE GRAVEL, SP			
S#4	30-40			MEDIUM BROWN SAND, MEDIUM, FINE LOOSE-DENSE, POORLY GRADED, NO ODOR, W/LITTLE-SOME GRAVEL DRY-DAMP, SP		1 ppm	
S#5	40-50		40-42	MEDIUM BROWN SAND, MEDIUM-VF, SOME COARSE AND SILTY, WELL GRADED, DAMP, NO ODOR SW		BKGD.	
			42-45	SANDY CLAY, SL PLASTIC, DAMP-MOIST, SOME SILT CL W/LITTLE GRAVEL			
			45-50	LT BROWN SAND, MED-V. FINE, WELL [redacted] GRADED MOIST-WET, NO ODOR, TRACE GRAVEL SW			
S#6	50-60			LT BROWN SAND, MED-V. FINE, SOME SILT, MOIST-WET, WELL GRADED, NO ODOR, SW		BKGD.	
S#7	60-70			LT BROWN SAND, MED-V FINE, SOME SILT, MOIST-WET, WELL GRADED, TRACE GRAVEL SW		BKGD	
S#8	70-80			LT BROWN SAND, MED-V. FINE, SILTY MOIST-WET, WELL GRADED, TRACE GRAVEL AND CLAY, SW		BKGD	

FIELD BORING LOG

BORING NO. OAM-89-02

PROJECT NO.: [redacted]6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2
DRILLING CONTRACTOR: [redacted] MATHES	DRILLER: M. TINNIN	DATE STARTED 10/27/89	COMPLETED 10/27/89
METHOD: ROTARY	CASING SIZE: 9 IN.	TIP eV:	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED:	WATER LEVEL: 98 FT	TOTAL DEPTH:
LOGGED BY: D. BELAN	CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#9	80-90			LT. BROWN SAND, MEDIUM-V FINE, SILTY, MOIST-WET, WELL GRADED, SOME GRAVEL @ 89-85 FT, TRACE FINE GRAVEL THROUGHOUT SW		BKGD	
S#10	90-100			LT BROWN SAND, MED-V. FINE, S.A.A. TO 96'		BKGD	
			96-98'	TAN SAND, MEDIUM, DAMP, POORLY GRADED, SP			
			98-100	LT BRN SAND, MEDIUM-FINE-V. FINE, WET, WELL GRADED, SOME GRAVEL, SW		BKD	
S#11	100-110			SAND, S.A.A.		BKGD.	
S#12	110-112.5 113			LT BRN SAND, MED-V. FINE, WET. WELL GRADED, WITH GRAVEL INCREASING TO GREATER THAN HALF SAMPLE.		BKGD.	
				BOB 113FT. 10/27/89 6PM			

ABANDONED 11/1/89

FIELD BORING LOG

BORING NO. OPM-89-03

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 2
[redacted] CONTRACTOR: MATHES	DRILLER: MAX TIMM	DATE STARTED 11-9-89	COMPLETED 11-11-89
METHOD: Hammer	CASING SIZE: 9"	TIP eV: 10.02 eV	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 168	WATER LEVEL: 149.5	TOTAL DEPTH: 168
LOGGED BY: NSG	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0'-10'			BROWN F. SAND AND SILT, TR CLAY MOIST-WET SM	BORING ADVANCED	BKGD	
S-2	10'-20'			BROWN F. SAND AND SILT TR CLAY MOIST-WET SM	≈ 1'/0.5 min	BKGD	
S-3	20'-30'			TAN F. SAND SOME SILT SOME GRAVEL DRY SM/GM	≈ 1'/0.25 min	BKGD	
S-4	30'-40'			SAME AS S-3 - BOULDER @ 37' SM	≈ 1/0.5 min	BKGD	
S-5	40'-50'			SAME AS S-3 - BOULDERS AT 44' SM	≈ 1/3 min	BKGD	
S-6	50'-60'			SAME AS S-3 BOULDER AT 52' SM	≈ 1'/3 min	BKGD	
S-7	60'-70'			SAME AS S-3 SM	≈ 1'/min	BKGD	
S-8	70'-80'			SAME AS S-5 SM	≈ 1'/min	BKGD	
S-9	80'-90			TAN F. SAND AND SILT TR GRAVEL MOIST SM	1'/min	BKGD	
S-10	90'-100'			SAME AS S-9 SM	1'/min	BKGD	
S-11	100'-110'			TAN F. SAND TR SILT TR GRAVEL, MOIST-WET SP	1'/1.25 min	BKGD	

FIELD BORING LOG

BORING NO. OPM-89-03

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP			PAGE 2 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: MAX TIMMONS		DATE STARTED 11-9-89	COMPLETED 11-11-89
METHOD: HAMMER	CASING SIZE: 9"	TIP eV: 10.02 eV		PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 168'	WATER LEVEL: 149.6'		TOTAL DEPTH: 168'
LOGGED BY: NSG	CHECKED BY: P. Bolmer	DATE: 11-30-89 PLQ		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	110'-120'			TAN F. SAND, M GRAVEL, TR SILT MOIST-WET SP	1'/1.25 min	BKGD	
S-13	120'-130'			TAN F. SAND M GRAVEL SP	1'/1.25 min	BKGD	
S-14	130'-140'			SAME AS S-13 SP	1'/1.25 min	BKGD	
S-15	140'-150'			BROWNISH TAN F. SAND M GRAVEL. BOULDER AT 144. MOIST SP	1'/2 min	BKGD	
S-16	150'-160'			TAN F. SAND M GRAVEL BOULDER AT 150'. DRY SP	1'/2...	BKGD	
S-17	160'-168'			TAN - GRAVEL, SOME SAND WET GM	1'/min	BKGD	
				BOB 168'			

FIELD BORING LOG

Boring No. OAB9101

Project No 685303	Project Name USATHAMA BAAR		Page 1 of 3
Contractor MATHES	Driller T. CRANK	Date started 10/9/91	completed 10/9/91
Method HSA 4¼"	Casing Size —	HNU 11.7/10.2 #3	Protection Level D
Ground El	Soil Drilled 89.5	& below ground 87	Total Depth 89.5'
Logged by SANDIN	Checked by DRP	Date 10/11/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU ATR	Monitoring LEL
1800	S-1 A9101002	0-2	15/29/13/7	2.0/1.3	Brown, sandy silty gravelly Fill. angular rock fragments	S-1 ANALYTICAL		BKG	
1830	S-2 A9101003	4.5-6.5	1/2/2/3	2.0/1.9	Dark brown v.f. sand with silt/clay, dense damp. SM	S-2. ANALYTICAL		BKG	
1835	S-3 A9101011	9.5-11.5	10/26/37/46	1.6/1.6	LIGHT Brown f-cse sand with rounded gravel and cobble fragments, loose dry SP	S-3 ANALYTICAL		BKG	
	S-4	14.5-16.5	50/10" 50/5.5"	1.3/0.9	LIGHT Brown f-cse sand. loose, dry seemed to have a slight petroleum odor but no response on HNu ambient or jarred headspace sample SP	S-4 Ref	BKG	BKG	
1845	S-5 A9101021	19.5-21.5	20/37/37/46	2.0/1.5	LIGHT Brown SAND fine-med with some coarse and rounded gravel, loose, dry, well graded SP	S-5 ANALYTICAL		BKG	
	S-6	24.5-26.5	15/23/30/34	2.0/2.0	24.5-25.1 sand m-cse with 40% rounded gravel loose dry SP 25.1-26.5 sand tan, generally fine with 5% med-cse sd and 5-10% gravel, loose dry	S-6 REF		BKG	

FIELD BORING LOG

Boring No. OAB39

Project No 685303	Project Name LISATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-9-91	completed 10-9-91
Method HSA 4¼ ID	Casing Size —	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 89.5	∑ below ground 87	Total Depth 89.5'
Logged by SANDIN	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-7	29.5 - 31.5	15/36/ 32/31	2/0	LOST SPOON SHOE IN HOLE. NO RECOVERY	Reference	BKG	BKG	
S-8	39.5 - 41.5	20/21 22/35	2.0/2.0	Tan Sand fine poorly graded with trace med - coarse rounded grains and 5-10% fine-med rounded gravel. loose, dry. SP	Reference	BKG	BKG	
S-9	49.5 - 51.5	10/26/ 37/38	2.0/2.0	TAN SAND Fine grained poorly graded 50.0 - 50.2 fine sand with rounded fine gravel loose, dry. SP	Reference	BKG	BKG	
S-10	59.5 - 61.5	14/40/ 45/50 for 10"	1.9/1.9	TAN SAND fine poorly graded with trace fine rounded gravel SP	Reference	BKG	BKG	
S-11	69.5 - 71.5	14/31/ 45/46	2.0/2.0	TAN SAND fine grained very well sorted, trace gravel. SP	Reference	BKG	BKG	
S-12	79.5 - 80.5	rods fell and drove spoon 1st foot 15/39/50	2.0/1.8	TAN SAND fine, well sorted with occassional fine to medium zones. clear rounded quartz grains. SP	Reference	BKG	BKG	

FIELD BORING LOG

FIELD BORING LOG			Boring No. 0AB9101
Project No 685303	Project Name USATHAMA BLAP		Page 3 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-9-91	completed 10-9-91
Method HSA 4-1/4 ID	Casing Size —	HNU 11.7 (10.2) #3	Protection Level D
Ground El	Soil Drilled 89.5	⊻ below ground 87	Total Depth 89.5
Logged by SANDIN	Checked by DRP	Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	LEL
	S-13	84.5-86.5	15/28/30/37	2.0 / 2.0	Tan sand fine v. well sorted. damp. SP	Reference	BKG	BKG	
1200	S-14 A9101091	89.5-91.5	4/5/14/36	2.0 / 2.0	TAN SAND fine to medium with trace fine gravel saturated, loose, SP	Analytical		BKG	

Water measured in augers 87.0' bgs.

BOB 89.5 HSA
91.5 last s.spoon

FIELD BORING LOG

Boring No. OAB-91

Project No 6853-03	Project Name BAAP		Page 1 of 3
Contractor MATHES	Driller Kevin Braxtmeyer	Date started 10-9-91	completed 10-9-91
Method HSA/NW-75	Casing Size 4.25" ID	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 90'	∑ below ground	Total Depth 92'
Logged by RHA.	Checked by DRP	Date 10/10/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL	HEAD SPACE
08:10	S-1 A9102002	0-2'	6/7/14/12	24"/24"	Brown fine Sand; little silt; trace clay and fine gravel; dry. (FILL) SM	Bkg = background 1 ppm. (HNU - 10.2ev probe) S-1: Analytical	ATR NAB	NAB	0.5
08:20	S-2 A9102007	5-7'	3/5/3/6	2.0'/1.5	Brown fine Sand; little silt and medium sand; trace Clay and fine to medium rounded gravel. dry. SM.	S-2: Analytical	NHB		0.5
08:30	S-3 A9102012	10-12.0	5/13/20/23	1.5/1.5	Bottom 1.2' - Brown to tan fine Sand; trace fine to medium gravel, dry. SP Top 0.3' Brown Clay, moist, soft. trace silt and fine sand. SC	Drillers over-driving split spoon RHA requests not to do so. S-3: Analytical	Bkg	Bkg	0.5
09:10	S-4 15-16.5		30/50/50	1.5/1.3	Tan fine and medium Sand; Little coarse to fine rounded gravel; trace coarse sand, fine dry.	S-4: Reference	Bkg.	Bkg	Bkg

* NHB = Not above background.

FIELD BORING LOG

Boring No. OAB-91-02

Project No 6853-03	Project Name RAAP		Page 2 of 3
Contractor MATHES	Driller KEITH Buckner	Date started 10-9-91	completed 10-9-91
Method HSA/~~8~~-75	Casing Size 4.25" I.D.	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 90'	∑ below ground	Total Depth 92'
Logged by RHA	Checked by DRP	Date 10/10/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BKGR	HNU ATR	LEL	HEAD SPACE
09:15	S-5 A9102222	20-22'	7/15/24/26	2.0/2.0	Tan Medium Sand; little fine sand; trace coarse sand and Medium gravel; dry. SP (Peppered with red and black minerals)	S-5: Analytical	Bkg	Bkg	Bkg	Bkg
09:40	S-6	25-26.5	6/16/21		Tan medium Sand, peppered w/brown; red sand; trace fine and coarse Sand and fine to medium rounded gravel; dry. SP	S-6: Reference	Bkg	Bkg		Bkg
[illegible]:20	S-7	30-31'	53/100	11"/10"	Tan to Brown medium Sand; some coarse Sand and fine gravel; little medium gravel and fine sand; dry SW.	Refusal at 100 Blow Counts. S-7: Reference	Bkg	Bkg		0.0
10:15	S-8	40-42'	16/23/29	1.5/1.5	Tan medium Sand; little coarse sand; trace fine to medium gravel - angular to subrounded.; dry. SP	S-8: Reference	Bkg	Bkg		Bkg
0:30	S-9	50-52	15/34/43/55	2.0/2.0	Tan fine Sand; trace coarse sand and fine to med. subrounded gravel.; dry. SP	S-9: Reference	Bkg	Bkg		Bkg
11:00	S-10	60-62'	23/43/43/52	2.0/1.5	Tan fine Sand; trace coarse sand and fine rounded gravel.; dry. SP.	18" split spoon over driven 6-inches. S-10: Reference	Bkg	Bkg		Bkg

FIELD BORING LOG

Boring No. 0AB-91-

Project No 6853-03	Project Name BAAP		Page 3 of 3
Contractor MATHES	Driller Keith	Date started 10-9-91	completed 10-9-91
Method HSA/Cme 75	Casing Size 4.25" I.D.	HNU 11.7 (10.2)	Protection Level D
Ground El	Soil Drilled 90'	▽ below ground 91'	Total Depth 92'
Logged by RHA	Checked by DRP	Date 10-10-91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen / Rec	Description	Comments on Advance of Boring	Monitoring HNU BKG	Monitoring HNU ATR	Monitoring LEL	
11:30	S-11	70-72	8/17/24/35	2.0/2.0	Tan fine Sand; trace medium Sand and fine rounded gravel; dry. SP	S-11: Reference	Bkg	Bkg	Bkg	
12:15	S-12	80-81.5	10/16/38	1.5/1.5	Tan fine Sand; trace medium Sand; dry. SP	S-12: Reference	Bkg	Bkg	Bkg	Bkg
13:30	S-13 A9102C92	90-92	28/4/0/0 *	2.0/0.7	Tan fine Sand; trace medium and coarse sand; wet	S-13: Analytical * using down-hole hammer - could not tell how many blows were used to drive spoon. Measured DTW w/ electric tape - Bottom of boring is dry, but the rats tail is filled with water.	Bkg	Bkg	B	
						T.D. 92'				

FIELD BORING LOG

Boring No. CAB9103

Project No 665303	Project Name USATHAMA BAAP		Page 1 of 3
Contractor MATHES	Driller T. CRANL	Date started 10·16·91	completed 10·16·91
Method HSA 4 1/4"	Casing Size ——	HNU 11.7/10.2 #3	Protection Level D
Ground El	Soil Drilled 89	∑ below ground 86.5	Total Depth 91
Logged by E. SINPIN	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAS	Monitoring HNU AIR	Monitoring LEL
S-1	0-2	9/9/8/9	2.0/1.8	brown sandy gravelly fill, loose, dry from 0-0.5. 0.5-1.8 dark brown silt, stiff, dense, very slightly plastic	ANALYTICAL SAMPLE A9103002	BKG	BKG	21.0
S-2	4-6	3/5/6/7	2.0/1.8	brown silty clay moderately plastic grading to light brown wet fine sand well sorted.	ANALYTICAL SAMPLE A9103006	BKG	BKG	
S-3	9-11	weight of hammer /3/7/9	2.0/1.7	sandy silt, brown, wet from 9-9.3 9.3-10.1 brown silty sand, wet, rounded gravel. stiff at bottom 10.1-10.7 tan fine sand, well-sorted dry	ANALYTICAL SAMPLE A9103011	BKG	BKG	
S-4	14-16	15/25/33/25	2.0/2.0	14-15.1 tan sand fine well sorted dry 15.1-16 tan gravelly sand, loose dry	Reference Sample			

FIELD BORING LOG

Boring No. 04891[illegible]

Project No. 685303	Project Name USATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRAWL	Date started 10-16-91	completed 10-16-91
Method HSA 4¼"	Casing Size ——	HNU 11.2/10.2 3	Protection Level D
Ground El.	Soil Drilled 89	∑ below ground 86.5	Total Depth 91
Logged by B. SANDIN	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-5	19-21	5/20/35/50/4"	2.0/1.7	light brown sand fine to coarse with trace rounded gravel moist, loose	ANALYTICAL SAMPLE 09103021	BKG	2
S-6	24-26	12/28 43/45	2.0/2.0	tan to brown gravelly sand, fine to coarse with 30% rounded gravel	Reference Sample	BKG	
S-7	29-31	21/21/21/38	2.0/1.8	tan sand, fine, well sorted, loose grading to fine to coarse with small gravell, loose, dry	Reference Sample	BKG	
S-8	39-41	12/17/30/40	2.0/2.0	sand tan fine well sorted occaissinally fine to medium well sorted, trace gravel, loose, moist	Reference Sample	BKG	

FIELD BORING LOG

Boring No. OAB9103

Project No 685303	Project Name USAHAM BAAP		Page 3 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-16-91	completed 10-16-91
Method HSA 4 1/4"	Casing Size ———	HNU 11.7/10.2 std 3	Protection Level D
Ground El.	Soil Drilled 89	∇ below ground 86.5	Total Depth 91
Logged by E. SANDIN	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
S-9	49-51	15/35	2.0	tan sand fine, well sorted, slightly moist. occassional med to coarse layers 0.01 - 0.03 thick	Reference Sample	BKG	BKG (breathing zone)	
		37/50	2.0					
S-10	59-61	11/23	2.0	tan sand fine with trace gravel similar to S-9	Reference Sample	BKG	BKG	
		36/50	2.0					
S-11	69-71	13/25/33	2.0	tan sand, fine well sorted, occassional medium sand layering no gravel, moist base	Reference Sample	BKG	BKG	
		48	2.0					
S-12	79-81	16/30/	2.0	tan sand fine well sorted, damp to coarse sand to fine gravel	Reference Sample	BKG	BKG	
		36/43	2.0					
S-13	89-91	4/8/	2.0	tan sand, fine well sorted trace coarse, trace gravel, base wet, BOB 89 AUGERS 91 SPOON	Analytical Sample A9103091	BKG	BKG	
		13/25	2.0					

FIELD BORING LOG

BORING NO. OABB9C1

PROJECT NO.: 6049- C4	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Cook	DATE STARTED 10-17 89	COMPLETED 10-17
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 85.3	TOTAL DEPTH: 92 C
LOGGED BY: D LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN TIP	MONITORIN LEL
S-1 AB9C1000	0-2	10/10/8/9	2.0 / 1.6	Dark brown gravelly silt. Low plasticity, loose, damp. Mottling pH-6 (GM)	S-1 Analytical	-2 / -2	21
S-2 AB901005	5-7'	4/7/7/9	2.0 / 1.5	Dark brown silty clay, trace gravel. Moderate plasticity, loose, damp. (CL) pH-6	S-2 Analytical	-2 / -2	
S-3 AB901010	10-12'	13/30/33	1.5 / 1.2	Tan to med. brown gravelly sand (gravel size up to 3") Sand is med. gr, poorly sorted, dense, damp, no plast. pH-6 (SW) *Change between 7-10.	S-3 Analytical	-2/3	
S-4 Reference	15-17'	4/16/30/32	2.0 / 1.8	15.0 to 15.1: Med. brown gravelly sand (Poorly sorted, damp mottled, no plas. dense) 15.1 to 16.0: med. gr. clean tan sand (well sorted, damp, no plast, trace heavy mineral) 16.0-17.0: Med. brown, med grained gravelly sand. No plast, poorly sorted, dense, damp. (Gravel size .1" to 3") pH-6 (SW/SP)	Reference sample	-2/2.5	

FIELD BORING LOG				BORING NO. CABEGE1
JECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP			PAGE 2 OF 5
LLING CONTRACTOR: MATHES	DRILLER: Ed Clark		DATE STARTED 10-17-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6		PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 92.0'	WATER LEVEL: 65.3'		TOTAL DEPTH: 92.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-5 AS9C1020	20-22'	15/41/24/27	2.0 / 2.0	Med brown to tan, med gr. gravelly sand. No plas, poorly sorted, dense, dry to damp. Trace lens of med. gr. clean sand PH-6 (SW)	S4 Analytical	-3/2	
S-6 Reference	25-27	15/16/20/40	2.0 / 1.7	Med. brown, med gr. gravelly sand (lg. gravel) (Poorly sorted, no plasticity, dense, damp to moist.) grading to tan, med to fine gr. gravelly sand (small size gravel - ½") (Poorly sorted, no plas, dense, damp) Trace heavy mineral. (SW) PH-6	Reference sample	-4.3 / -4	
S-7 Reference	30-32	13/30/33/56	2.0 / 2.0	30-31 Med. br., med gr. gravelly sand. No plas, poorly sorted, damp, dense. 31-31.6: Tan, med. gr clean sand, trace gravel. Mod. to good sorting, no plasticity, dense, damp. * See "varied" sequence of silty sand in this	Reference sample	-4 / -4	

FIELD BORING LOG

BORING NO. OAB89C1

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-17-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 85.3'	TOTAL DEPTH: 92'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
	30 - 32 cont'd			intervals. 1/4" apart, 2mm size 31.6 to 32.0 med. gr. tan sand, med. sorting, dense, damp. pH-6 (SW/SP)			21
S-8 Reference	40 - 42	14/25/38/42	2.0 / 2.0	Tan, med. gr. gravelly sand. Poorly sorted, no plas, dense, damp. Some mottling. Gravel is dominant thru first 6", then grades to much smaller amt & size (1/4", about 10%) (SW) pH-6	Reference sample	.3 / -3	
S-9 Reference	50 - 52'	15/26/30/29	2.0 / 2.0	alternating layers of med. gr. gravelly sand (Poor sorting, no plas. dense, dry) with tan, med. gr., ~~to~~ fine gr. clean sand. (well sorted, no plast, dense, damp, slight mottling) (SW/SP) pH-6	Reference sample	-3 / -3	

FIELD BORING LOG

BORING NO. OHBE9C1

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-17-89	COMPLETED 10-23-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 85.3'	TOTAL DEPTH: 92'
LOGGED BY: D LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-10 Reference	60-62	11/22/34/37	2.0 / 2.0	Tan, med. gr. clean sand. Trace gravel well sorted, no plast., dense, damp to dry Couple layers of med gr. gravelly sand. Few med. br. silty sand layers (~2mm thick) Sample is damp to moist directly underneath these layers. (SW) pH-6	Reference Sample	-3 / -1.3	21
S-11 Reference	70-92	14/29/35/38	2.0 / 2.0	Tan, med. gr. clean sand. Trace gravel, well sated no plast., dense, damp. Dk. brown sandy silt layers as before (~2mm) Slight mottling. (SP) pH-6	Reference Sample	-3 / -3	
S-12 Reference	60-82	12/25/43/48	2.0 / 2.0	Tan, med. gr. clean sand mod. to well sorted. Trace gravel. Non plastic, dense dry to damp. Some mottling. Trace heavy mineral. (SP) pH-6	Reference Sample	-3 / -3	

FIELD BORING LOG			BORING NO. CABE-BC1
PROJECT NO.: 6049- C4	PROJECT NAME: USATHAMA- BAAP		PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-17 E9	COMPLETED 10 17 E9
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 92.0'	WATER LEVEL: 90.0'	TOTAL DEPTH: 92 C
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN TIP	MONITORIN LEL
S-13 AB90 1090	90-92	11/43/.	2.0 / 1.1	Tan, med. gr. sand well sorted, trace heavy mineral, trace gravels. No plasticity, dense, saturated pH-6 (SP) * hit water at 90'.	S-5 Analytical	-3 / -3	21
				T.D. @ 92'			

FIELD BORING LOG

BORING NO. OAB-59-02

PROJECT NO.: 6049-64 | PROJECT NAME: USATHAMA- BAAP | PAGE 1 OF 3

DRILLING CONTRACTOR: MATHES | DRILLER: Ed | DATE STARTED 10/23/89 | COMPLETED 10/24/89

METHOD: CME-75 HSA | CASING SIZE: 4 1/4" ID | TIP eV: #11 10.6 | PROTECTION LEVEL: D

GROUND ELEV.: | SOIL DRILLED: 102 | WATER LEVEL: 91.2 | TOTAL DEPTH: 102

LOGGED BY: Buss/Glucksberg | CHECKED BY: P. Balmer | DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	0-2	~~1 3 4 5~~	17/24	light brown med fn Sand and angular gravel dry-moist. grading to dark brown Silt wt gravel. FILL sm	Bkgd=background =0-5ppm.	Bkgd	
S-2	5-7	5 5 7 7	15/24	light brown med-fine SAND wt/little silt and occas. gravel angular Fill moist-wet sm		Bkgd	
S-3	10-12	10 13 14 27	14/24	light brown med-fine SAND wt/little silt and occas. gravel iron staining, dark brown to black silt/clay, plastic at 11.5-12 ft. sm-ML FILL	FILL	Bkgd	
S-4	15-17	20 36 50 55	18/24	light brown crse-fine SAND and GRAVEL dry-moist glaciolacustrine sw-sp	Native Soil.	Bkgd	
S#5	20-22	3 8 17 24	20/24	tan medium fine SAND dry moist, Brown gravelly layer at 21.5 ft. glaciolacustrine sw-sp		Bkgd	

FIELD BORING LOG

BORING NO. OAB-89-

PROJECT NO.: 6049-04 | PROJECT NAME: USATHAMA- BAAP | PAGE 2 OF 3

DRILLING CONTRACTOR: MATHES | DRILLER: Ed Clark | DATE STARTED 10/23/89 COMPLETED 10/24/

METHOD: Augers | CASING SIZE: 4 1/4" ID | TIP eV: #11 10.6 | PROTECTION LEVEL: D

GROUND ELEV.: | SOIL DRILLED: 102 | WATER LEVEL: 91.2 | TOTAL DEPTH: 102

LOGGED BY: Buss/Glucksberg | CHECKED BY: P. Balmer | DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#6	25-27 ~~25-27~~ ~~30-32~~ JAB	6 10 19 26	14/24	Similar to S#5 SW-SP		Bkgd	
S#7	JAB ~~JAB~~ ~~JAB~~ 30-32	15 26 32 57	20/24	brown Crse-fine sand wt subang. to rounded gravel glaciofluvial SP		Bkgd	
S#8	40-42 ~~40-52~~ JAB	12 19 26 32	23/24	Tan fine-med Sand wt/ layered fine-med sand + crse sand zones. SM		Bkgd	
S#9	50-52 ~~50-52~~ JAB	10 20 23 30	19/24	Tan Med-fine SAND wt minor stratified zones occasional gravel. SM		Bkgd	
S#10	60-62 ~~60-72~~ JAB	JAB 15 32 44 51	17 ~~17~~/24	70-71 tan Med-fine SAND wt/ coarse sand + gravel at 71 ft dark med fine sand wt/ crse sand below 71 ft. dry/moist SM-SP		Bkgd	

FIELD BORING LOG

BORING NO. OAB-89-02

PROJECT NO.: 6049-04 | PROJECT NAME: USATHAMA- BAAP | PAGE 3 OF 3

DRILLING CONTRACTOR: MATHES | DRILLER: Ed Clark | DATE STARTED 10/23/89 COMPLETED 10/24/89

METHOD: Augers | CASING SIZE: 4¼" ID | TIP eV: #11 106 | PROTECTION LEVEL: D

GROUND ELEV.: | SOIL DRILLED: 102 ft | WATER LEVEL: 91.2 ft BGS | TOTAL DEPTH: 102 ft

LOGGED BY: Bissig/Eichelberger | CHECKED BY: P. Bolmer | DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S# 11	~~JAB~~ ~~80-82~~ 70-72	9 19 26 31	20/24	Similar to S# 9 wt layered mafic sands v. thin dry-moist. SM	easy drilling	Bkgd	
S#12	~~JAB~~ 80-82 ~~90-92~~	8 18 26 42	19/24	Similar to S#11 possible x bedding. moist-dry SM	10/23/89	Bkgd	
					10/24/89		
S#13	90-92	7 21 26 62	18/24	light brown med-fn SAND coarse Sand at 91.6 to 91.7 ft. wet SP pH = 6	easy drilling	Bkgd	
S#14	100-102	4 6 17 29	18/24	similar to S#13 no med-crse sand layers, no stratification. SP WL = 91.2' BGS 102 ft = BOE.	Smooth drilling below WT, only a 1ft heave into augers.	Bkgd	

[redacted]

FIELD BORING LOG

BORING NO. OAB-8903

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: MOD D
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90'	TOTAL DEPTH: 97'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1 A8903000	0-2'	2/4/6/7	2.0 / 1.4	Top 6" dark brown sandy gravel. Surface material grades to dark brown gravelly silt mottling. Poorly sorted, damp, mod. plasticity, loose. (GM) pH-6	S-1 Analytical	-2 / -2	21
S-2 A8903005	5-7'	4/4/7/7	2.0 / 1.4	Dark to med. brown sandy silt. Gravel in the top 1". Some mottling. Mod. plasticity, loose, poorly sorted, damp to moist. Grades to fine silty sand at base. (SM) pH-6	S-2 Analytical	-2 / -2	
S-3 A8903010	10-12'	6/11/22	1.5 / 1.5	Top 6" grades from tan, fine gr. gravelly sand to dark brown silty sand. No plas, damp. At 11.0: med. gr. tan sand with trace gravel. No plas., dry to damp, poor sorting med. dense. (GP) pH-7 *change at 10.0' *change at 11.0'	S-3 Analytical	-2 / -2	

FIELD BORING LOG

BORING NO. OABE903

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89	COMPLETED 10 17 89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97'
LOGGED BY: D. LaRue	CHECKED BY: P. Bohmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-4 Reference	15-17	7/28/32/30	2.0 / 1.9	Med. brown to tan, med. gr. gravelly sand. Poorly sorted, no plasticity damp dense. Mottled. A couple tan, clean med. gr. sand lens. Well sorted, damp. (SP/GP) pH-6	Reference sample	-2.0 / -2.0	
S-5 3020	20-22	18/24/30/40	2.0 / 1.6	TO 21.0: Med. brown, med. gr. gravelly sand. (Gravel up to 3" size) Poorly sorted, no plast., dense, damp. TO 22.0: Tan, med to fine gr clean sand. Well sorted: No plas., dense, dry to damp. Trace heavy mineral. (SW/SP) pH-6 *change at 21.0	S-4 Analytical	-2.4 / 2.0	
S-6 Reference	25-27	13/41/45/42	2.0 / 1.8	Med brown to tan, med. gr. gravelly sand. (gravel ~30%, size 1/4") Poorly sorted, no plast., dense, damp. Mottled (SW) pH-6 *change between 22' & 25'	Reference sample	-2 / -2	

FIELD BORING LOG

BORING NO. OP58903

PROJECT NO.: 6049- 64	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89	COMPLETED 10 17 89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-7 Reference	30-32	16/27/33/26	2.0 / 2.0	Alternating layers of tan med gr gravelly sand. (Poorly sorted, dense, nonplastic, damp) with tan, clean, med to fine gr sand. (well sorted no plasticity, dense, damp. Mottling. (SP/SW) pH-6	Reference Sample	-2 / -2	21
S-8 Reference	40-42	10/23/40/49	2.0 / 2.0	Tan, med. gr. gravelly sand. Poorly sorted, no plas., dense, damp. Mottling. Very small (~2mm) silty sand layers located in the well sorted sand. Layers are approx 1/4" apart consist. (varved appearance.)(GM) pH-6	Reference Sample	-2.0 / -1.6	
S-9 Reference	50-52	12/20/27/35	2.0 / 2.0	Top 2": Tan, med. gr. gravelly sand. Poorly sorted, no plasticity, dense, damp. Next 1": Tan, med gr. sand (trace gravel) mod. sorting no plasticity, dense, damp. At 51.2: med. brown, very fine gr sand lens, 2"	Reference Sample	-2 / -2	

FIELD BORING LOG

BORING NO. OAB8903

PROJECT NO.: 6049- 04	PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89	COMPLETED 10-17 87
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod. D
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				thick. No plasticity, very well sorted, dense, damp. 51.4 to 52.0 grades from tan very fine grained sand to tan, gravelly sand, med. gr. Poorly sorted, no plasticity, dense, damp. (SW) pH-6			21
S-10 Reference	60-62	19/25/35/55	2.0 / 2.0	Tan, med. gr gravelly sand layers alternating with layers of tan, med gr clean sand. No plasticity, damp, dense. Gravelly sands are poorly sorted, med. clean sands are well sorted. Slight mottling. (GP/SP) pH-6	Reference Sample	-2 / -1.3	
S-11 Reference	70-72	16/24/47/59	2.0 / 2.0	Tan, med. gr sand. Trace gravel. Moderate sorting, no plasticity dense, damp to moist. (SP) pH-6	Reference Sample	-2 / -1.4	

FIELD BORING LOG

BORING NO. OAB8903

PROJECT NO.: 6049- 04	PROJECT NAME: USATHAMA- BAAP		PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP eV: 10.6	PROTECTION LEVEL: Mod D
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Balmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12 Reference	80-82	15/35/50/51	2.0 / 2.0	Alternating layers of tan, med. gr. gravelly sand (Poorly sorted, no plasticity, dense, damp) with tan, med. to fine gr. clean sand (well sorted, no plasticity, dense, damp.) Some med bl.. silty sand layers (1-2mm) in the clean sand. (GP/SP) pH-6	Reference Sample	2.0 / 1.0	=21
S-13 A8903090	90-92	6/13/25/40	2.0 / 1.6	Tan, med. gr sand. Trace gravel. Moderate sorting, no plasticity, dense, saturated. pH-6 (SP) *Hit water at 90'	S-5 Analytical	-2 / -1.5	
S-14 Reference	95-97	6/10/18/32	2.0 / 1.8	Tan, med gr sand. Well sorted, no plas. dense saturated. (SP) pH-6	Reference	-2 / -2	
				T.D. 97'			

FIELD BORING LOG

Boring No. OAM-91-01

Project No. 06853-03	Project Name BADGER AAP		Page 1 of 1
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-27-91	completed 10-29-91
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 100'	∇ below ground 88.5'	Total Depth 100'
Logged by RRR	Checked by DRP	Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU (ppm) BAR	HNU (ppm) ATR	LEL
S-1	0-10'			BROWN SILTY SAND, WGD, F, SOME M, TR C COHESIVE, DAMP	(SM)	0	7	0
S-2	10-20'			LT BROWN SAND, WGD, M-C LITTLE F, LITTLE F GRAV, TR COBBLES	(SW)	0	4	0
S-3	20-30'			- SAME AS S-2	(SW)	0	14	0
S-4	30-40'			- SAME AS S-2	(SW)	0	0	0
S-5	40-50'			LT BROWN SAND, PGD-MOD GRADED, M, LITTLE F, LITTLE C, TR COBBLES.	(SP)	0	0	0
S-6	50-60'			LT BROWN SAND, WGD, M, LITTLE F, SOME C, LITTLE F GRAV	(SW)	0	0	0
S-7	60-70'			SAME AS S-6	(SW)	0	0	0
S-8	70-80'			SAME AS S-6	(SW)	0	0	0
S-9	80-90'			LT BROWN SAND, PGD, M LITTLE C, TR F GRAV, TR F SAND	(SP) ▼ 88.5	0	0	0
S-10	90-100'	90-93		LT BROWN SAND, WGD, M, SOME C, LITTLE - SOME F GRAV.	(SW)	0	0	0
		93-100		BROWN SAND, PGD, F, LITTLE M, TR SILT	(SP)			
				100' = B.O.E.				

FIELD BORING LOG

Boring No. FTB-9

Project No. 6953-03	Project Name BAAP		Page 1 of 3
Contractor MATHES	Driller KEITH BURKHARDT	Date started 10/22/91	completed 10/22/91
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 90'	∇ below ground	Total Depth 92'
Logged by W. HYLDEN	Checked by DRP	Date 10/22/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-2'	3-5-5-7	18"/24"	0-.3 light brown silty SAND with some gravel, well graded, non-plastic loose (FILL) 0.3-2.0 Dark brown fine sand SILT some fine gravel, well-graded non-plastic, loose, dry (FILL)	~~Analytical~~ Analytical	BKG	BKG
~~S-2~~	~~5-7'~~	~~5-6-7-8~~	~~2.0~~				
S-2	5-7'	5-6-7-8	2.0'/2.0'	0.0-0.8' Black fine Sandy SILT, well graded, slightly plastic, medium dense, oil stained with fuel oil odor 0.8'-2.6' Light brown Silt, well graded, slightly plastic, medium dense	Analytical	20	17
S-3	10-12'	2-4-4-6	1.2'/2.0'	Brown fine SAND with occasional SILT layers, well graded, non-plastic Sandy slightly plastic silt, loose, Stratified, Some Sporatic oil staining	Analytical	1.0	BKG

FIELD BORING LOG

Boring No. FTB-91-01

Project No. 6853-03	Project Name USATHAMA - BAAP		Page 2 of 3
Contractor MATTHES	Driller K. Bunse/Iregen	Date started 10/22/91	completed 10/22/91
Method MSA	Casing Size 4¼" ID	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 90'	∇ below ground	Total Depth 92'
Logged by WHITES	Checked by DRP	Date 10/22/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ/AIR	Monitoring HNU LEL
S-4	15-17'	9-17-45-50	2.0/2.0	Light brown fine SAND and gravel, some to little medium sand, well-graded, non-plastic, very dense, dry, with light brown fine sand layer 0.6-1.0'	Artificial	0.5 BZ/AIR	
S-5	20-20.9'	33-100/5"	0.9'/0.9'	Same as S-4, cobble fragment in spoon-tip	Reference	0.5 BZ	
S-6	25-27'	14-20-20-30	2.0/2.0'	Tan fine to medium SAND with some course sand and fine gravel strata, occassion course subangular gravel, poorly graded, non-plastic, dense, dry	Reference	BZ	
S-7	30-32'	22-25-30-28	2.0/2.0'	Tan fine SAND, some medium sand, little course sand, trace fine gravel, poorly graded, non-plastic dense, stratified with med-course sand fine gravel thin layers	Reference	BZ	

FIELD BORING LOG

Boring No. FTB-T1

Project No. 6853-03	Project Name USA THOMA - BAAP		Page 3 of 3
Contractor MASTEC	Driller K. Bumselmeyer	Date started 10/22/91	completed 10/22/91
Method HSA	Casing Size 4¼ ID	HNU 11.7/10.2	Protection Level D
Ground El.	Soil Drilled 90'	∑ below ground	Total Depth 92'
Logged by WC HILDS	Checked by DRP	Date 10/22/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-8	40-42	17-22 26-30	2.0'/2.0'	Tan fine SAND, trace medium to coarse sand and fine gravel, poorly graded, non-plastic, dense, dry, stratified	REFERENCE	JAR/BKG	ATR/BKG
S-9	50-52	15-24 28-33	2.0'/2.0'	Same as S-8	REFERENCE	BKG	BLG
S-10	60-62	10-17- 23-40	2.0/2.0'	Same as S-8	REFERENCE	BKG	BKG
S-11	70-72	17-23 30-40	/2.0'	Tan fine SAND, trace medium sand, poorly graded, non-plastic, very dense dry. stratified	REFERENCE	BKG	BKG
S-12	80-82	20-25 33-46	2.0/2.0	Same as S-11	REFERENCE	BKG	BKG
S-13	90-92	8-22- 25-50	2.0/2.0	Tan fine SAND, trace medium sand, poorly graded, non-plastic, dense, stratified, wet	ANALYTICAL	BKG	BKG
				Terminated boring at 92.0' depth bgs			

FIELD BORING LOG

Boring No. FTB9102

Project No. 685303	Project Name USATHAMA BAAP		Page 1 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-22-91	completed 10/22/91
Method HSA 4 1/4	Casing Size —	HNU 11.7 (10.2) #1	Protection Level D
Ground El	Soil Drilled 8.7	∑ below ground 8.5	Total Depth 8.9
Logged by E. SANDIN	Checked by DRP	Date 10/23/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring HNU	LEL
400	S-1	0.5-2.5	1-4-8 10	2.0 1.5	0.5 - 0.8 Black silt beneath asphalt 0.8-2.5 brown to dark brown silty clay very dense, hard, no horizontal partings.	Analytical Sample F9102002	BKG	BKG	
1415	S-2	4.5-6.5	4/5/6/6	2.0 2.0	gray to brown silty clay, dense, plastic, mottled brown,	Analytical Sample F9102006	BKG	BKG	
1420	S-3	9.5-11.5	4/9/21/29	2.0 1.7	9.5 - 9.7 brown silty clay with large rounded gravel, dense plastic 9.7- brown sand fine to coarse with 20% rounded gravel moist, loose	ANALYTICAL SAMPLE F9102011	BKG	BKG	
	S-4	14.5 - 16.5	18/36 50/5"	1.4 1.9	brown sandy gravel Fine to coarse with 40% rounded gravel	Reference Sample Headspace BKG	BKG	BKG	

FIELD BORING LOG

Boring No. FTB9102

Project No 685303	Project Name USATHAMA BAAP		Page 2 of 3
Contractor MATHES	Driller T. CRANK	Date started 10-22-91	completed 10/22/91
Method HSA 4¼"	Casing Size —	HNU 11.7/10.3 @ 1	Protection Level D
Ground El.	Soil Drilled 87'	∑ below ground	Total Depth 89'
Logged by E. SANDIN	Checked by DRP	Date 10/23/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring HNU	LEL
						JAR	AIR	
1440 S-5	19.5-21.5	15/26/ 34/50	2.0/2.0	Sand, tan, medium to coarse with some fine and 20% rounded gravel loose, dry, well graded SW	Analytical Sample F9102021	100 BKG	BKG	
S-6	24.5-26.5	10/20 20/36	2.0/2.0	Sand, tan, fine to coarse with 10% gravel loose, dry, SW	Reference Sample Headspace Bkg	BKG	BKG	
S-7	29.5-31.5	11/22/ 36/42	2.0/2.0	Sand, tan, fine laminated, well sorted to fine to coarse with gravel, loose, dry SP/SW	Reference Sample Headspace Bkg	BKG	BKG	
1520 S-8	39.5-41.5	12/29/ 39/35	2.0/2.0	Sand, tan, well sorted fine to poorly sorted fine to coarse with fine gravel loose, dry	Reference Sample Headspace Bkg	BKG	BKG	
S-9	49.5-51.5	19/34 49/36	2.0/2.0	Sand, tan, well sorted to poorly sorted fine to coarse with gravel. occasional orange mottling and brown horizontal laminations dry to moist, loose	Reference Sample Headspace Bkg			

FIELD BORING LOG

Boring No. FTB9102

Project No 685303	Project Name USATHAMA		Page 3 of 3
Contractor MATHES	Driller T. CRANK	Date started 10/22/91	completed 10/22/91
Method HSA 4 1/4"	Casing Size ———	HNU 11.7/10.2 #1	Protection Level D
Ground El	Soil Drilled 87'	∑ below ground 86.5	Total Depth 89'
Logged by E. SANDIN	Checked by DRP	Date 10/23/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATR	Monitoring LEL
S-10	59.5-61.5	15/26 35/40	2.0/2.0	Sand, tan, fine well sorted to fine to medium well sorted, loose, dry, trace gravel SP	Reference Sample	BKG	BKG	
S-11	69.5-71.5	16/32 28/40	2.0/2.0	sand, tan, fine well sorted with trace gravel and horizontal laminations. one zone of well sorted medium sand with trace gravel loose slightly moist SP	Reference Sample	BKG	BKG	
S-12	79.5-81.5	13/18 27/27	2.0/2.0	Sand, tan, fine, to coarse, to gravel, loose, slightly moist well sorted. SP	Reference Sample	BKG	BKG	
S-13	~~84.5-86.5~~ 87-89	14/20/50/5"	1.4/2.0	Sand, tan, fine, well sorted, no gravel wet, loose water level in augers 86.5' bgs BOB AUGERS 87.0 Last spoon 89.0	F9102089 Analytical Sample	BKG	BKG	

FIELD BORING LOG

BORING NO. FTB-89-01

PROJECT NO.: 6049- 64	PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark	DATE STARTED 10/24/89	COMPLETED 10/24/89
METHOD: CME-75	CASING SIZE: 4 1/4" ID	TIP eV: #11 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 92.5ft	WATER LEVEL: 86.95ft	TOTAL DEPTH: 92.5ft
LOGGED BY: Bliss	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LE
S#1	0-2	3 3 4 6	12/24	Stratified Sands and Silt. Black fuel oil odor black to gray, product FILL. Note: Breathing zone = 5ppm SM = bkgd.	2ft gravel fill placed over	FCO	
S#2	5-7	1 4 4 4	15/24	Brown to gray med-fn SAND and gray brown silt. fuel oil odor, moist-wet. No visible product. FILL SM	TIP just above bkgd	27 11	
S#3	10-12	6 12 32	18/18	brown to gray crse-fine sand wt silt + gravel moist-wet, No odor FILL. SP			
S#4	15-17	6 21 43 50	13/24	tan med-fine sand 15-16.5ft over gravel + med-fine SAND FILL SP		Bkgd.	
S#5	20-22	8 19 26 32	19/24	Tan med fine SAND wt layer of Med to Crse SAND + fine gravel at 21.5ft SM dry-moist		Bkgd	

FIELD BORING LOG

BORING NO. FTB-89-01

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10/24/89	COMPLETED 10/24/89
METHOD: Augers	CASING SIZE: 4 1/4" ID	TIP eV: #11	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 92 ft	WATER LEVEL: 86.9 ft	TOTAL DEPTH: 92 ft
LOGGED BY: Boss	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
	JAB			50% 31.5 JAB			
S#6	~~25-27~~ 30-32	11 30 46 40	20/24	~~25 to 26.5~~ Tan medium fine SAND ~~27.5-29.7~~ Red brown crse-med SAND wt/ fine-med gravel & subangular to rounded some bedding in med. fn Sand stratified. SP/SM		Bkgd	
S#7	40-42 ~~38-39~~	10 20 22 23	21/24	Tan med-fine SAND wt/ med crse sand + gravel layers at ~~BOTTOM~~ ft. dry-moist stratified SP		Bkgd	
				41.7 + 41 ft JAB			
S#8	50-52	15 28 30 40	20/24	Tan med-fn SAND wt/ med crse SAND layers. SP		Bkgd	
S#9	60-~~62~~ 62	17 25 31 36	21/24	Tan, med-fine SAND stratified wt/ thin crse sand + gravel layers. SP		Bkgd	

FIELD BORING LOG

BORING NO.: FTB-89-01

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10/24/89	COMPLETED 10/24/89
METHOD: Auger 3	CASING SIZE: 4 1/4" ID	TIP eV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 86.9' BGS	TOTAL DEPTH: 92
LOGGED BY: J. Buss	CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN TIP	MONITORIN LEL
S#10	70-72	12 28 40 50	20/24	Tan med-fn SAND wt some bedding, med-crse sand and gravel layer at 71.7 ft. moist (SP)		Bkgd	
S#11	80-82	10 26 30 36	18/24	Tan med-fine SAND wt some bedding med-crse sand and fine gravel at 81.2 to 81.3 ft. moist (SP)		Bkgd.	
S#12	90-92	18 34 38	12/24	Tan med fn SAND No visible bedding or crse layers. wet (SP)		Bkgd	

WL = 86.9 ft BGS

Sand heave to 89 ft BGS

BOE = 92 ft.

BORING

eder associates, consulting engineers p. c.
85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, WI. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 3

DATE STARTED : 6-6-91 | DATE FINISHED : 6-6-91 | BORING No. PHM-9101

CLIENT : OLIN CORPORATION | PROJECT No : 814-2

PROJECT NAME & LOCATION : OLIN CORP. / BAAP, RARABOO | PREPARED BY: DJO

DRILLING CONTRACTOR : WTD | LOGGED BY: DJO | DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER : SPLIT SPOON		CORE BARREL	AUGER	MON. WELL (MW) PIPE	MON. WELL (MW) CAP	DRILL RIG AND METHOD
TYPE :	—	STAINLESS		—	HSA	SCH. 80 PVC	STEEL	D-120 w/ HSA
SIZE :	—	2 x 24"		—	4 1/4" ID 6 1/4"	4"	6" x 7'	
HAMMER WT / FALL	—	140# / 30"		BIT	CARBIDE 8" / 10"			

SURFACE ELEVATION : | SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 8/0.5 FT. AFTER WHILE DRILLING HRS. 87.77 FT. AFTER 24 HRS.

DEPTH BELOW GRADE	OVA READINGS (ppm)	SAMPLE TYPE AND No.	SAMPLE DEPTH (FROM - TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
0	0.8	1	0.25 to 2.25'	M	50%	9/19 18/	0.25 ASPHALT 1.0'	TAN SAND & GRAVEL (FILL) BLK-BRN. F-C SAND w/ LITTLE GRAVEL (SP)
5							3.5'	
10	<0.2	2	5 to 7'	M	75%	2/2 3/3		RED-BRN. FINE SAND w/ TRACE GRAVEL (SP)
15	<0.2	3	10 to 12'	M	80%	5/2 2/2	12.5' 13.5' 14.5'	BRN. FINE SAND w/ TRACE GRAVEL (SW) DK. GRAY FINE SAND (SW) (STRONG ODOR - SATURATED) CONCRETE
20								GRN-GRAY, M-C SAND & GRAVEL (FILL) (NO SAMPLE)
25	10.0	4	20 to 22'	M	75%	17/20 22/27		TAN F-M SAND w/ TRACE GRAVEL (SW)

PROJECT NAME: CLIN / BAAP BORING No. PHM-9101 PROJECT No. 814-2 SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (ppm)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE = 0–10% LITTLE = 10–20% SOME = 20–35% AND = 35–50%
30								TAN, F-M SAND w/ TRACE GRAVEL (SW)
35								GRN-GRAY, F-M SAND (SLIGHT ODOR - OLD FUEL OIL?
40								
45	310.0	5	40 to 42'	M	21/57 25/32	40%		GRAY, FINE SAND w/ TRACE GRAVEL (SW) (MODERATE ODOR)
50								SAME
55								LT. GRAY, FINE SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR)
60								SAME
65	435.0	6	60 to 62'	M	28/44 10/5"	75%		LT. GRAY, FINE SAND w/ TRACE GRAVEL (SW) (MODERATE ODOR)
70								SAME
75								SAME

PROJECT NAME: OLIN CORP / BAAP BORING No. PHM-9101 PROJECT No. 814-2 SHEET 3 OF 3

DEPTH BELOW GRADE	OVA READINGS	TYPE AND No.	DEPTH FROM – TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE=0–10% LITTLE=10–20% SOME=20–35% AND=35–50%
80								
	580.0	7	80 to 82'	M	26/35 65/91	80%		BRN-GRAY, F-M SAND (SW) (STRONG ODOR)
85								
	710.0	8	85 to 87'	M	30/38 83/100/5"	75%	86.0'	SAME
								GRAY, FINE SAND (SW) (STRONG ODOR)
90								
	44.0	9	90 to 92'	W	13/58 100/7"		91.5'	BRN-GRAY, F-M SAND (SW) (SLIGHT ODOR)
								TAN, FINE SAND (SW) (NO ODOR)
95								
							98.0' EOB	
100								4¼" AUGERS TO 98' FOR PILOT HOLE AND SAMPLING. 6¼" AUGERS BLIND DRILL TO 98' FOR WELL INSTALLATION.

BORING

eder associates, consulting engineers p. c.
85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, W. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 2

DATE STARTED : 6-4-91	DATE FINISHED : 6-4-91	BORING No. B-1
CLIENT : OLIN CORPORATION		PROJECT No : 814-2
PROJECT NAME & LOCATION : OLIN CORP./RAAP, BARABOO	PREPARED BY: DJO	
DRILLING CONTRACTOR : WTD	LOGGED BY: DJO	DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER : SPLIT SPOON		CORE BARREL	AUGER	MON. WELL (MW) PIPE	MON. WELL (MW) CAP	DRILL RIG AND METHOD
TYPE :	—	STAINLESS		—	HSA	—	—	D-120 w/HSA
SIZE :	—	2 x 24"		—	4¼ ID	—	—	
HAMMER WT / FALL	—	140#/30"		BIT CARBIDE 8"				

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 86.5 FT. ~~AFTER~~ WHILE DRILLING HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE TYPE AND No.	SAMPLE DEPTH (FROM – TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0–10% LITTLE=10–20% SOME=20–30% AND=35–50%
0	2.8	1	0.25 to	M	50%	8/12	0.25'	ASPHALT
			2.25'			13/14	1'	TAN SAND & GRAVEL (FILL)
								GRAY-BLK MOTTLED SILT w/ TRACE SAND (ML)
							3.5'	— —
5								
	0.9	2	5 to	M	50%	5/8		GRAY-BRN MOTTLED SILT (ML)
			7'			9/14		
							8'	— —
10								
	0.7	3	10 to	M	80%	16/44		TAN F-C SAND w/ TRACE LITTLE GRAVEL (SP)
			12'			40/38		
15								
	1.0	4	15 to	M	30%	55/68		TAN M-C SAND w/ TRACE LITTLE GRAVEL (SP)
			17'			100/2"		
20								
	350.0	5	20 to	M	60%	10/29		TAN F-C SAND w/ TRACE-LITTLE GRAVEL (SP) (MODERATE ODOR)
			22'			30/35		
25								

PROJECT NAME: OLIN / BAAP BORING No. B-1 PROJECT No. 814-2 SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (PPM)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%
30	620.0	6	25 to 27'	M	20/16 23/25	60%		TAN F-M SAND w/ TRACE GRAVEL. BLK SILT IN TIP OF SPOON (SW) (STRONG ODOR)
35	105.0	7	30 to 32'	M	21/37 52/77	75%		TAN F-M SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR)
40	9.6	8	35 to 37'	M	9/20 31/63	60%	37.5'	TAN FINE SAND (SW) GRAY F-M SAND (SW) (SLIGHT ODOR)
45	240.0	9	40 to 42'	M	16/55 58/81	60%		GRAY F-M SAND (SW) (MODERATE ODOR)
50	375.0	10	45 to 47'	M	11/21 49/100/0	50%		GRAY F-M SAND w/ TRACE GRAVEL (SW) (STRONG ODOR)
55	270.0	11	50 to 52'	M	11/30 41/68	60%	53.5'	SAME
60	15.0	12	55 to 57'	M	7/13 37/59	60%		TAN F-M SAND (SW) (NO ODOR)
65	11.0	13	60 to 62'	M	8/18 29/43	75%		SAME
70	58.0	14	65 to 67'	M	15/36 65/90	75%	66.0'	TAN F-M SAND w/ TRACE GRAVEL (SW) (NO ODOR) GRAY F-M SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR - OLD FUEL OIL?)
75	160.0	15	70 to 72'	M	16/40 60/79	75%		SAME

PROJECT NAME: OLIN / BAAP BORING No. B-1 PROJECT No. 814-2 SHEET 3 OF 3

DEPTH BELOW GRADE	OVA READINGS (ppm)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE = 0-10% LITTLE = 10-20% SOME = 20-30% AND = 35-50%
	430.0	16	75 to 77'	M	7/38 45/6"	60%		GRAY-TAN, F-M SAND (SW) (MODERATE ODOR)
80								
	650.0	17	80 to 82'	M	10/18 44/5"	60%		GRAY F-M SAND (SW) (STRONG ODOR)
85								
	>1000.0	18	85 to 87'	M W	7/22 56/4"	75%	86.5'	DK. GRAY F-M SAND (SW) (STRONG ODOR) ▽ TAN F-M SAND (SW)
90							90.0' EOB	

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT
Form 3300-5 Rev. 3-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

GENERAL INFORMATION

(2) FACILITY NAME

Well/Drillhole/Borehole Location	County	Original Well Owner (If Known)
	SAUK	N/A
___ 1/4 of ___ 1/4 of Sec. ___ ; T. 10 N R. 6 ☒ E ☐ W		Present ~~Well~~ Owner: OLIN CORP. / BADGER AAP
(If applicable) ___ Gov't Lot ___ Grid Number		Street or Route: HIGHWAY 12 SOUTH
Grid Location ___ ft. ☐ N. ☐ S., ___ ft. ☐ E. ☐ W.		City, State, Zip Code: BARABOO, WI 53913
Civil Town Name: SUMPTER		Facility Well No. and/or Name (If Applicable): B-1
		WI Unique Well No.: _____
Street Address of Well: OLIN CORPORATION / BAAP		Reason For Abandonment: TEST BORING
City, Village		Date of Abandonment: 6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original ~~Drillhole~~/Borehole Construction Completed On (Date): 6-4-91

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

~~Construction Report~~ BORING LOG Available? ☒ Yes ☐ No

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify)

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) 90 (From groundsurface) Casing Diameter (ins.) —

Casing Depth (ft.) —

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet

(4) Depth to Water (Feet) 86.5

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain: _____

Was Casing Cut Off Below Surface?	☐ Yes	☐ No	N/A
Did Sealing Material Rise to Surface?	☐ Yes	☐ No	
Did Material Settle After 24 Hours?	☐ Yes	☐ No	
If Yes, Was Hole Retopped?	☐ Yes	☐ No	

(5) Required Method of Placing Sealing Material
☒ ~~Conductor Pipe~~-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☒ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
CHIPPED BENTONITE	1	90	43 BAGS	

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work: WTD ENVIRONMENTAL DRILLING

Signature of Person Doing Work	Date Signed
David J. Oley	6-12-91
Street or Route: 8000 EXCELSIOR DR.	Telephone Number: (608) 836-1500
City, State, Zip Code	

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	
Follow-up Necessary	

BORING

eder associates, consulting engineers p. c.
85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, WI. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 3

DATE STARTED : 6-5-91	DATE FINISHED : 6-5-91	BORING No. B-2
CLIENT : OLIN CORPORATION		PROJECT No : 814-2
PROJECT NAME & LOCATION : OLIN CORP/BAAP, PARA BOO	PREPARED BY: DJO	
DRILLING CONTRACTOR : WTD	LOGGED BY: DJO	DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER : SPLIT SPOON		CORE BARREL	AUGER	MON. WELL (MW) PIPE	MON. WELL (MW) CAP	DRILL RIG AND METHOD
TYPE :	—	STAINLESS		—	HSA	—	—	D-120
SIZE :	—	2 X 24"		—	4¼" ID	—	—	w/ HSA
HAMMER WT / FALL	—	140#/30"		BIT CARBIDE 8"				

SURFACE ELEVATION : SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 88.5 FT. WHILE DRILLING AFTER HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE TYPE AND No.	SAMPLE DEPTH (FROM – TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0–10% LITTLE=10–20% SOME=20–30% AND=35–50%
0	13.0	1	0.25 to 2.25'	M	50%	12/21 37/58	0.25 1.0'	ASPHALT TAN SAND & GRAVEL (FILL)
5								
	10.0	2	5 to 7'	M	60%	4/6 12/16	7.5'	RED-BRN MOTTLED SILT (a)
10								— —
	<0.2	3	10 to 12'	M	60%	3/10 18/26		BRN. F-C SAND (SP) (2" LENS OF BLK CINDERS AT 11')
15								
	0.2	4	15 to 17'	M	60%	5/16 69/76		BRN. M-C SAND w/ TRACE - LITTLE GRAVEL (SP)
20								
	1.4	5	20 to 22'	M	60%	8/35 36/30	21.0'	— SAME TAN F-M SAND (SW)
25								

PROJECT NAME: CLIN / BAAP BORING No. B-2 PROJECT No. 814-2 SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (PPM)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE =0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
	0.4	6	25 to 27'	M	13/25 67/100/7"	75%		TAN F-M SAND w/ TRACE GRAVEL (SW)
30								
	<0.2	7	30 to 32'	M	6/14 28/38	75%		SAME
35								
	0.5	8	35 to 37'	M	12/27 44/60	75%		TAN F-M SAND w/ TRACE LITTLE GRAVEL (SP)
40								
	<0.2	9	40 to 42'	M	9/12 20/38	80%		TAN F-M SAND (SW)
45								
	0.4	10	45 to 47'	M	18/56 90/100	90%		TAN F-M SAND w/ TRACE GRAVEL (SW)
50								
	<0.2	11	50 to 52'	M	9/17 24/49	75%		SAME
55								
	1.1	12	55 to 57'	M	14/35 59/91	75%		TAN F-M SAND w/ LENSES F-M GRAVEL (SW)
60								
	0.9	13	60 to 62'	M	11/28 43/48	80%		TAN F-M SAND w/ TRACE C. SAND (SW)
65								
	0.5	14	65 to 67'	M	13/37 59/60	80%		TAN F-M SAND (SW)
70								
	0.3	15	70 to 72'	M	12/16 53/64	80%		SAME
75								

PROJECT NAME: CLIN / BAAP BORING No. B-2 PROJECT No. 814-2 SHEET 3 OF 3

DEPTH BELOW GRADE	OVA READINGS	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE =0-10% LITTLE=10-20% SOME=20-35% AND=35-50%
80	<0.2	16	75 to 77'	M	11/17 24/28	60%		TAN F-C SAND (SP)
85	4.9	17	80 to 82'	M	10/26 77/100	75%	81.0'	SAME GRAY FINE SAND (SP) (SLIGHT ODOR)
90	610.0	18	85 to 87'	M	12/26 79/100	75%		SAME (STRONG ODOR) ▽
	8.8	19	90 to 92'	W	44/100	50%		TAN F-M SAND (SW) (NO ODOR)

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B
Rev 3-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: SAUK

__ 1/4 of __ 1/4 of Sec. ____ ; T. 10 N. R. 6 ☒ E ☐ W

(If applicable) ____ Gov't Lot ____ Grid Number

Grid Location ____ ft. ☐ N. ☐ S., ____ ft. ☐ E. ☐ W.

Civil Town Name: SUMPTER

Street Address or Well: OLIN CORPORATION / BAAP

City, Village

(2) FACILITY NAME

Original Well Owner (If Known): N/A

Present Well Owner: OLIN CORP. / BADGER AAP

Street or Route: HIGHWAY 12 SOUTH

City, State, Zip Code: BARABOO, WI 53913

Facility Well No. and/or Name (If Applicable): B-2

WI Unique Well No.: _____

Reason For Abandonment: TEST BORING

Date of Abandonment: 6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 6-4-91

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

BORING LOG
Construction Report Available?
☒ Yes ☐ No

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) ____

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) 90 Casing Diameter (ins.) —
(From groundsurface)

Casing Depth (ft.) —

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet

(4) Depth to Water (Feet) 88.5

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain ____

Was Casing Cut Off Below Surface?	☐ Yes	☐ No
Did Sealing Material Rise to Surface?	☐ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☐ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

N/A

(5) Required Method of Placing Sealing Material
☒ ~~Gendastor~~ Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☒ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
CHIPPED BENTONITE	1	90	40.5 BAGS	

(8) Comments: ____

(9) Name of Person or Firm Doing Sealing Work: WTD ENVIRONMENTAL DRILLING

Signature of Person Doing Work: David J. Ole
Date Signed: 6-13-91

Street or Route: 7000 EXCELSIOR DR.
Telephone Number: (608) 836-1500

City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	
Follow-up Necessary	

BORING

eder associates, consulting engineers p. c.
85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, WI. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 1

DATE STARTED : 6-6-91	DATE FINISHED : 6-6-91	BORING No. B-3
CLIENT : OLIN CORPORATION		PROJECT No : 814-a
PROJECT NAME & LOCATION : OLIN CORP. / BAAP, BARABOO	PREPARED BY: DJO	
DRILLING CONTRACTOR : WTD	LOGGED BY: DJO	DRILLER : JON WEEK

EQUIPMENT :	CASING :	SOIL SAMPLER : SPLIT SPOON		CORE BARREL	AUGER	MON. WELL (MW) PIPE	MON. WELL (MW) CAP	DRILL RIG AND METHOD
TYPE :	—	STAINLESS		—	HSA	—	—	D-120
SIZE :	—	2 X 24"		—	4¼" ID	—	—	W/ HSA
HAMMER WT / FALL	—	140#/30"		BIT CARBIDE 8"				

SURFACE ELEVATION : SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT FT. AFTER HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	OVA READINGS	SAMPLE TYPE AND No.	SAMPLE DEPTH (FROM – TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0–10% LITTLE=10–20% SOME=20–30% AND=35–50%
0		1	0.25 to	M	40%	9/18	0.25'	ASPHALT
			2.25'			15/22	1.0'	TAN SAND & GRAVEL (FILL)
								LT. BRN. FINE SAND w/ TRACE GRAVEL (SP) (2" LENS BLK CINDERS)
5							4.5'	
		2	5 to	M	75%	6/7		RED-BRN. FINE SAND w/ TRACE C. SAND & GRAVEL (SP)
			7'			7/8		
10								
		3	10 to	M	60%	7/11		0.5' BLK CINDERS
			12'			3/4		TAN FINE SAND w/ TRACE GRAVEL (SW)
							12.5'	
							13.5'	GRAY FINE SAND (SW) (STRONG ODOR - SATURATED)
15							EOB	CONCRETE
20								
25								

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT
Form 3300-5B
Rev. 3-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: SAUK

___ 1/4 of ___ 1/4 of Sec. ___ ; T. 10 N. R. 6 ☒ E ☐ W

(If applicable) ___ Gov't Lot ___ Grid Number

Grid Location ___ ft. ☐ N. ☐ S., ___ ft. ☐ E. ☐ W.

Civil Town Name: SUMPTER

Street Address of Well: OLIN CORPORATION / BAAP

City, Village

(2) FACILITY NAME

Original Well Owner (If Known): N/A

Present ~~Well~~ Owner: OLIN CORP. / BADGER AAP

Street or Route: HIGHWAY 12 SOUTH

City, State, Zip Code: BARABOO, WI 53913

Facility Well No. and/or Name (If Applicable): B-3

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: ENCOUNTERED CONCRETE (FOOTINGS?)

Date of Abandonment: 6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 6-4-91

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

~~Construction Report~~ Boring Log Available?
☒ Yes ☐ No

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) ___

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total ~~Well~~ Depth (ft.) 13.5 Casing Diameter (ins.) ___
(From groundsurface)

Casing Depth (ft.) ___

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet

(4) Depth to Water (Feet) ___

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain ___

Was Casing Cut Off Below Surface?	☐ Yes	☐ No
Did Sealing Material Rise to Surface?	☐ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☐ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

N/A

(5) Required Method of Placing Sealing Material
☒ ~~Centractor~~ Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☒ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7)

Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
CHIPPED BENTONITE	1	13.5	6.5 BAGS	

(8) Comments: ___

(9) Name of Person or Firm Doing Sealing Work
WTD ENVIRONMENTAL DRILLING

~~Signature of Person Doing Work~~ | Date Signed
David G Olz | 6-12-91

Street or Route | Telephone Number
8000 EXCELSIOR DR. | (608) 836-1500

City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	
Follow-up Necessary	

BORING

eder associates, consulting engineers p. c.
85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, WI. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 3

DATE STARTED : 6-7-91	DATE FINISHED : 6-7-91	BORING No. B-4
CLIENT : OLIN CORPORATION		PROJECT No : 814-2
PROJECT NAME & LOCATION : OLIN CORP. / RAAP, BARABOO	PREPARED BY: DJO	
DRILLING CONTRACTOR : WTD	LOGGED BY: DJO	DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER : SPLIT SPOON		CORE BARREL	AUGER	MON. WELL (MW) PIPE	MON. WELL (MW) CAP	DRILL RIG AND METHOD
TYPE :	—	STAINLESS		—	HSA	—	—	D-120 w/ HSA
SIZE :	—	2 x 24"		—	4¼" ID	—	—	
HAMMER WT / FALL	—	140# / 30"		BIT CARBIDE 8"				

SURFACE ELEVATION : SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 87.0 FT. WHILE DRILLING HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE TYPE AND No.	SAMPLE DEPTH (FROM – TO)	SAMPLE MOISTURE CONTENT	SAMPLE RECOVERY	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0–10% LITTLE=10–20% SOME=20–30% AND=35–50%
0	3.5	1	0.25 to 2.25'	M	75%	18/19 19/20	0.25 1.0'	ASPHALT TAN SAND & GRAVEL (FILL) GRAY-BRN MOTTLED SILT (M (BLK SILT FINAL 3")
5								
	<0.2	2	5 to 7'	M	90%	6/10 14/18		SAME
10								
	<0.2	3	10 to 12'	M	60%	7/12 13/17		RED-BRN, F-M SAND (SM (TAN, F-M SAND FINAL 2")
15								
	1.2	4	15 to 17'	M	50%	14/57 100/5"		TAN SAND & GRAVEL w/ COBBLES (GP)
20								
	—	5	20 to 22'	—	NONE	100/2"		SAME
25								

PROJECT NAME: OLIN CORP. / BAAP BORING No. B-4 PROJECT No. 814-2 SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (ppm)	TYPE AND No.	DEPTH FROM – TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE = 0–10% LITTLE = 10–20% SOME = 20–35% AND = 35–50%
	—	6	25 to 27'	—	100/0	NONE		SAME
30								
	0.4	7	30 to 32'	M	5/5	60%		TAN, F-M SAND w/ LITTLE - SOME C. SAND & GRAVEL (S
					32/67			
35								
	0.4	8	35 to 37'	M	20/27	75%		TAN F-M SAND w/ TRACE C. SAND & GRAVEL LENSES (SW
					61/74			
40								
	0.6	9	40 to 42'	M	11/23	80%		SAME
					48/100/0"			
45								
	0.6	10	45 to 47'	M	9/15	80%		SAME
					51/88			
50								
	0.6	11	50 to 52'	M	8/32	75%		SAME
					75/100/0"			
55								
	1.6	12	55 to 57'	M	11/29	80%		SAME
					49/57			
60								
	0.8	13	60 to 62'	M	11/35	75%	61.0'	TAN FINE SAND (SW)
					59/90			
65								
	0.4	14	65 to 67'	M	12/23	85%		TAN FINE SAND w/ TRACE GRAVEL (SW)
					60/67			
70								
	0.9	15	70 to 72'	M	6/25	60%		SAME
					60/95			
75								

PROJECT NAME : OLIN CORP. / BAAP BORING No. B-4 PROJECT No. 814-2 SHEET 3 OF 3

DEPTH BELOW GRADE	OVA READINGS (ppm)	TYPE AND No.	DEPTH FROM – TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE =0–10% LITTLE=10–20% SOME=20–35% AND=35–50%
	0.3	16	75 to 77'	M	4/24 44/91	80%		TAN, FINE SAND (SW)
80								
	0.3	17	80 to 82'	M	6/15 32/72	80%		TAN, F-M SAND (SW)
85								
	0.2	18	85 to 87'	M	10/19 34/48	60%		TAN, FINE SAND (SW ▽
90							90'	
	0.4	19	90 to 92'	W	27/96 100/3"	40%	EOB	TAN, FINE SAND (SW)

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT
Form 3300-5B
Rev. 8-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: SAUK

___ 1/4 of ___ 1/4 of Sec. ___ ; T. 10 N. R. 6 ☒ E ☐ W

(If applicable) ___ Gov't Lot ___ Grid Number

Grid Location ___ ft. ☐ N. ☐ S. ___ ft. ☐ E. ☐ W.

Civil Town Name: SUMPTER

Street Address of Well: OLIN CORPORATION / BAAP

City, Village

(2) FACILITY NAME

Original Well Owner (If Known): N/A

Present Well Owner: OLIN CORP. / BADGER AAP

Street or Route: HIGHWAY 12 SOUTH

City, State, Zip Code: BARABOO, WI 53913

Facility Well No. and/or Name (If Applicable): B-4

WI Unique Well No.: _____

Reason for Abandonment: TEST BORING

Date of Abandonment: 6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 6-5-91

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

Construction Report Available? BORING LOG
☒ Yes ☐ No

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) 90 (From groundsurface) Casing Diameter (ins.) ___

Casing Depth (ft.) ___

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet

(4) Depth to Water (Feet) 87

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain N/A

Was Casing Cut Off Below Surface?	☐ Yes	☐ No
Did Sealing Material Rise to Surface?	☐ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☐ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

N/A

(5) Required Method of Placing Sealing Material
☒ ~~Tremie~~ Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☒ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
SOIL CUTTINGS	1	4	—	
CHIPPED BENTONITE	4	90	34 BAGS	

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work: WTO ENVIRONMENTAL DRILLING

Signature of Person Doing Work: David J. Olson — Date Signed: 6-13-91

Street or Route: 7000 EXCELSIOR DR — Telephone Number: (608) 836-1500

City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected | District/County

Reviewer/Inspector

Follow-up Necessary

FIELD BORING LOG

Boring No. PBV-91-01C

Project No 6853-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne Env.	Driller Art B		Date started 10/24	completed 10/24
Method Dual wall	Casing Size 9" OD	HNU 11.7/10.2 TIP		Protection Level D
Ground El	Soil Drilled 160'	∑ below ground 85'		Total Depth 160'
Logged by Colby	Checked by DRP	Date 10/26/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATP	Monitoring LEL
S-1	0-10			organics, gravel, cobbles + crs sand (SP-GP)		0	0	0%
S-2	10-20			Med-crs sand some thin gravel layers (SP)	10'			
S-3	20-30							
S-4	30-40			crs sand + fine gravel (SP-GP)	30' / 40'			
S-5	40-50			Med-crs sand some thin gravel layers (SP)				
S-6	50-60							
S-7	60-70							
S-8	70-80							
S-9	80-90				∑ 85			
S-10	90-100							
S-11	100-110				99'			
S-12	110-120			Gravel, cobbles + crs sand poorly sorted (SP-GP)				
S-13	120-130				115'			
S-14	130-140			Fine Med sand some thin gravel layers (SP)				
S-15	140-150							
	150-160				BOE 160'			

FIELD BORING LOG

Boring No. PBW-91-02B

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Act R	Date started 9/28	completed 9/28
Method Dual-Wall Hammer	Casing Size 4" OD	HNU 11.7/10.2 TIP#5	Protection Level D
Ground El.	Soil Drilled 120'	∇ below ground 83	Total Depth 120'
Logged by Blake Colby	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU / LEL
S-1	0-10'			Brown - Tan Fine - Medium sand poorly sorted (SP)		JAR / ATR / 0%
S-2	10-20					Bkg / Bkg
S-3	20-30					
S-4	30-40					
S-5	40-50					
S-6	50-60					
S-7	60-70			Tan Fine sand w/some med sand + gravel (SP-SW)		
S-8	70-80					
S-9	80-90			Tan Medium - Coarse Sand at 100' gravel + Cobbles to 115 (SP-GP)	∇ 83'	
	90-100					
	100-110					
see PBW-91-02	110-120			below 115 med Sand w/ some coarse sand (SP)		
				B.O.E. 120'		

FIELD BORING LOG

Boring No. PBV-91-023

Project No 6853-02	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art P	Date started 9-30	completed 9-30
Method Dual-Wall Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP	Protection Level D
Ground El	Soil Drilled 170'	∑ below ground 85'	Total Depth 160'-170'
Logged by Banks Colby	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BZ	Monitoring HNU ATP	Monitoring LEL
S1 - S7 see PBV-91-023	0-10			Brown-Tan Fine-Medium SAND Poorly Sorted (SP)		0	0	0%
	10-20							
	20-30							
	30-40							
	40-50							
	50-60			Some ~~thick~~ thin layers of Fine gravel				
	60-70							
	70-80							
	80-90				∑ 85'			
S-10	90-100							
S-11	100-110			coarse sand, gravel + cobbles 98'-108'				
S-12	110-120							
S-13	120-130			Med-Crs SAND (SP)				
S-14	130-140			Some layers of gravel				
S-15	140-150							
S-16	150-160							
S 17	160-170			B.O.E. 170'				

FIELD BORING LOG

Boring No. PBN-91-03 B

Project No 6853-03	Project Name BHAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art R	Date started 9/26	completed 9/26
Method CME Hollow Stem Auger	Casing Size 9" OD	HNU 11.7/10.2 Tip-5	Protection Level D
Ground El	Soil Drilled 110'	∇ below ground 80'	Total Depth 110'
Logged by Colby/Bass	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-1	0-10			Brown-Tan Fn-Med SAND (SP)		BK	BK	0%
S-2	10-20			similar to S-1				
S-3	20-30			~~[illegible]~~ ↓				
S-4	30-40							
S-5	40-50							
S-6	50-60			Tan Fn SAND wt/ little Medium Sand (SP-SW)				
S-7	60-70							
S-8	70-80				∇ ~80'			
S-9	80-90			Tan Med-~~Fn~~ Crse SAND at 95' crs gravel and cobbles. to 105' SP-GP				
S-10	90-100							
S-11	100-110			below 105 med-crse sand wt little gravel + cobbles.				
				B.O.E. 110'				

FIELD BORING LOG

Boring No. PBW-91-03

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art	Date started 9-27	completed 9-27
Method Hammer Dual-Wall	Casing Size 4" OD	HNU 11.7/10.2 TIP-5	Protection Level D
Ground El	Soil Drilled 150'	∇ below ground 79'	Total Depth 150'
Logged by Bibbs Colby	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU AIR	Monitoring LEL
See S-1 to S-11 PBW-91-03B	0-50			Brown-Tan Fine-Med SAND (SP)		Bkg	Bkg	0%
	50-80			Tan Fine Sand some Medium Sand (SP-SW)	∇ 79'			
	80-100			Tan Med-coarse sand changing to coarse sand + gravel				
	100-110			gravel to 105'				
S-12	110-120			Tan Med-coarse sand some small gravel (SP)				
S-13	120-130							
S-14	130-140							
S-15	140-150			BOE 150'				

FIELD BORING LOG

BORING NO. PBM-90-01D

PROJECT NO.: 8298-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/23/90	COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE=2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 217.0'	WATER LEVEL: 86.0'	TOTAL DEPTH: 217.0'
LOGGED BY: J Bliss	CHECKED BY: P Bolmer	DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10ft	—	ML SM	Black organic topsoil grading to dark brown fine ~~Silt~~ Sand + Silt 0-8ft Tan fine-med Sand with occ. gravel 8-10ft	Change 8ft		
S#2	10-20		SM	Med fine SAND little Silt.			
S#3	20-30		SP/SM	med fine sand, stratified w/ crse-Bmed Sand			
S#4	30-40		SM	Tan Med-fn SAND			
S#5	40-50		~~SP~~ SM	Tan crse to fn SAND trce fine gravel.			
S#6	50-60		SM	Tan Med-fn SAND, similar to S#4			
S#7	60-70		SM	Tan Med-fine SAND w/ trace crse Sand.			

FIELD BORING LOG				BORING NO. PBM-90-01C
PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS			PAGE 2 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/23		COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9" ID.	TIP eV: TE#2		PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 217.0'	WATER LEVEL: 86.0'		TOTAL DEPTH: 217.0'
LOGGED BY: J BLASS	CHECKED BY: P. Bolmer	DATE: 9/28/90		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#8	70-80ft		SM	Tan Med Gn SAND V. moist possible thin silt or cemented layer of v. fn sand at ~80 ft.	change at 80		
S#9	80-90ft		SM/ML	Brown fine "silt balls" from 80-83 ft then grading to crse to fine sand with increasing gravel to 90 ft.	change at 83 change at 90		
S#10	90-100		SM	med-fn SAND becoming coarser at 97 ft	change at 97 ft.		
S#11	100-110		GP	fn to crse gravel	change at 110		
S#12	110-112		SP	crse-Med SAND with occasional gravel			

FIELD BORING LOG

BORING NO. PBM-90-010

PROJECT NO.: 6238-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 3 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/23	COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP ID: TE #2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 2120	WATER LEVEL: 86.0	TOTAL DEPTH: 212.0'
LOGGED BY: J Buss	CHECKED BY: P. Palmer	DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#13	120-130		SP	Med-fn SAND trace gravel			
S#14	130-140		SP	Med-fn SAND with some crse SAND thin gravel layer @ 135 ft.			
S#15	140-150		SP	Med-fn SAND w/ trc crse Sand + gravel.			
S#16	150-160		SP	Med-fn SAND			
S#17	160-170		SP	Med-fn SAND.			
S#18	170-180		SP	Med fn Sand little crse sand and fn gravel.			
S#19	180-190		SP	Med-fn Sand w/ trce gravel. Med to fn gravel with crse sand at 189 ft.	change at 189 ft		
			GP				
S#20	190-200		GP	crse-med SAND and gravel (well rounded) becoming Med to crse gravel at 200 ft.			

FIELD BORING LOG

BORING NO. PBM-90-01D

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS	PAGE 4 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/23 COMPLETED 8/24
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP #: 4E#2 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 2120'	WATER LEVEL: 86.0 TOTAL DEPTH: 217.0'
LOGGED BY: J Buss	CHECKED BY: P. Bolmer	DATE: 9/24/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#21	200-210		SP	crse gravel + cobbles well rounded with trace med-fine gravel.	Change ~210		
S#22	210-220		SP	~~Med~~ crse to fn SAND wt/ some gravel. bedrock-fn silty brown Sandstone-	change at ~~215~~ 217		

No water added to this hole

FIELD BORING LOG

BORING NO. RBM-90-02D

OJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/17	COMPLETED 8/19
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE#2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 210	WATER LEVEL: 79.85	TOTAL DEPTH: 210
LOGGED BY: J Buss	CHECKED BY: JAD P. Bolmer	DATE: 8/17	9/28/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#1	0-10		SP-SM	Topsoil over brown med-fn. Sand Trace silt and gravel	little cuttings return.		
S#2	10-20		SP	brn med-fn SAND			
S#3	20-30		SP	tan med-fn SAND trace gravel			
S#4	30-40		SP	med-fn SAND, with fine gravel layer at 35 ft.			
S#5	40-50		SP	med-fn SAND, gravel layers from 45-50 ft.			
S#6	50-60		SP	tan med-fn SAND with trace silt and gravel.			
S#7	60-70		SP	tan med-fine Sand trace gravel.			
S#8	70-80		SP-SM	tan med-fn Sand w/ trace gravel thin. cemented silt zone at ~75 ft with water table, some crse gravel below water table to 80 ft.	change at 75' (thin silt bed)		
S#9	80-90		SP	tan-gray med-fn SAND w/ trace to little gravel			

FIELD BORING LOG

BORING NO. PBM-90-020

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS	PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/17/90 COMPLETED 8/19
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE#2 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 214	WATER LEVEL: 79.8 TOTAL DEPTH: 214
LOGGED BY: J. Buss	CHECKED BY: P. Baker → 9/26/90	DATE: 8/17-18/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S#10	90-100		SP-GP	90-95 ft Med-fn SAND wt little gravel. 95 ft crse sand and fn gravel becoming coarser at 100 ft.	change at 95 ft		
S#11	100-110		SP	med-fn Sand wt crse Sand + little gravel.			
S#12	110-120		SP	similar to S#11			
S#13	120-130		SP	similar to S#11			
S#14	130-140		SP	similar to S#11			
S 15	~~140-150~~		SP	similar to S#11			
S#16	150-160		SP	med-fn Sand with crse Sand, More gravel at 165 ft (fine gravel)			
S#17	160-170			crse-fine Sand wt little gravel			
S#18	170-180		SP	similar to S#17			
S#19	180-190		~~SP~~ GP	180-185 similar to S#17 185-190 crse gravel + cobbles.	change at 185		
S#20	190-200		GP	Very crse gravel and cobbles at 195 ft.			
S#21	200-210		GP/SP	200-205 gravel cobble zones 205-214 med-crse sand with some gravel.			

FIELD BORING LOG

BORING NO. PBM-90-03D

PROJECT NO.: 6298-11	PROJECT NAME: USATHANA- BAAP FS		PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/7/90	COMPLETED 8/16/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE#2	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 205.0'	WATER LEVEL: 72.7' (meas)	TOTAL DEPTH: 205.0'
LOGGED BY: C. Moore	CHECKED BY: P. Bolmer	DATE: 8/7/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN./REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	surface	NA	SP	Organic topsoil		0	
S-2	10'	NA	SP	Brown, fine to med sand, poorly graded, damp			
S-3	20'	"	SP	Same as above			
S-4	30'	"	SP	Brown, fine to med sa, trace gravel			
S-5	40'		SP	Tan, fine to med sa, trace coarse sa and gr., damp	Note: no hammer needed to drive pipe — very soft		
S-6	50'		SP	Same as above			
S-7	60'		SP	Tan, fine to med sa, poorly graded, damp			
S-8	70'		SP	Same as above	change @		
S-9	80'		SW	Brown, med sa with some gr., well rounded, well graded (all sizes, colors), moist	~ 75'	0	

FIELD BORING LOG				BORING NO. PBM-90-03D
PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS			PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/7/90		COMPLETED 8/16/9
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE #2	PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 205.0	WATER LEVEL: 72.7'	TOTAL DEPTH: 205.0	
LOGGED BY: C Moore	CHECKED BY: P. Bolmer	DATE: 8/7/90		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-10	90'		SW	Brown, fine to med sa w/ little to some coarse sa & gravel - wet	(producing a lot of water)		
				GP change @ 95'			
S-11	100'		SP	Brown, fine to med sa w/ little gravel - wet	still very soft		
S-12	110'		SP	Tan, fine to med sa w/ trace of gravel, dryer than above			
S-13	120'		SP	Brown, fine to med sa w/ some coarse sand, trace gr., saturated			
S-14	130'		SP	Same as above			
S-15	140'		SP	Same, with slight increase in coarse fraction	Change @ around 145'		
S-16	150'		SW	Brown, fine to med sa with some coarse sand & some gravel (definitely more gravel than above). Variegated in size and color			
S-17	160'		SP/SW	Same as above w/ decrease in gravel			
S-18	170'		SW	Same as above			

FIELD BORING LOG

BORING NO. PBM-90-03D

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS	PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/7/90 COMPLETED 8-16/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE#2 / PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 205.0'	WATER LEVEL: 72.7' / TOTAL DEPTH: 205.0'
LOGGED BY: C Moore / Bus	CHECKED BY: P. Bohner → 9/28/90	DATE: ~~8/16/90~~ 8/16/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
				Borehole relocated ~75' east after difficulties with heaving sands.			
			SP	fine-med Sand with trce-little gravel 0-90ft			
			GP	gravel cobble zone 90-95ft.			
S-19	180		SP	fine med sand w/ trce-little gravel 95-183 ft.			
S-20	190		GP	Gravel cobble zone 183-200ft			
S-21	200		SP	fine-med sand 200-205 ft			
S-22	205			bedrock at 205 ft.			
				BOE = 205 ft.			
				~800 gal. H_2O added to this boring.			

FIELD BORING LOG

BORING NO. PBN-90-04B

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA- BAAP FS	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/6/90 COMPLETED 8/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP ID: TE 100 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 130'	WATER LEVEL: 90.5 TOTAL DEPTH: 130'
LOGGED BY: P. Balmer	CHECKED BY: P. Balmer	DATE: 9/28/90

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN./REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-1	Surface	NA	SP	Brown med to Fi sa, Tr c, organics, poorly graded, damp			
S-2	10'		SP	Brown med to Fi sa, tr c poorly graded, damp			
S-3	20'		SP	Tan med to Fi sa, Tr c, Tr fi gravel poorly graded, damp			
S-4	30'		SP	Tan Fi to med sa, Tr c, poorly graded, damp			
S-5	40'		SP	As above			
S-6	50'		SP	As above			
S-7	60'		SP	Tan med to Fi sa, tr c, poorly graded, damp			
S-8	70'		SP	Tan med to Fi sa, tr c, poorly graded, damp to moist			
S-9	80'		SP	As above w/ incr in moisture			
S-10	90'		SP	As above	Δ@96' incr in coarse		
S-11	100'		SW	Tan Sandy gravel, sa is med to Fi Tr c, gravel is well rounded, poorly graded			

FIELD BORING LOG

BORING NO. PBN-90-01B

PROJECT NO.: 6298-11	PROJECT NAME: USATHAMA - BAAP FS		PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 5/6/90	COMPLETED 5/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE 10.0	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 130'	WATER LEVEL: 90.5	TOTAL DEPTH: 130'
LOGGED BY: P. Bolmer	CHECKED BY: P. Bolmer	DATE: 9/28/90	

4XS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	REV. / REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-12	110'	NA	GP	Variegated, Gravelly Sand, sc is med to c. tr Fi sc, poorly graded, Gravel is well rounded, Saturated			
S-13	120'		SW/GP	Tan Sand, gravel, sc is med to c tr fi, poorly graded, Gravel is well rounded, Saturated	Δ e ≈ 119-120 going to set well in this gravel zone 110-120		
S-14	130'		SP	Tan med to Fi sc, Tr c, poorly grade, Saturated	going over next joint to confirm stratigraphic Δ		
				BOD e 130'	0930 add ≈ 460 gals 1040 add ≈ 300 gals		

FIELD BORING LOG

BORING NO. PBN-90-040

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 1 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/2/90	COMPLETED 8/5/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP #: TE 100	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 232.0'	WATER LEVEL: 90.60 bgs	TOTAL DEPTH: 232.0'
LOGGED BY: P. Bolmer	CHECKED BY: P. Bolmer	DATE: 9/28/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	USCS SEC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN TIP	MONITORIN LEL
S-1	Surface	NA	SP	Dark brown mod to Fi sand, Tr Fi gr, poorly graded, damp SP	Δe ≈ 3'		
S-2	10'		SP	Tan to light tan Fi to med Sand, Tr Fi gr, poorly graded, damp			
S-3	20'		SP	As above			
S-4	30'		SP	As above w/ inc in grat ≈25'			
S-5	40'		SP	Tan to light Fi sa, tr med sa, poorly g , dam, Rock Sand			
S-6	50'		SP	Tan mod to Fi sa, tr Fi gr, poopoorly graded, damp to moist			
S-7	60'		SP	Tan mod to Fi sa, Tr c sa, poorly graded, damp to moist			
S-8	70'		SP	Tan mod to Fi sa, poorly graded damp to moist			

FIELD BORING LOG

BORING NO. PBN-90-04D

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS	PAGE 2 OF 4	
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/2/90	COMPLETED 8/5/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP or: TE 10.0	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 237.0'	WATER LEVEL: 90.60 bgs	TOTAL DEPTH: 237.0'
LOGGED BY: P. Bolmer	CHECKED BY: P. Bolmer	DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	USCS	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-9	80'	NA	SP	Similar to S-8 w/ incr in Fi sa			
S-10	90'	NA	SP	As above	Δ @ 95'		
S-11	100'		SP/SW	~~Med Tan Med to Fi sa, trc, some F~~ PLB Tan sandy gravel, sa is med to fi, tr c sa, poorly to med graded, moist	▼ 90.6' - 8/3/90 w/ probe; ▼ @ ≈ 104; Δ @ ≈ 104		
S-12	110'		GP	Gravelly Sand, sa is med to Fi, tr c well graded, saturated. End of Day	This could be the gravel zone for the shallow well		
S-13	120'		SW	Variegated Gravelly Sand, sa is med w/ some Fi sa, poorly graded, saturated	Δ @ ≈ 122		
S-14	130'		SP/SW	Tan med to Fi sa, some coarse, moderately to well graded, saturated			
S-15	140'		SW	Tan med to Fi sa some coarse, well graded, Tr Fi gr saturated			
S-16	150'		SP	Tan med to Fi sa, little coarse, moderately graded, saturated			

FIELD BORING LOG

BORING NO. PBN-90-04D

PROJECT NO.: 6296-11	PROJECT NAME: USATHANA- BAAP FS		PAGE 3 OF ~~4~~ PLB
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/2/90	COMPLETED 8/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE 10.0	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 237.0'	WATER LEVEL: 90.60' bgs	TOTAL DEPTH: 237.0'
LOGGED BY: D. Bolmer	CHECKED BY: P Bolmer	DATE: 9/25/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN./REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-17	160'	NA	SP	Tan med to f-i s, Tr c, poorly graded, saturated	Adding H_2O ≈ 600 gals		
S-18	170'		SP	as above	Slight scheen on water - no reading on TE 0920 → Adding H_2O ≈ 500 gals		
S-19	180'	*	~~GW~~ SW	Variegated Gravelly Sand, sa is med to f, ~~poorly graded, saturated~~ some coarse sa, moderately to well graded, saturated 8/31/90 PLB	1000 → added ≈ 500 gals 1600 - added ≈ 300 gals 1615 added ≈ 300 gals	Δe	180'
S-20	190'		SW/SP	Variegated sandy gravel, sa is med to f, some coarse ~~poorly graded saturated~~ PLB 8/31/90 Moderately to well graded, saturated	Added ≈ 300 gals		
S-21	200'	*	GW	Variegated gravelly sand, sa is med to f; w/ some coarse, well graded, gravel is f to coarse well graded saturated	added ≈ 300 gal		
S-22	210'		GW	As above	added ≈ 300 gal		
S-23	220		GW	As above	added ≈ 300 gal		

FIELD BORING LOG

BORING NO. PDN-90-041D

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAP FS		PAGE 4/4 OF 4/4
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/2/90	COMPLETED 8/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP eV: TE 10.0	PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 232.0'	WATER LEVEL: 90.60	TOTAL DEPTH: 232.0'
LOGGED BY: P. Bolmer	CHECKED BY: P. Bolmer	DATE: 9/28/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN/REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING TIP	MONITORING LEL
S-24	230'		SP	Tan Med to Fine sd, Tr c, poorly to moderately graded, saturated	∆ e ≈ 234		
S-25	236		SW/SP	Tan med to fine sd some coarse, well graded, saturated	Rock at ≈ 236'		
				BOB e 237'	Total water ≈ 340 gals		

Rig 2

FIELD BORING LOG

Boring No. SWN-91-01B

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne Enviro	Driller Art R	Date started 10/15	completed 10/15
Method Dual wall	Casing Size 9" OD	HNU 11.7/10.2 TIP #5	Protection Level D
Ground El	Soil Drilled 120'	⚓ below ground 85'	Total Depth 120'
Logged by Colby	Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
See SWN-91-01D	0-10			Tan Med-crs sand		0	0	0%
	10-20			some thin layers of gravel				
	20-30			(SP)				
	30-40							
	40-50							
	50-60							
	60-70							
	70-80				⚓ 85'			
	80-90				95			
	90-100			Gravel, cobbles + crs sand (SP-GP)				
	100-110				115'			
	110-120			Med-crs sand (SP)	BOE 120'			

FIELD BORING LOG

Boring No. SWM-91-012

Project: No 6253-03	Project Name B+AP RI/FS		Page 1 of 1
Contractor Layne Environ.	Driller Art R	Date started 10/16	completed 10/16
Method Dual Wall	Casing Size 9" OD	HNU 11.7/10.2 TRIP 5	Protection Level D
Ground El	Soil Drilled 170'	∑ below ground 85'	Total Depth 170'
Logged by Colby	Checked by DRP	Date 10/17/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
See SWM-91-010	0-10			Fine-crs SAND some cobbles (SP-GP)		0	0	0 %
	10-20				7'			
	20-30			TAN Fine-Med Sand some thin layers of gravel (SP)				
	30-40				35'			
	40-50			Med-crs SAND some thin layers of gravel (SP)				
	50-60							
	60-70							
	70-80							
	80-90				∇ 85'			
	90-100				95'			
				crs SAND Cobbles + Gravel (SP-GP)				
	100-110				112'			
	110-120			Med-crs Sand (SP)				
	120-130							
	130-140							
	140-150							
	150-160							
	160-170							
					BOE 170'			

FIELD BORING LOG

Boring No. SWM-11-01D

Project No 6953-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne	Driller A. + R	Date started 10/14	completed 10/14	
Method Dual-Wall Hammer	Casing Size 4" OD	HNU 11.7/10.2 Tip #5	Protection Level D	
Ground El	Soil Drilled 220'	∇ below ground 85'	Total Depth 220'	
Logged by Barbara Colby	Checked by DRP	Date 10/15/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
S-1	0-10			Fine-coarse SAND some cobbles (SP-GP)	7'	JAR 0	ATR 0	0%
S-2	10-20			TAN Fine-Med SAND some thin layers of gravel				
S-3	20-30				33'			
S-4	30-40			Med-coarse SAND some thin layers of gravel (SP)				
S-5	40-50							
S-6	50-60							
S-7	60-70							
S-8	70-80				∇ 85' - VOA 90'			
S-9	80-90							
S-10	90-100				95'			
S-11	100-110			coarse SAND Gravel + cobbles (SP-GP)	- VOA 110'			
S-12	110-120				115'			
S-13	120-130			Med-coarse sand (SP)				
S-14	130-140							
S-15	140-150							
S-16	150-160							
S-17	160-170				160'			
S-18	170-180			Fine-Med SAND (SP)	170'			
S-19	180-190			Med-coarse SAND w/some gravel + cobbles mixed in (SP)	195'			
S-20	190-200							
S-21	200-210			Med-coarse Sand (SP) some thin gravel layers				
S-22	210-220				- BOE 220'			

FIELD BORING LOG

Boring No. SWM-91-02C

Project No 6553-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne Env.	Driller Art R	Date started 10/22	completed 10/22
Method Dual Wall	Casing Size 4" OD	HNU 11.7/10.2 #5	Protection Level D
Ground El	Soil Drilled 160'	▽ below ground 85'	Total Depth 160'
Logged by Colby	Checked by DRP	Date 10/25/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
SWM-91-02C	0 - 10			organics cobbles, gravel & crs sand (SP-GP)	0'	JAR	AIR	0%
	10 - 20			Fine - ~~med~~ crs sand poorly sorted some thin layers of gravel (SP)	10'	0	0	
	20 - 30							
	30 - 40							
	40 - 50							
	50 - 60							
	60 - 70							
	80 - 90				▽ 85'			
	90 - 100				95'			
	100 - 110			Gravel Cobbles & crs sand (SP-GP)				
	110 - 120							
	120 - 130			Med - crs Sand (SP)	115'			
	130 - 140							
	140 - 150							
	150 - 160				BOE 160'			

FIELD BORING LOG

Boring No. SWA-91-03

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Act R	Date started 10/8	completed 10/8
Method Hammer	Casing Size 9" OD	HNU 11.7/10.2 Tip #5	Protection Level D
Ground El	Soil Drilled 120'	∇ below ground 85	Total Depth 120'
Logged by Colby	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-1	0-10			Brown/TAN fine-crs SAND Poorly sorted some thin layers of fine gravel (SP)		0	0	0 %
S-2	10-20							
S-3	20-30							
S-4	30-40							
S-5	40-50							
S-6	50-60			Tan Md-crs SAND Poorly sorted Some thin layers of gravel. (SP)				
S-7	60-70							
See SWA-91-03C	70-80				∇ ~85'			
	80-90							
	90-100							
	100-110				105'			
	110-120			CRS Sand + Gravel and Cobbles (SP-GP)	112-115			
				Tan Md-crs SAND (SP) ↓ B.O.E. 120'	B.O.E. 120'			

FIELD BORING LOG

Boring No. SWN-91-03C

Project No 6853-03	Project Name BAAP RI/FS			Page 1 of 2
Contractor Layne	Driller A.C.R.		Date started 10-2-91	completed 10-2-91
Method Dual-Wall Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP#19		Protection Level D
Ground El.	Soil Drilled 165'	∑ below ground 85		Total Depth ~~165~~ TD 170'
Logged by BBHS	Checked by	Date		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATR	Monitoring LEL
See SWN-91-03B	0-10			Brown-Tan Fine-med-crs SAND) Poorly sorted some thin layers of fine gravel (SP)		0	0	0%
	10-20							
	20-30							
	30-40							
	40-50							
S-6	50-60			Tan Med-crs Sand Poorly sorted some thin layers of gravel	∑ ~ 85'			
S-7	60-70							
S-8	70-80							
S-9	80-90							
S-10	90-100				100'			
S-11	00-110			crs Sand, gravel + cobbles (SP-GP)				
S-12	110-120				114			
S-13	120-130			Tan Med-Crs SAND) (SP)				
S-14	130-140							
S-15	140-150							
S-16	150-160							
S-17	160-170				- BOE 170'			

FIELD BORING LOG

Boring No. SWW-91-03D

Project No 6853-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne	Driller A. Rodriguez	Date started 10/1/91	completed 10/1/91	
Method Hammer	Casing Size 9" OD	HNU 11.7/10.2 Tip#5	Protection Level D	
Ground El	Soil Drilled 210'	∇ below ground 85'	Total Depth 210'	
Logged by Bruce Colby	Checked by DRP	Date 10/10/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU BAR	Monitoring HNU AIR	Monitoring LEL
0-10				Brown-Tan Fine-Med-crs Sand. Poorly sorted some thin layers of fine gravel (SP)		0	0	0%
10-20								
20-30								
30-40								
40-50								
50-60				Tan Med-crs sand Poorly sorted some thin layers of gravel (SP)	∇ ~85'			
60-70								
70-80								
80-90								
90-100								
100-110				crs Sand + gravel some cobbles (SP-GP)				
110-120								
120-130				Tan Med-crs Sand (SP)				
130-140								
140-150								
150-160								
160-170								
170-180	S-20			crs sand, gravel + cobbles (SP-GP)				
180-190	S-19							
190-200	S-20			Tan crs Sand (SP)				
200-210	S-21							
					– BOE 209'			
				Dolomite Bedrock 209'				

SB8 SWW-91-03C

FIELD BORING LOG

Boring No. SWN-91-03E

Project No. 6853-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor LAYNE ENV.	Driller A. RODRIGUEZ	Date started 11/8/91	completed 11/10/91	
Method Dual-Wall Rot.	Casing Size 9"	HNU 11.7/10.2	Protection Level D	
Ground El	Soil Drilled 210'	∇ below ground	Total Depth 258'	
Logged by R. Perdue	Checked by [illegible]	Date 11-11-91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
	0-10			Brown med. sand, tr. silt and coarse sand, poorly graded (SP).		GAR ATR BKG	
	10-100			Tan med. sand, some fine sand, coarse sand and fine gravel, occasional cobble, poorly graded (SP).	∇ ~85ft.		
	100-110			Tan med.-crs. sand and fine gravel, some med.-crs. gravel, a few cobbles, poorly graded (SP-GP).			
	110-170			Tan med. sand, some fine and coarse sand, tr. fine gravel, poorly graded (SP).			
	170-180			Tan crs. sand and fine gravel, some med. sand and crs. gravel, poorly graded (SP-GP).			
	180-210			Tan med.-crs. sand, tr. fine-med. gravel, poorly graded (SP).			
Six (6) samples of bedrock cuttings collected. See SWN-91-03D Boring Log	210-220			Blue-Gray Dolomite Bedrock			
	220-235			Tan-Brown Sandstone			
	235-258			Blue-Gray Dolomite			
				B.O.E. 258 feet			

FIELD BORING LOG

Boring No. SWN-91-03X

Project No 6853-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne Env.	Driller A. Rodriguez	Date started 10/26/91	completed 11/7/91	
Method Triple Wall	Casing Size 10¾"	HNU 11.7/10.2	Protection Level D	
Ground El	Soil Drilled 210'	∑ below ground 85'	Total Depth 230'	
Logged by Colby	Checked by DRP	Date 11/10/91		

BORING ABANDONED

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU ATM	Monitoring LEL
	0-10			Organic matter, gravel and coarse sand. (SP-GP)			0	0%
	10-210			Tan, fine-coarse sand, some thin gravel layers. (SP)			↓	↓
	210-220			Blue-gray dolomite. BEDROCK				
	220-230			Sand and gravel, outwash. Possibly a fault or fracture filled by outwash. (SP-GP)				
				B.O.E. 230 feet				
				BORING ABANDONED ON 11/07/91				

See SWN-91-03D Boring Log

FIELD BORING LOG

Boring No. SWM-91-04C

Project No 6853	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art R	Date started 10/13	completed 10/13
Method Dual-Wall Hammer	Casing Size 9" OD	HNU 11.7/10.2	Protection Level D
Ground El	Soil Drilled 170'	∇ below ground 85	Total Depth 170'
Logged by Colby	Checked by DRP	Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU GAR	Monitoring HNU AIR	Monitoring LEL
	0-10			Tan Med-Crs Sand w/ thin layers of gravel (SP)		0	0	0%
	10-20							
	20-30							
	30-40							
	40-50							
	50-60							
	60-70							
	70-80							
	80-90				∇ ~ 85'			
	90-100				97'			
	100-110			Gravel, Crs SAND & Cobbles (SP-GP)				
	110-120				112'			
	120-130			Tan Med-Crs Sand (SP)				
	130-140							
	140-150							
	150-160							
	160-170			B.O.E. 170'				

SWM-91-04D

SEE

FIELD BORING LOG

Boring No. SWM-91-04D

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art R	Date started 10/9	completed 10/9
Method Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP #5	Protection Level D
Ground El	Soil Drilled 200'	∑ below ground 85'	Total Depth 200'
Logged by Bruce Colby	Checked by DRP	Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
S-1	0-10			Tan Md-crs SAND some thin layers of gravel (SP)		GAR 0	AIR 0
S-2	10-20						0%
S-3	20-30						
S-4	30-40						
S-5	40-50						
S-6	50-60						
S-7	60-70						
S-8	70-80						
S-9	80-90				∑ ~85'		
S-10	90-100				95'		
S-11	100-110			crs SAND Gravel + Cobbles (SP-GP)	115'		
S-12	110-120			Tan Md-crs Sand some thin layers of gravel (SP)			
S-13	120-130						
S-14	130-140						
S-15	140-150						
S-16	150-160						
S-17	160-170						
S-18	170-180				170'		
S-19	180-190			crs sand, gravel + cobbles (SP-GP)			
S-20	190-200				195'		
				Tan crs Sand (SP)	~ BOE 200'		
				Dolomite Bedrock ~210'			

FIELD BORING LOG

Boring No. SWM-91-05D

Project No. 6553.03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne Environ	Driller Art R		Date started 10/12/91	completed 10/12/91
Method Dual-Wall Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP#5		Protection Level D
Ground El	Soil Drilled 120'	∑ below ground		Total Depth 120'
Logged by Culby-Grove	Checked by DRP	Date 10/14/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU BR	Monitoring HNU AIR	Monitoring LEL
Soc SWM-91-05D	0-10			Tan fine-Med Sand		0	0	0%
	10-20			w/ Thin layers of		↓	↓	↓
	20-30			crs sand or thin				
	30-40			gravel				
	40-50			(SP)				
	50-60			↓				
	60-70							
	70-80				∑ 85'			
	80-90							
	90-100							
	100-110			Gravel, crs sand & Cobbles (SP-GP)	98'			
	110-120				115			
				Med-crs Sand (SP) ↓	BOE 120'			

FIELD BORING LOG

Boring No. SNW-91-05D

Project No 6953-03	Project Name BAAP RI/FS			Page 1 of 1
Contractor Layne	Driller Art R		Date started 10/11/91	completed 10/12/91
Method H Direct-Rigsll Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP+5		Protection Level D
Ground El	Soil Drilled 170'	∇ below ground 85'		Total Depth 170'
Logged by Barbara Colby	Checked by DRP	Date 10/13/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU	Monitoring LEL
						BAR / ATR	0 %
	0-10			Tan Fine-Med SAND w/ some thin layers of gravel (SP)		0 / 0	
	10-20						
	20-30						
	30-40						
	40-50						
	50-60						
	60-70						
	70-80				∇ ~ 85'		
	80-90						
	90-100				98'		
See SNW-91-05D	100-110			Gravel, Cobbles & crs Sand (SP-GP)	115'		
	110-120			Med-crs Sand (SP)			
	120-130						
	130-140						
	140-150				150'		
	150-160			gravel, cobbles & crs sand (SP-GP)	160'		
	160-170			Med-crs Sand (SP)	BoE 170'		

FIELD BORING LOG

Boring No. SWM-91-053

Project No 6853-03	Project Name BAAP RI/FS		Page 1 of 1
Contractor Layne	Driller Art R	Date started 10/10	completed 10/10
Method Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP #5	Protection Level D
Ground El	Soil Drilled 202'	∑ below ground 85'	Total Depth 202'
Logged by Bindy Colby	Checked by DRP	Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen/Rec	Description	Comments on Advance of Boring	Monitoring HNU JAR	Monitoring HNU AIR	Monitoring LEL
S-1	0-10			Tan Fine-Med SAND		0	0	0%
S-2	10-20			some thin gravel				
S-3	20-30			layers (SP)				
S-4	30-40							
S-5	40-50							
S-6	50-60							
S-7	60-70							
S-8	70-90							
S-9	80-90				∑ @ 85'			
S-10	90-100				95' VOC samples 100'			
S-11	100-110			Gravel Cobbles + Cos Sand (SP-GP)	VOC samples 115' 110'			
S-12	110-120							
S-13	120-130			Med-Cos SAND (SP)				
S-14	130-140							
S-15	140-150				150'			
S-16	150-160			Gravel + Cobbles w/Cos SAND (SP-GP)	160'			
S-17	160-170			Cos SAND some fine gravel (SP)				
S-18	170-180							
S-19	180-190				195'			
S-20	190-200			gravel, cos Sand + Cobbles SP-SP				
					BOE 202'			

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,732.21 E2,064,450.61

Boring No. S1101

Surface Elevation 828.2[illegible]

Job No. C 8742

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE		Recovery	Moisture			CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL
						*					
					5	Tan to Brown Stratified Fine, to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	B B C C				
					10	Granite, Quartzite & Rhyolite Cuttings	C C C				
					15		C				
					20	pfl at 20'	C				
D0001	2SS	X	M	49			C B	44	48	8	
					25						
					30		C C C C C C C C C C				
					35	* Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)	C C C C C C				
					40		C C C				
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N484,732.21 E2,064,450.61

Boring No. S1101
Surface Elevation 828.24
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
D0002	2SS	X	M	53	50	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C	23	70	7		
					55							
					60	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					65							
					70							
					75							
D0003	2SS	X	W	46	80			1	94	5		
						End Boring at 80'						
					85							
					90							

GENERAL NOTES

Start 12/12/79 Complete 12/13/79
Crew Chief RS/RJR Rig CME750
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,687.77 E2,067,591.00

Boring No. S1103

Surface Elevation 807.53

Job No. C 8742

Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL
					0	Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)					
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)					
D0004	SS	X	M	22	15	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	B	4	90	6	
D0005	SS	X	M	65	30	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)		52	43	5	
					40	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N484,687.77 E2,067,591.00

Boring No. S1103
Surface Elevation 807.63
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
D0006	SS	X	M	35	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	94	4		
					55							
					60							
					65							
D0007	SS	X	M	43	70							
					75		B					
					80							
D0008	SS	X	M	71	85							
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,687.77 E2,067,591.00

Boring No. S1103

Surface Elevation 807.63

Job No. C 8742

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
D0009	SS	X	W	70	100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		1	95	4		
D0010	SS	X	W	33	120	End Boring at 120'						

95 100 105 110 115 120 125 130 135

GENERAL NOTES

Start 10/31/79 Complete 11/2/79

Crew Chief HFS Rig ACE #1

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484.793.05 E2,071,101.83

Boring No. S1106

Surface Elevation 837.9±

Job No. C 8742

Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10							
					15		C					
D0011	SS	X	M	13	20		C					
					25	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					30		C					
					35							
D0012	SS	X	M	18	40			14	81	5		
					45	pfl at 45'						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,793.05 E2,071,101.83

Boring No. S1106
Surface Elevation 837.
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL
					50	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)					
D0013	SS	X	M	55				23	72	5	
					55	pfl at 55'	C				
					60		C				
					65	pfl at 65'	C				
					70	pfl at 70'					
					75	pfl at 75'	C				
					80		C				
					85						
					90		C				
D0014	SS	X	W	49		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt & Clay (SP,SP-SM)		9	97	3	

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,793.05 E2,071,101.83

Boring No. S1106

Surface Elevation 837.94

Job No. C 8742

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					95							
					100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					105		B					
					110	pfl at 110'						
D0015	SS	X	W	60	115			2	96	2		
							C					
					120	pfl at 120'	C					
					125							
					130	pfl at 130'						
					135	End Boring at 136'						

GENERAL NOTES

Start 11/14/79 Complete 11/14/79

Crew Chief HFS, BKH Rig ACE #1

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,860.18 E2,072,645.25

Boring No. S1107

Surface Elevation [redacted]

Job No. C.8742

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL
					5	Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)					
					10	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C				
					15		C				
					20						
					25	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
D0016	SS	X	M	41	30			0	95	5	
					35		C C				
					40						
					45						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N484,860.18 E2,072,645.25

Boring No. S1107
Surface Elevation 810.06
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
						Tan to Brown Fine to Coarse SAND, Little to Some Silt & Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)						
D0017	SS	X	W	71	55			0	96	4		
					60							
					65	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					70							
					75							
D0018	SS	X	W	88				0	96	4		
					80	End Boring at 78'						
					85							
					90							

GENERAL NOTES

Start 1/10/80 Complete 1/10/80
Crew Chief HFS Rig ACE #2
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N484,751.72 E2,073,316.38

Boring No. S1108

Surface Elevation

Job No. C 8742

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
						Fill Material, Brown Silty CLAY, Some Sand and Gravel						
						Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium SAND (CL,CL-ML)						
					5							
					10							
					15							
D0019	SS	X	W	11	20	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					25							
					30							
					35							
					40		42'	0	97	3		
D0020	SS	X	W	22								
						End Boring at 42'						
					45							

GENERAL NOTES

Start 12/29/80 Complete 12/[illegible]/80

Crew Chief JR Rig ACE #

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N488,536.15 E2,064,509.76

Boring No. S1109
Surface Elevation 854.68
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
D0021	SS	X	M	NA	5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)		0	18	72		
					10							
					15		C					
							C					
					20	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					25		C					
D0022	SS	X	M	49	30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	94	6		
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N488,536.15 E2,064,509.76

Boring No. S1109
Surface Elevation [redacted]
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	I
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					55							
					60	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C					
					65		C					
					70	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					75		C C					
D0023	SS	X	W	48	80	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C	5	92	3		
					85		C C					
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N488,536.15 E2,064,509.76

Boring No. S1109
Surface Elevation 854.62
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
							C					
							C					
					100		C					
							B					
							C					
					105		C					
							C					
							C					
							C					
							C					
D0024	SS	NR	-	100			C					
					110	End Boring at 108'						
					115							
					120							
					125							
					130							
					135							

GENERAL NOTES

Start 2/14/80 Complete 2/14/8
Crew Chief HFS, MLC Rig ACE
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N486,476.12 E2,073,302.11

Boring No. S1110
Surface Elevation 8[redacted]
Job No. C 8742
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	
						Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)	B					
					5		C					
						Tan to Brown Clayey Silty SAND, Little to Some Gravel, Cobbles and Boulders (SC)	C					
					10		C					
							C					
					15		C					
							B					
						Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					20							
					25							
D0025	SS	X	M	30				12	82	6		
					30							
						Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N485,475.12 E2,073,302.11

Boring No. S1110
Surface Elevation 810.48
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
D0026	SS	X	W	30	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		10	85	5		
D0027	SS	X	M	27	65			9	93	7		
						End Boring at 66'						
					70							
					75							
					80							
					85							
					90							

GENERAL NOTES

Start 1/15/80 Complete 1/15/80
Crew Chief HFS Rig ACE #1
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N487,413.09 E2,075,847.11

Boring No. S111[redacted]

Surface Elevation 8[redacted]

Job No. C 8742

Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	P
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10		C					
							C					
					15	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
D0028	SS	X	M	57	20			8	79	13		
D0029	SS	X	M	-	25			10	45	45	25.9	9.0
					30	Tan to Brown Clayey Silty SAND, Little to Some Gravel (SC)						
					35		C					
					40		C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N487,413.09 E2,075,847.11

Boring No. S1111
Surface Elevation 846.49
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown Clayey Silty SAND, Little to Some Gravel (SC)						
					55							
					60	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
D0030	SS	X	M	50	65			1	92	7		
					70							
					75							
					80							
					85							
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N487,413.09 E2,075,847.11

Boring No. S1111
Surface Elevation
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	
					95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					100							
00031	SS	X	W	114				0	96	4		
						End Boring at 102'						
					105							
					110							
					115							
					120							
					125							
					130							
					135							

GENERAL NOTES

Start 1/2/80 Complet
Crew Chief HFS Rig ACE
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N490,049.07 E2,076,746.15

Boring No. S1112
Surface Elevation 836.23
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10							
					15		C					
							C					
							C					
					20	Tan to Brown Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					25		C					
							B					
							C					
					30		C					
D0032	SS	NR	-	100			C					
					35		B					
					40		C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N490,049.07 E2,076,746.15

Boring No. S1112
Surface Elevation 8
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	
D0033	SS	X	M	74	50	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)		17	70	13		
					55							
					60							
					65							
					70		C					
							C					
					75							
					80							
							C					
					85							
							C					
					90							
							C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Location: N490,049.07 E2,076,746.15

Boring No. S1112
Surface Elevation 836.23
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type			N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					95	*						
D0034	SS	X	W	50		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	97	3		
						End Boring at 96'						
					00							
					05	* Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					10							
					15							
					20							
					25							
					30							
					35							

GENERAL NOTES

Start 1/3/80 Complete 1/4/80
Crew Chief HFS Rig ACE #2
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Location: N491,603.29 E2,079,574.42

Boring No. S1114
Surface Elevation 8[redacted]
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)	B					
						Sandstone Cuttings 4-6½'	B					
					10		C					
							C					
					15		B					
							B					
					20		C					
D0035	SS	X	M	13				19	73	8		
					25	Tan to Brown, Stratified Fine to Coarse SAND, and to Some Fine to Coarse Gravel, Trace to Little Silt and Clay Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					30							
					35	pfl at 35'						
					40							
						pfl at 43'						
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N491,603.29 E2,079,574.42

Boring No. S1114
Surface Elevation 819.75
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown, Stratified Fine to Coarse SAND, and to Some Fine to Coarse Gravel, Trace to Little Silt and Clay Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					55		C					
					60		C					
					65	pfl at 67'	C					
D0036	SS	X	M	50	70			47	49	4		
					75		C					
					80		C					
						pfl at 83'						
					85	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N491,603.29 E2,079,574.42

Boring No. S1114 [redacted]75
Surface Elevation
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
						pfl at 92'						
					95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					100							
						pfl at 103' to 105'						
D0037	SS	X	W	44	105			0	97	3	[redacted]	
						End Boring at 106'						
					110							
					115							
					120							
					125							
					130							
					135							

GENERAL NOT[redacted]

Start 11/19/79 Complete 11/20/
Crew Chief HFS Rig ACE #1
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N490,445.70 E2,070,359.29

Boring No. S1116

Surface Elevation 860.41

Job No. C 8742

Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10		C					
					15		C					
					20	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SP-SW) (SP)	C					
					25		C					
D0038	SS	X	M	55	30		C					
					35	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N490,445.70 E2,070,359.29

Boring No. S1116
Surface Elevation 8
Job No. C 8742
Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture									
No.	Type	N	Depth			*	% Gravel	% Sand	% P200	LL	
			50		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and CLAY (SP,SP-SM)	C					
			55		Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C B C C B C B C					
			65		Continual Fluid Losses between 50' and 85'	C B B C					
			75								
			80		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
			85								
			90								

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N490,445.70 E2,070,359.29

Boring No. S1116
Surface Elevation 860.41
Job No. C 8742
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
D0039	SS	X	W	66	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		5	91	4		
					100		C					
					105	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					110							
D0040	SS	X	W	118	115	tfl at 115' to 116'	C C C	40	54	6		
					120	Sandstone Cuttings 120' to 125'	C C C C C C					
					125		C					
					130	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					135							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N490,445.70 E2,070,359.29

Boring No.: S111

Surface Elevation: 860

Job No.: C 8742

Sheet: 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
D0041	SS	X	W	60+	140	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
						End Boring at 141'						
					145							
					150							
					155							
					160							
					165							
					170							
					175							
					180							

GENERAL NOTES

Start 12/11/79 Complete 12/11/7

Crew Chief HFS Rig ACE #1

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N490,354.23 E2,066,372.44

Boring No. S1117
Surface Elevation 862.61
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C C					
					15		C					
					20		C					
					25		C C C C					
D0042	SS	X	M	40				20	76	4		
D0045	SS	X	M	60	30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N490,354.23 E2,066,372.44

Boring No. S1117

Surface Elevation

Job No. C 8742

Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					55							
					60	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					65		C					
D0043	SS	X	M	54	70		C	40	54	6		
					75		C					
					80		C					
					85		C					
					90		C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N490,354.23 E2,066,372.44

Boring No. S1117

Surface Elevation 862.61

Job No. C 8742

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					95	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to LittLe Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C C C C B					
					100							
					105	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					110	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C C C C C C C C					
					115							
						Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
D0044	SS	X	M	44	120			0	98	2		
						End Boring at 121'						
					125							
					130							
					135							

GENERAL NOTES

Start 2/13/80 Complete 2/13/80

Crew Chief HFS, MIC Rig ACE #1

Drilling Method .....

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Location: N492,933.24 E2,072,320.48

Boring No. S1118
Surface Elevation 87
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10							
					15							
					20	Cobbles and Boulders from 19' to 25'	B					
							B					
							B					
					25		B					
							B					
							C					
							B					
D0046	SS	X	M	19	30	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)		11	73	16		
					35		B					
							C					
							C					
					40							
							C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N492,933.24 E2,072,320.48

Boring No. S1118
Surface Elevation 872.84
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders(SM)						
					55	pfl at 54'	C					
					60		C B C					
					65	Quartzite Cuttings	B C					
					70	Continual Total Fluid Loss Between 67' - 75'	B B B B B C C B					
					75		C					
					80	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					85							
					90		C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N492,933.24 E2,072,320.48

Boring No. S1118
Surface Elevation [redacted]4
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	%Gravel	% Sand	% P200	LL	PI
No.	Type			N	Depth							
D0047	SS	X	W	35	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		3	95	2		
D0048	SS	X	W	51	100							
					105							
					110	End Boring at 110'						
					115							
					120							
					125							
					130							
					135							

GENERAL NOTES

Start 11/27/79 Complet[redacted] 7
Crew Chief HFS Rig ACE
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N496,201.38 E2,072,983.10

Boring No. S1119
Surface Elevation 877.67
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					10							
					15							
					20	Occasional Layers of Sandy Silt						
					25							
D0049	SS	X	-	21				0	42	58	17.7	2.2
(Divided Sample in Two)												
D0050	SS	X	-	-	30			0	94	6		
					35	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM) Occasional Layers of Clayey Sand						
					40							
					45	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N496,201.38 E2,072,983.10

Boring No. S1119
Surface Elevation [redacted]
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	I
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					55		C					
					60						[redacted]	
					65							
					70		C					
					75	Large Fluid Losses 73-93'	C					
					80	Brown Fine to Coarse GRAVEL, And to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)						
					85							
					90	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	C				[redacted]	

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N496,201.38 E2,072,983.10

Boring No. S1119
Surface Elevation 877.67
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95		C					
							C					
					100		C					
D0051	SS	X	W	84		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		13	84	3		
					105							
					110							
					115							
D0052	SS	NR	-	92	120							
						End Boring at 121'						
					125							
					130							
					135							

GENERAL NOTES

Start 1/19/80 Complete 1/ 22/80
Crew Chief HFS Rig ACE #1
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Location N493,313.14 E2,075,597.06

Boring No. S1120
Surface Elevation 877.06
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	P
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10		C					
					15	Quartzite Cuttings	C					
					20	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					25		C					
D0053	SS	X	M	34	30		B	1	84	15		
					35		C					
					40		C					
					45		C					
							C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N403,313.14 E2,075,597.06

Boring No. S1120

Surface Elevation 877.06

Job No. C 8742

Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C B C C					
					55		C					
					60		C C					
							C					
					65	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Caorse Gravel, Trace to Little Silt and Clay, Occasional	C B C					
D0054	SS	X	M	85		Cobbles and Boulders (SP-SM,SW-SM) (SP)	C	22	68	10		
					70		C B					
					75							
					80		C B C B C C					
					85		C C					
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N493,313.14 E2,075,597.06

Boring No. S1120

Surface Elevation [redacted]

Job No. C 8742

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	F
					95	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					100		C					
					105		C				[redacted]	
							C					
							B					
					110		B					
							C					
							C					
					115		C					
							C					
							C					
					120		C					
D0055	SS	X	W	40	125			36	58	6		
						End Boring at 125'						
					130							
					135							

GENERAL NOTES

Start 1/16/80 Complete [redacted]80

Crew Chief HFS Rig [redacted]1

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N496,296.77 E2,079,127.02

Boring No. S1121
Surface Elevation 813.93
Job No. C 8742
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10							
					15	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)						
					20							
					25							
D0056	SS	X	M	22		Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)		14	79	7		
					30		C					
							C					
					35							
							C					
					40		C					
						Brown Silty Clay 41'42'						
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N1496,296.77 E2,079,127.02

Boring No. S1121

Surface Elevation 81[redacted]

Job No. C 8742

Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
D0057	SS	X	W	21			C	6	88	6		
					55	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
D0058	SS	X	W	43	60			0	91	9	[redacted]	
						End Boring at 61'						
					65							
					70							
					75							
					80							
					85							
					90							

GENERAL NOTES

Start 1/18/80 Complete 1[redacted]80

Crew Chief HFS, BLH Rig A[redacted]

Drilling Method

Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N500,702.29 E2,074,444.43

Boring No. S1122
Surface Elevation 904.87
Job No. C 8742
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10		C					
							C					
							C					
							C					
					15		C					
							C					
						Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					20		C					
							C					
					25							
D0059	SS	NR	-	-								
					30		C					
D0060	SS	X	M	19				11	79	10		
					35							
					40		C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Location: N500,702.29 E2,074,444.43

Boring No. S1122
Surface Elevation 9
Job No. C 8742
Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					50		C					
					55		C					
					60		C					
					65	Tan to Brown, Stratified Fine to Coarse SAND. And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					70		C					
					75		C					
					80		C					
					85		C					
D0061	SS	X	M	-	90			22	71	7		

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N500,702.29 E,2074,444.43

Boring No. S1122
Surface Elevation 904.87
Job No. C 8742
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95	Tan to Brow, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					100		C					
					105		C					
					110							
					115							
					120	Quartzite Cuttings at 120'	C B					
					125							
					130	Brown Clayey SILT, Little to Some Fine Grained Sand, Trace Gravel (ML)						
D0062	SS	X	M	32	135			0	3	97		

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N500,702.29 E2,074,444.43

Boring No. S1122
Surface Elevation
Job No. C 8742
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	
						Brown Clayey SILT, Little to Some Fine Grained Sand, Trace Gravel (ML)	C					
					40	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	B C B C C					
					45	End Boring at 144'						
					50							
					55							
					60							
					65							
					70							
					75							
					80							

GENERAL NOTES

Start 1/24/80 Complete 1/8
Crew Chief HFS, BKH Rig
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N494,500.23 E2,062,374.27

Boring No. S1123
Surface Elevation 867.03
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
						Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)						
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand with Some Cobbles (CL,CL-ML)						
					10	pfl at 8-11'	C					
						Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C C C C C C C					
					20							
					25	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
D0063	SS	X	M	54	30			10	75	15		
					35							
					40		C					
					45		C C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N494,500.23 E2,062,374.27

Boring No. S1123
Surface Elevation 86
Job No. C 8742
Sheet 2 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
					55		C					
							C					
							C					
					60		C					
					65	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
D0064	SS	X	M	31	70		C	44	49	7		
							C					
						pfl at 72-74'	C					
					75		C					
							C					
					80		C					
							C					
					85		C					
							C					
					90		C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N494,500.23 E2,062,374.27

Boring No. S1123

Surface Elevation 867.03

Job No. C 8742

Sheet 3 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95	*						
D0065	2SS	X	M	60	100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt, and Clay (SP,SP-SM)		1	94	5		
					105		C					
							B					
							B					
							B					
							C					
							C					
							B					
					110		B					
						Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Caorse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					115		C					
					120		C					
							C					
							C					
					125	* Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					130		C					
							C					
D0066	2SS	X	W	48	135							
						End Boring at 135'						

GENERAL NOTES

Start 12/20/80 Complete 12/28/80

Crew Chief JPR Rig 750

Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N497,938.40 E2,072,925.10

Boring No. S1124
Surface Elevation [redacted]
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL
						*					
						Tand to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	B				
					5		B				
							C				
					10		C				
						Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, (GP-GM) pfl at 10-15'					
					15						●
					20						
D0067	2SS	X	-	36	25						
						Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
D0068	2SS	X	M	24	30						
					35	* Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)					
					40						
					45						●

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N497,938.40 E2,072,925.10

Boring No. S1124
Surface Elevation 878.01
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					55							
					60							
					65	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt & Clay, Occasional Cobbles & Boulders (GP-GM)						
D0069	2SS	X	M	51	70			3	91	6		
					75	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
					80							
					85							
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N497,938.40 E2,072,925.10

Boring No. S1124
Surface Elevation 8[redacted]
Job No. C 8742
Sheet 3 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type			N	Depth		*	%Gravel	% Sand	% P200	LL	P
					95							
D0070	2SS	X	W	100 / 11	100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		7	70	23		
					105							
					110							
					115		C					
					120	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					125		C					
							C					
D0071	2SS	X	M	100 / 31	130		C	34	53	13		
						End Boring at 130'						
					135							

GENERAL NOTES

Start 12/17/79 Complete 12/[redacted]
Crew Chief RLS Rig 750
Drilling Method
Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N496,507.67 E2,067,952.90

Boring No. S1125

Surface Elevation 894.87

Job No. C 8742

Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)	C					
					10		C					
					15		C					
							C					
					20	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					25							
					30							
D0072	SS	X	M	56								
D0073	SS	X	M	-	35			4	94	2		
					40	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N496,507.67 E2,067,952.90

Boring No. S1125

Surface Elevation 894.8

Job No. C 8742

Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	
					50							
					55	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					60		C					
					65							
					70							
					75							
					80							
D0074	SS	X	M	64								
					85	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C C C					
					90							

(Continued)

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WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N500,012.88 E2,063,332.17

Boring No. S1126
Surface Elevation 874.70
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML) (Silty Clay Appears to Grade into Underlying Sand)						
D0076	SS	X	M	1				8	48	44		
D0077	SS	X	D	1				22	70	8		
D0078	SS	X	M	4								
					10							
					15	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					20		C					
					25							
					30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N500,012.88 E2,063,332.17

Boring No. S1126

Surface Elevation 874.70

Job No. C 8742

Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL
D0079	SS	X	M	43	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		6	92	2	
					55						
					60						
					65						
					70						
					75						
					80						
					85		C				
					90	Stiff Clay Layer 89' to 90'					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N500,012.88 E2,063,332.17

Boring No. S1126
Surface Elevation 874.70
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					100							
					105							
					110	* Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
						Brown Clayey SILT, Little to Some Fine Sand, Trace Gravel (ML)						
D0080	SS	X	W	35	115			3	16	81		
						End Boring at 116.5'						
					120							
					125	* Brown Clayey SILT, Little to Some Fine Sand, Trace Gravel (ML)						
					130							
					135							

GENERAL NOTES

Start 2/11/80 Complete 2/11/80
Crew Chief HFS,MLC Rig ACE #1
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N503,380.50 E2,063,312.68

Boring No. S1127

Surface Elevation 87[redacted]

Job No. C 8742

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					15		C					
					20		C					
					25		C					
							C					
00081	SS	X	M	47	30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	98	2		
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N503,380.50 E2,063,312.68

Boring No. S1127
Surface Elevation 878.31
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
D0082	SS	X	M	54	50			19	77	4		
					55							
					60	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
D0083	SS	X	W	24	65			0	96	4		
			▽		70							
					75	Thin Layer of Reddish Brown Clay at 74'						
						End Boring at 75'						
					80							
					85							
					90							

GENERAL NOTES

Start 2/7/80 Complete 2/8/80
Crew Chief WFS, MLC Rig ACE#1
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N504,039.10 E2,062,711.52

Boring No. S1128
Surface Elevation [redacted]9
Job No. C 8742
Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10		C					
							C					
					15	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					20		C					
							C					
					25		C					
D0085	SS	X	M	25	30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					35							
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N504,039.10 E2,062,711.52

Boring No. S1128
Surface Elevation 877.19
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
					50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
D0086	SS	X	W	62	55			0	97	3		
					60	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
					65		C					
					70		C					
						SANDSTONE, Well Sorted, Fine Grained, Calcitic Cement Weathers to a White Silt						
D0087	SS	NR	-	-	75	End Boring at 75'						
					80							
					85							
					90							

GENERAL NOTES

Start 12/18/79 Complete 12/19/79
Crew Chief HFS Rig ACE #1
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N503,571.75 E2,068,121.29

Boring No. S1129
Surface Elevation [redacted]
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
D0088	SS	X	D	NA				6	12	82	42.8	24
					10		C					
							C					
					15		B					
							B					
							C					
					20	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay Occasional Cobbles and Boulders (GP-GM)	B					
							B					
							C					
					25		C					
							C					
D0089	SS	X	M	57			C	53	38	9		
					30		C					
							C					
							C					
					35	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					40		C					
							C					
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N503,571.75 E2,068,121.29

Boring No. S1129

Surface Elevation 910.95

Job No. C 8742

Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
					50	Tan to Brown, Stratified Fine to Coarse SAND, and to Some Fine to Coarse Gravel, Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
							C					
							C					
					55		R					
							C					
							C					
							C					
					60		C					
							C					
					65							
							C					
					70	Red Clay 69'-71'	C					
							B					
							C					
					75	Occasional Thin Clay Layers 75-80'						
						Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)						
					80		G					
							C					
					85							
							C					
D0090	SS	NR	-	-			C					
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N503,571.75 E2,068,121.29

Boring No. S1129
Surface Elevation 910.25
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL
					95	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C C C C C				
					100						
					105	SANDSTONE, Well Sorted, Fine Grained, Calcitic Cement Weathers to a White Silt					
					110						
					115						
					120	End Boring at 120'					
					125						
					130						
					135						

GENERAL NOTES

Start 2/6/80 Complete 2/8/80
Crew Chief HFS, BKH Rig
Drilling Method Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N504,612.08 E2,071,642.61

Boring No. S1131
Surface Elevation 940.90
Job No. C 8742
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	% Gravel	% Sand	% P200	LL	PI
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	C					
							C					
					15		B					
							B					
					20		B					
							B					
							B					
							B					
					25	Large(1'-5' diameter) Granitic Boulders 20-35'	B					
							B					
					30		B					
							B					
							B					
							B					
							B					
					35		B					
					40							
					45							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N504,612.08 E2,071,642.61

Boring No. S1131
Surface Elevation 940.90
Job No. C 8742
Sheet 2 of

1408 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	I
D0092	SS	X	M	60+	50			51	41	8		
							B					
						Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	B					
					55		B					
					60	Quartzite Cuttings	B					
							B					
					65		B					
							B					
					70							
					75		C					
							B					
						QUARTZITE CONGLOMERATE, Yellow Brown Sandstone and Red Clay Matrix, Quartzite Cobbles and Boulders up to 15' in diameter (Sandstone Matrix Weathers to a White Silt)	C					
					80		C					
							C					
							C					
							C					
							C					
					85		C					
							C					
							C					
						Large Fluid Losses 85-88'	C					
D0093	SS	X	M	46	90		C	52	25	23		
							C					

(Continued)

WARZYN
ENGINEERING INC
1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N504,612.08 E2,071,642.61

Boring No. S1131
Surface Elevation 940.90
Job No. C 8742
Sheet 3 of 4

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	% Gravel	% Sand	% P200	LL	PI
							C C C C B C C					
					95	QUARTZITE CONGLOMERATE, Yellow Brown Sandstone and Red Clay Matrix, Quartzite Cobbles and Boulders up to 15' in diameter (Sandstone Matrix Weathers to a White Silt)						
					100		C C					
					105		C B					
					110		C C B B B B B					
					115		B B B B B					
					120		B B B B B B					
					125	Large Fluid Losses 124'-128'	B B					
					130		C C C B C					
					135		C C C					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin

Location: N504,612.08 E2,071,642.61

Boring No. S1131

Surface Elevation 940

Job No. C 8742

Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture									
No.	Type	N	Depth			✳	% Gravel	% Sand	% P200	LL	PI
			140		QUARTZITE CONGLOMERATE, Yellow Brown Sandstone and Red Clay Matrix, Quartzite Cobbles and Boulders up to 15' in diameter (Sandstone Matrix Weathers to a White Silt)	B C C C C C C C C C C C C C C C C C B B B B B					
			145								
			150								
			155		End Boring at 155'						
			160								
			165								
			170								
			175								
			180								

GENERAL NOTES

Start 12/3/79 Complete 12/[illegible]/79

Crew Chief JR/HS Rig A[illegible]

Drilling Method

Rotary Mud

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N502,464.29 E2,072,997.91

Boring No. 51132
Surface Elevation 912.97
Job No. C 8742
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture									
No.	Type	N	Depth			*	% Gravel	% Sand	% P200	LL	PI
			5		Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)	C					
					Cobbles and Boulders Between 5 and 9'	C					
						B					
			10			C					
						C					
						B					
			15			C					
						C					
						C					
						C					
			20		Fluid Losses Through Cobble Zone 9' to 29'	C					
						C					
						C					
						C					
						C					
			25			C					
						B					
						C					
						C					
			30		Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	C					
						C					
			35			C					
						C					
						C					
			40			B					
						C					
						C					
			45								

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N502,464 29 E2,072,997.91

Boring No. S1132[redacted]
Surface Elevation 9[redacted]
Job No. C 8742
Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	PI
D0094	SS	X	M	123	50	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	B C	55	39	6		
					55		C C					
					60	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C				[redacted]	
					65							
					70		C					
					75		C					
D0097	SS	X	M	64			C					
D0098	SS	X	M	109	80							
							C C					
					85							
							C					[redacted]
					90							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N502,464.29 E2,072,997.91

Boring No. S1132
Surface Elevation 912.97
Job No. C 8742
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		*	%Gravel	% Sand	% P200	LL	PI
					95		C					
							C					
							C					
							C					
							C					
							C					
							C					
							C					
							C					
							C					
					100		C					
							C					
					105	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					110							
							C					
							C					
					115		C					
					120							
							C					
							C					
							C					
					125		C					
							C					
D0095	SS	X	M	100				0	89	11		
					130	Clayey Sand 131'-132'						
					135							

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant, Baraboo, Wisconsin
Location: N502,464.29 E2,072,997.91

Boring No. S1132
Surface Elevation [redacted]
Job No. C 8742
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 8538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture									
No.	Type	↓	↓	N	Depth		✳	%Gravel	% Sand	% P200	LL	P
					40	Clayey Sand 136'-137'						
						pfl at 138'						
					45	Clayey Sand 142'-145'	C					
						Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
D0096	SS	X	W	127	50		C	24	75	1		
						Igneous Cuttings	C					
					55		B					
							C					
							C					
							C					
					60	End Boring at 160'						
					65							
					70							
					75							
					80							

GENERAL NOTES

Start 2/1/80 Complete 2/[redacted]
Crew Chief HFS/BKH Rig AC[redacted]
Drilling Method
Rotary Mud

APPENDIX B
LOG OF TEST BORING

Project Badger Army Ammunition Plant, Baraboo, WI
Location N 3,021.422 ... E 5,149,283

Boring Number S-83-1147
Surface Elevation ... 812.98
Job Number ... 4910 ...
Sheet ... 1 ... of ... 2 ...

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
17			Very dark grayish-brown (10 yr 3/2) clayey silt (ML)					
	4	1	Dark brown (10 yr 3/3) silty clay (CL)	0	24	76	27	14
16		2	Brown (10 yr 4/3) silty sand (SM)	0	78	22	NP	NP
13	6	3	Brown (10 yr 4/4) silty clay (CL) common, medium, distinct mottles (seasonal perched water condition)					
			Brown (10 yr 4/4) silty, clayey, sand (SM-SC)	0	65	35	22	3
21	7	4						
20		5	Yellowish-brown (10 yr 5/4) silty clay (CL)	0	20	80	29	10
	13							
		6						
		7						
		8						
		9	(Continued)					

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N.3,021,422 E.5,149,283

Boring Number: S-83-1147
Surface Elevation: 812.98
Job Number: 4910
Sheet 2 of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
14		10	Light, yellowish-brown, gravelly sand (SW) (10 yr 6/4)	18	79	3	NP	NP
0.4		20	Very pale brown (10 yr 7/4) sand (SW)	2	97	1	NP	NP
		30						
		40						
		50						
		60						
		70						
		80	Wet sample					
		90	Light yellowish-brown (10 yr 6/4) silty sand (SW-SM)	0	90	10	NP	NP
			End of Boring					

APPENDIX B
LOG OF TEST BORING

Project Badger Army Ammunition Plant - Baraboo, WI
Location N 2,801.577 E 6,204.146

Boring Number S-83-1148
Surface Elevation 799.49
Job Number 4910
Sheet 1 of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St. Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
31			V. dark grayish-brown (10 yr 3/2) clayey fine to medium sand (SC)	12	40	48	28	10
	7	1	Brown (10 yr 4/4) to yellowish-brown (10 yr 5/4) clayey silt	0	33	67	27	5
24		2	30% fine and very fine sand (ML)					
	8							
		3	Common, medium, distinct mottles (seasonal perched water condition)					
17	14	4	Yellowish, brown (10 yr 5/4) fine sandy silt (ML)	0	46	54	NP	NP
9								
		5	Pale brown (10 yr 6/3) gravelly, silty, sand (SW-SM)	9	85	6	NP	NP
	18							
		6						
		7						
		8						
		9						

(Continued)

APPENDIX B
LOG OF TEST BORING

Project..Badger Army Ammunition Plant
..Baraboo, Wisconsin..
Location..N 2,801,577....E 6,204.146

Boring Number..S-83-1148
Surface Elevation..799.49
Job Number..4910
Sheet.....2.....of...2..

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓ Stan. Pen.		Depth		% Gravel	% Sand	% P200	LL	PI
0.2		10	Pale brown (10 yr 6/3) gravelly sand (SW)	42	54	4	NP	NP
		20						
		30						
		40						
		50						
		60						
		70						
			End of Boring					
		80						

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant - Baraboo, WI
Location: N 3,252,536 E 7,110.671

Boring Number: S-83-1149
Surface Elevation: 803.63
Job Number: 4910
Sheet: 1 of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
29	6	1	Very dark grayish-brown (10 yr 3/2) silty clay (CL,ML) 26% fine and very fine sand	0	26	74	35	16
29	5	2 3	Very dark grayish-brown (10 yr 3/2) clayey silt (ML) 26% fine and very fine sand	0	26	74	39	10
28 24	8 12	4 5	Very dark grayish-brown (10 yr 3/2) silty clay (CL)	0	18	82	33	10
		6	Dark brown (10 yr 3/3) sandy clay (CL-ML)	0	44	56	20	7
13		7 8 9	(Continued)					

APPENDIX B
LOG OF TEST BORING

Project..Badger Army Ammunition Plant
..Baraboo, Wisconsin.....
Location...N.3,252,536 .E.7,110.671

Boring Number..S-83-1149....
Surface Elevation..803.63....
Job Number...4910.....
Sheet....2.....of..2.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
		10						
11		20	Brown (10 yr 4/3) gravelly sand (SW)	8	89	3	NP	NP
		30						
19		40	Brown (10 yr 4/3) gravelly silty sand (SM)	14	72	14	NP	NP
		50						
		60						
		70						
		80	End of Boring					

APPENDIX B
LOG OF TEST BORING

Project Badger Army Ammunition Plant - Baraboo, WI
Location N.14,918.656 E.8,243.989

Boring Number S-83-1150
Surface Elevation 893.06
Job Number 4910
Sheet 1 of 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
	Stan. Pen	Depth		% Gravel	% Sand	% P200	LL	PI
14			Very dark grayish-brown (10 yr 3/2) silty sand fill					
12	16	1	Dark brown (10 yr 3/3) clayey sand fill					
	21	2	Dark brown (10 yr 3/3) gravelly sandy silt fill					
6		3	Brown (10 yr 4/3) gravelly silty sand fill					
20			Very dark grayish-brown clayey (10 yr 3/2) silt fill					
	36	4	Dark brown (10 yr 3/3) gravelly clayey sand fill					
21		5	Very dark grayish-brown (10yr 3/2) clayey silt fill					
22	6 12	6 7	Very dark grayish-brown (10 yr 3/2) silty clay fill					
	30	8	Brown (10 yr 4/3) gravelly silty sand fill					
		9	(Continued)					

APPENDIX B
LOG OF TEST BORING

Badger Army Ammunition Plant
Baraboo, Wisconsin
N 14,918.656 E 8,243.989

Boring Number S-83-1150
Surface Elevation 893.06
Job Number 4910
Sheet 2 of 3

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
42			Very dark grayish-brown (10 yr 3/2) clayey silt (MH) original topsoil	0	5	95	56	13
23	4	10	Brown (10 yr 4/3) silty clay (CL) Many, coarse, prominent mottles (seasonal perched water condition)	0	4	96	37	20
10			Brown (10 yr 4/4) silty, clayey sand (SM-SC)	5	67	28	17	3
		20						
10		30	Brown (10 yr 5/3) silty sand (SW-SM)	1	88	11	NP	NP
		40						
		50						
		60						
		70						
9		80	Brown (10 yr 5/3) gravelly silty sand (SM)	5	83	12	NP	NP

APPENDIX B
LOG OF TEST BORING

Project..Badger.Army.Ammunition.Plant
..Baraboo,.Wisconsin.....
Location.N.14,918.656..E.8,243.989

Boring Number..S-83-1150.....
Surface Elevation.893.06.....
Job Number.4910.....
Sheet.....3.....of...3.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓ Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
	100						
	110	Brown (10yr 5/3) gravelly silty sand (SM)					
	120						
	130						
	140						
	150						
		End of Boring					
	160						
	170						

APPENDIX B
LOG OF TEST BORING

Project Badger Army Ammunition Plant - Baraboo, WI
Location N. 21,898.327 E. 12,254.520

Boring Number S-83-1151
Surface Elevation 890.75
Job Number 4910
Sheet 1 of 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
		1	Brown (10 yr 4/3) silty sand (SW-SM)	2	93	5	NP	NP
22	7	2	Very dark grayish-brown (10yr 3/2) silty clay (CL)	0	14	86	30	9
	6	3						
	8	4						
25		5						
	7	6						
	9	7						
		8	Dark-brown (10 yr 3/3) to brown (10 yr 4/3) silty clay (CL)	0	3	97	36	21

(Continued)

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant - Baraboo, Wisconsin
Location: N. 21,898.327 E. 12,254.520

Boring Number: S-83-1151
Surface Elevation: 890.75
Job Number: 4910
Sheet: 2 of 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE Stan. Pen.	SAMPLE Depth	CLASSIFICATION and Remarks	SOIL PROPERTIES % Gravel	% Sand	% P200	LL	PI
		Many coarse, prominent mottles (seasonal perched water condition) (5'-10')					
26	10						
16		Brown (10 yr 4/4) clayey sand (SC)	0	55	45	28	9
		Light yellowish-brown (10 yr 6/4) (SW-SM) gravelly, silty sand	35	55	10	NP	NP
	20						
9		Very pale brown (10 yr 7/4) sand (SW)	1	95	4	NP	NP
	30						
5	40	Light yellowish-brown (10 yr 6/4) gravelly silty sand (SM)	18	69	13	NP	NP
	50						
	60						
	70						
	80						
	90						

(Continued)

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Boring Number S-83-1151
Surface Elevation 890.75
Job Number 4910
Sheet 3 of 3

P.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
		100						
		110	Light yellowish-brown (10 yr 6/4) gravelly silty sand (SM)					
		120						
		130						
		140						
		150	End of Boring					
		160						
		170						

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. S-85-1152A

Surface Elevation

Job No. C 12228

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	▼	▼	N	Depth		qu	W	LL	PL	D
					10	See Log of Boring S-85-1152B for Soil Descriptions					
					20	10' Protective Casing					
					30	Earth Drill to 55' with Rock Bit					
					40						
					50						
					60	End Boring at 55'					
					70						
					80						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 9/26/85 Complete 9/26/85

Crew Chief LS Rig 9110

Drilling Method

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No: S-85-11528
Surface Elevation:
Job No: C 12228
Sheet: 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						0-10" Dark CLAY SILT (Moved 1' & Pushed Shelby Tube from 2-4')					
1	SS	18"	M	5	5	Lean, Brown Silty CLAY with Some Sand Seams					
						Advanced to 10' with Auger Pushed 6" Protective Casing					
2	SS	12"	M	32	10	Medium to Coarse SAND, Little Gravel, Trace Silt & Clay (SP)					
3	SS	8"	M	18	15						
4	SS	9"	M	47	20						
5	SS	8"	M	48	25						
6	SS	8"	M	51	30						
7	SS	15"	M	55	35						
8	SS	12"	M	100/4"	40						
9	SS	14"	M	42	45	(Stratified with Gravel Seams to Depth of 45')					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No.: S-85-11528

Surface Elevation:

Job No.: C 12228

Sheet: 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q_u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Medium to Coarse SAND, Little Gravel, Trace Silt & Clay (SP)					
10	SS	12"	W	51	50	Dense, Brown Fine to Medium SAND with Trace Silt and Clay (SP)					
11	SS	14"	W	58	55						
12	SS	10"	W	100/5"	60						
13	SS	10"	W	63	65						
14	SS	10"	W	42	70						
15	SS	10"	W	100/5"	75						
					80	End Boring at 75'					
					85						

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave in

GENERAL NOTES

Start 9/24/85 Complete 9/23/85

Crew Chief LS Rig 9110

Drilling Method

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. S-85-1153
Surface Elevation
Job No. C 12228
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture								
No.	Type	▼	▼	N	Depth		qu	W	LL	PL	D
						0-10" Dark Brown Sandy SILT					
1	SS	10"	M	9		Stiff Brown Lean CLAY, Trace Sand (Pushed 3" Shelby Tube, 3-4.5' and Bent by Cobbles					
2	SS	17"	M		5	Silty SAND at 4.5' with Little Gravel and Cobbles					
3	SS	10"	M	54	10	Drilled to 10' with Auger and Placed 6" Protective Casing					
4	SS	8"	M	37	15	White Fine to Medium SAND, Trace Gravel, Trace Silt and Clay (SP)					
5	SS	9"	M	42	20	Medium to Coarse SAND, Some Gravel, Little Silt and Clay (SW-SM)					
6	SS	6"	M	38	25						
7	SS	12"	M	45	30						
8	SS	12"	M	66	35						
9	SS	14"	M	94	40	(9/17/85 Drilling mud 13.6' from Ground Surface) Dense, Light Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
10	SS	18"	M	144	45						

(Continued)

W-3

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

S-85-1153

Surface Elevation:

Job No: C 12228

Sheet: 2 of 4

1409 EMIL STREET · P.O. BOX 9538, MADISON, WIS. 53715 · TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery	Moisture				q_u	W	LL	PL	D
No.	Type	▼	▼	N	Depth						
						Dense, Light Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
11	SS	12"	M	100/10"	50						
						Dense, Light Brown Fine to Medium Silty SAND (SM)					
12	SS	12"	M	100/11"	55						
13	SS	8"	M	100/11"	60						
14	SS	12"	M	100/11"	65	Some Gravel					
						Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
15	SS	8"	M	100/8"	70						
16	SS	5"	M	100/7"	75						
						Well-Graded SAND, Some Gravel, Little Silt & Clay (SW-SM)					
17	SS	4"	M	100/5"	80						
18	SS	3"	M	100/4"	85						
19	SS	4"	M	100/8"	90						

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No. S-85-1153
Surface Elevation
Job No. C 12228
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
						*					
20	SS	6"	M	100/9"	95	Fine to Medium SAND, Little Gravel, Little Silt & Clay (SP-SM)					
21	SS	5"	M	100/7"	100	(9/18/85 Drilling Mud 26.6' from Ground Surface)					
22	SS	6"	M	100/8"	105						
23	SS	4"	M	100/8"	110						
24	SS	6"	M	100/4"	115	Dense, Brown Fine to Medium SAND, Little Silt and Clay					
25	SS	4"	M	100/8"	120						
26	SS	5"	M	100/8"	125						
27	SS	5"	W	100/10"	130	Very Dense, Brown, Well-Graded SAND & GRAVEL, Little Silt and Clay (SW-SM)					
28	SS	6"	W	100/8"	135	Appears Saturated (9/19/85 Drilling Mud at 26.4' from ground surface)					

(Continued)

WARZYN ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Boring No: S-85-1153
Surface Elevation:
Job No.: C 12228
Sheet: 4 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
					140	Very Dense, Brown, Well-Graded SAND & GRAVEL, Little Silt and Clay (SW-SM) (Changed Bits from 5 7/8" to 9 1/4")					
29	SS	1"	W	100/4"							
						Very Hard Drilling Cuttings Indicate Mostly QUARTZITE					
30	SS	0"		100/0"							
					145	End Boring at 143.0'					
						(Reamed Hole to 143.0' with 5 7/8" Bit)					
					150						
					155						
					160						
					165						
					170						
					175						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling
Depth to Water
Depth to Cave In

GENERAL NOTES

Start 9/16/85 Complete 9/19/85
Crew Chief LS Rig 9110
Drilling Method

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