U-007-303.44

4820

PROJECT SPECIFIC PLAN FOR THE ROUTINE GROUNDWATER MONITORING PROGRAM ALONG THE DOWNGRADIENT BOUNDARY OF THE FEMP REVISION 1 OCTOBER 1993

10/01/93

DOE-FN/EPA
500
WORK PLAN

GAP IN PAGE NUMBERING
289-299

48 20

PROJECT SPECIFIC PLAN

for the

ROUTINE GROUNDWATER MONITORING PROGRAM

ALONG THE DOWNGRADIENT BOUNDARY OF THE FEMP

Revision 1
October 1993

WBS No. 50.03.20

Prepared by

Fernald Environmental Restoration Management Corporation

Prepared for

U.S. Department of Energy
Fernald Field Office

Under Contract DE-AC05-92OR21972

48 20

PROJECT SPECIFIC PLAN

for the

ROUTINE GROUNDWATER MONITORING PROGRAM

ALONG THE DOWNGRADIENT BOUNDARY OF THE FEMP

Revision 1
October 1993

WBS No. 50.03.20

Prepared by

Fernald Environmental Restoration Management Corporation

Prepared for

U.S. Department of Energy
Fernald Field Office

Under Contract DE-AC05-92OR21972

TABLE OF CONTENTS

	Page
List of Tables	ii
List of Figures	ii
1.0 INTRODUCTION	1
2.0 PREVIOUS RCRA INVESTIGATIONS	1
3.0 ROUTINE GROUNDWATER SAMPLING PROGRAM	3
3.1 WELL SELECTION	3
3.2 SAMPLING METHODOLOGY	4
3.3 ANALYTICAL PARAMETERS	4
3.4 SAMPLING PROCEDURES	8
3.5 REPORTING REQUIREMENTS	8
3.5.1 RCRA Annual Report	8
3.5.2 Removal Site Evaluation/Removal Action Process	9
3.6 FULFILLING RCRA REQUIREMENTS	9
3.6.1 Plan Objective Summary	14
4.0 ORGANIZATION AND RESPONSIBILITIES	15
4.1 FIELD ACTIVITIES	15
4.2 HEALTH AND SAFETY	15
4.3 QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)	15
5.0 HEALTH AND SAFETY CONSIDERATIONS	15
5.1 TASK SPECIFIC PLANS	16
5.2 RADIOLOGICAL MONITORING AND CONTROLS	17
5.3 NONRADIOLOGICAL MONITORING AND CONTROLS	17
6.0 QUALITY ASSURANCE AND QUALITY CONTROL	18
6.1 FIELD AND LABORATORY QUALITY CONTROL SAMPLES	18
6.2 TRAINING, RECORDS ADMINISTRATION, AND DOCUMENT CONTROL	18
7.0 FIELD ACTIVITY GUIDELINES	18
7.1 FIELD ACTIVITIES	19
7.2 FIELD ACTIVITY PROCEDURES	19
7.3 WASTE DISPOSITION	19
7.3.1 Purge Water and Decontamination Solutions	19
7.3.2 Contact Wastes	20
8.0 FIELD SAMPLING PLAN	20
8.1 SAMPLE TEAM ORGANIZATION	20
8.1.1 Organizational Structure	20
8.1.2 Responsibilities of Team Members	20
8.1.3 Sampling Schedule	21
APPENDIX A DOE Letter to OEPA Requesting an Alternate Monitoring Program	A-1
APPENDIX B Director's Final Findings and Orders (DFOs)	B-1
APPENDIX C Monitoring Well Boring Logs and Construction Information	C-1
APPENDIX D Data Quality Objective Flowsheet	D-1

48 20

2

LIST OF TABLES

Table	Title	Page
3-1	Routine Groundwater Monitoring Well Numbers	6
3-2	Target Analyte List	7
3-3	RCRA Monitoring Regulations	10
3-4	Summary of Objectives for Routine Groundwater Monitoring	14
7-1	Groundwater Sampling Procedures	19

LIST OF FIGURES

Figure		
3-1	Routine Groundwater Monitoring Locations	5

1.0 INTRODUCTION

CERCLA/RCRA Unit 5 (CRU5) has developed this Project Specific Plan (PSP) as a means to integrate the RCRA routine groundwater monitoring requirements with CERCLA RI/FS activities at the Fernald Environmental Management Project (FEMP). The data acquired from the routine groundwater monitoring program at the downgradient boundary of the facility will be used to provide on-going monitoring of the impact of the FEMP operations on groundwater quality in the Great Miami Aquifer. This PSP has been developed under the specifications of the FEMP Sitewide CERCLA Quality Assurance Project Plan (SCQ), and all field operations and data handling procedures will be consistent with the specifications in the FEMP SCQ.

The FEMP's alternate RCRA groundwater monitoring strategy consists of those portions of the CERCLA RI Work Plan and its Addenda that pertain to groundwater, as well as the activities described in this PSP for continuing routine groundwater monitoring along the FEMP downgradient boundary. The routine groundwater monitoring includes quarterly sampling of 33 monitoring wells screened in the Great Miami Aquifer for a list of site-specific parameters. This PSP has been prepared exclusively for the routine monitoring of the downgradient boundary of the FEMP.

2.0 PREVIOUS RCRA INVESTIGATIONS

In accordance with the requirements of OAC 3745-65-93 (D)(2)/40 CFR 265.90 through 93 (d)(2), an Interim Status Detection Monitoring Program was initiated at Waste Pit No. 4 in August 1985. The Interim Status Detection Monitoring Program included quarterly monitoring for one year of wells upgradient and downgradient of the regulated unit for general water quality, drinking water suitability, and indicator parameters as specifically defined in OAC 3745-65-92/40 CFR 265.92.

Water quality samples were collected from 41 detection monitoring wells during six rounds of sampling. A statistical analysis that compared upgradient to downgradient monitoring well indicator parameter results was completed following Round 5. In general, the water quality data collected under this program indicated the following:

- Water quality is degraded with respect to sulfate and nitrates in the Great Miami Aquifer beneath the FEMP Waste Pit Area.
- No pesticides/herbicides were detected in any of the wells sampled.

- Volatile organic compounds were detected consistently in only two monitoring wells (MW-15s and MW-19tp). Concentrations of organic compounds identified in these monitoring wells ranged from less than one part per billion (ppb) to less than 30 ppb.

A detailed discussion of the RCRA Detection Monitoring Program may be found in the RCRA Groundwater Monitoring Report, Volume 6 - Round 6 Sampling (March 1988).

In accordance with OAC 3745-65-93(D)(1), the United States Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (OEPA) were notified on November 13, 1987, that Waste Pit No. 4 may be affecting groundwater quality in the Waste Pit Area. This notification was based upon the statistical comparisons completed as part of the Interim Status Detection Monitoring Program implemented in the vicinity of Waste Pit No. 4. On November 25, 1987, a FEMP RCRA Groundwater Quality Assessment Program Plan (GQAPP) for Waste Pit No. 4 was submitted to the U.S. EPA and OEPA. This plan stated that the Assessment Monitoring Program could be most efficiently accomplished as part of the on-going sitewide RI/FS at the FEMP. Assessment sampling was initiated in May 1988.

In response to comments from U.S. EPA and to keep pace with progressive activities and findings made under the Assessment Monitoring Program, a revised GQAPP was submitted to the U.S. EPA and OEPA on March 23, 1989. The GQAPP was revised in 1991 to include comments received from the U.S. EPA on Revision 1 and was submitted in April 1991. Revision 2 of the GQAPP included an expanded monitoring well program, more detailed sampling procedures, and objectives and statistical procedures. The results of the RCRA Assessment Monitoring Program are summarized in the 1989, 1990, 1991, and 1992 RCRA Annual Reports.

In an effort to integrate the requirement to provide groundwater monitoring for RCRA regulated units with current CERCLA response activities at the FEMP, the RCRA Groundwater Monitoring Plan (GMP) was prepared in December 1991. Waste Management Areas (WMAs) were designated to most efficiently utilize existing wells, and to provide monitoring for the most highly contaminated areas of the facility. A WMA is defined in OAC 3745-65-91(B)(2)/40 CFR 265.91(b)(2) as an area within an imaginary boundary that circumscribes several waste management units. The Waste Pit Area and the Production Area were designated as WMAs because of the large number of Hazardous Waste Management Units (HWMUs) and Solid Waste Management Units (SWMUs) within them.

The RCRA GMP was designed to monitor for site-specific parameters at the boundary of the WMAs and at the facility boundary. Sampling was to occur quarterly for site-specific parameters during the months of January, April, July, and October each year. The objectives of the Assessment Monitoring Program (OAC 3745-65-93(D)(7)(a)/40 CFR 265.93(d)(7)(i)) were to be addressed through implementation of the RCRA GMP. As work under the GMP progressed, however, it became clear that achievement of all substantive requirements of Subpart F, as provided in the GMP, was not possible.

To resolve the RCRA groundwater monitoring issues at the FEMP, the DOE proposed an alternate groundwater monitoring program based on OAC 3745-65-90(D). The FEMP proposed this alternate program in a letter to the OEPA on May 12, 1993 (DOE-1946-93); the letter is provided in Appendix A. The proposed program consists of the groundwater characterization activities in the OU5 CERCLA RI Work Plan and its Addenda. In addition, the DOE proposed to continue quarterly monitoring of the downgradient property boundary line wells as a means of assessing releases from the FEMP during the RI/FS process. The nature and extent of contamination migration will be reported in the CERCLA documents in accordance with the schedules specified in the 1991 U.S. EPA/DOE Consent Agreement. The results of the quarterly property boundary monitoring will be reported annually in accordance with OAC 3745-65-94. This PSP has been prepared and revised according to Ohio EPA Director's Final Findings and Orders (DFO) to document the routine groundwater monitoring that is performed at the facility boundary. A copy of the DFO is provided in Appendix B.

3.0 ROUTINE GROUNDWATER SAMPLING PROGRAM

Thirty-three monitoring wells are sampled as part of the routine groundwater monitoring program at the facility boundary, including all of the monitoring wells installed for the downgradient facility boundary monitoring network defined in the RCRA GMP (Revision 1, December 1992).

3.1 WELL SELECTION

The routine monitoring wells were selected to provide comprehensive coverage of the downgradient facility boundary. The monitoring well clusters were installed at 14 cluster locations along the downgradient FEMP boundary to monitor the upper, middle, and lower zones of the Great Miami Aquifer. In the north-eastern most portion of the site only Monitoring Well 2754 was installed

because of the shallow depth to bedrock. Monitoring Well 2754 is screened above the normally saturated portion of the Great Miami Aquifer and may contain groundwater only when the water table is high. Two of the original monitoring wells, 3425 and 4425, were plugged and abandoned due to grout contamination and have since been replaced with monitoring wells 31217 and 41217.

Figure 3-1 shows the 14 cluster locations and associated well numbers. A listing of the well numbers is provided in Table 3-1. The boring logs and construction information along with plugging and abandonment records for the monitoring wells are provided in Appendix C.

3.2 SAMPLING METHODOLOGY

Samples were collected on a quarterly basis, beginning with July 1993. The fourth quarter 1993 sampling was conducted in September to coincide with the September 14-15 Comprehensive Monitoring Evaluation. Beginning in 1994, future sampling will proceed on a January, April, July, and October schedule. All wells will normally be sampled within a one week time period and will not exceed two weeks. All sampling will be conducted in accordance with SCQ procedures as specified in Section 6.2 "Collection of Aqueous Samples" and Appendix K "Sampling Methods."

Quality Assurance/Quality Control (QA/QC) samples will be collected in accordance with SCQ Appendix K criteria. The QA/QC samples will include field blanks, trip blanks, field duplicates, and rinsate samples. Field duplicates will be collected at a frequency of 1 per 10 sampling events, while at least one trip blank will accompany each sample shipment to the laboratory. Rinsate samples will be collected at a frequency of 1 per 20 decontamination operations of sampling equipment. Field blanks will be collected at a rate of 1 in 20 samples.

3.3 ANALYTICAL PARAMETERS

Data Quality Objectives (DQOs) for this plan have been developed using a Data Quality Objective (DQO) flowsheet. The DQO flowsheet is provided in Appendix D. To support the DQOs, an Analytical Support Level (ASL) of C was chosen for all laboratory analyses from this program. Ten percent of the analytical results will have an ASL of D. The target analyte list (TAL) is provided in Table 3-2. The TAL covers a wide range of site-specific parameters including volatiles, radionuclides, and general water quality parameters. The TAL includes the parameters listed in: Groundwater Quality Parameters (OAC 3745-65-92(B)(2)/40 CFR 265.92(b)(2)); Groundwater Contamination Parameters (OAC 3745-65-92(B)(3)/40 CFR 265.92(b)(3)); Parameters Characterizing

48 20

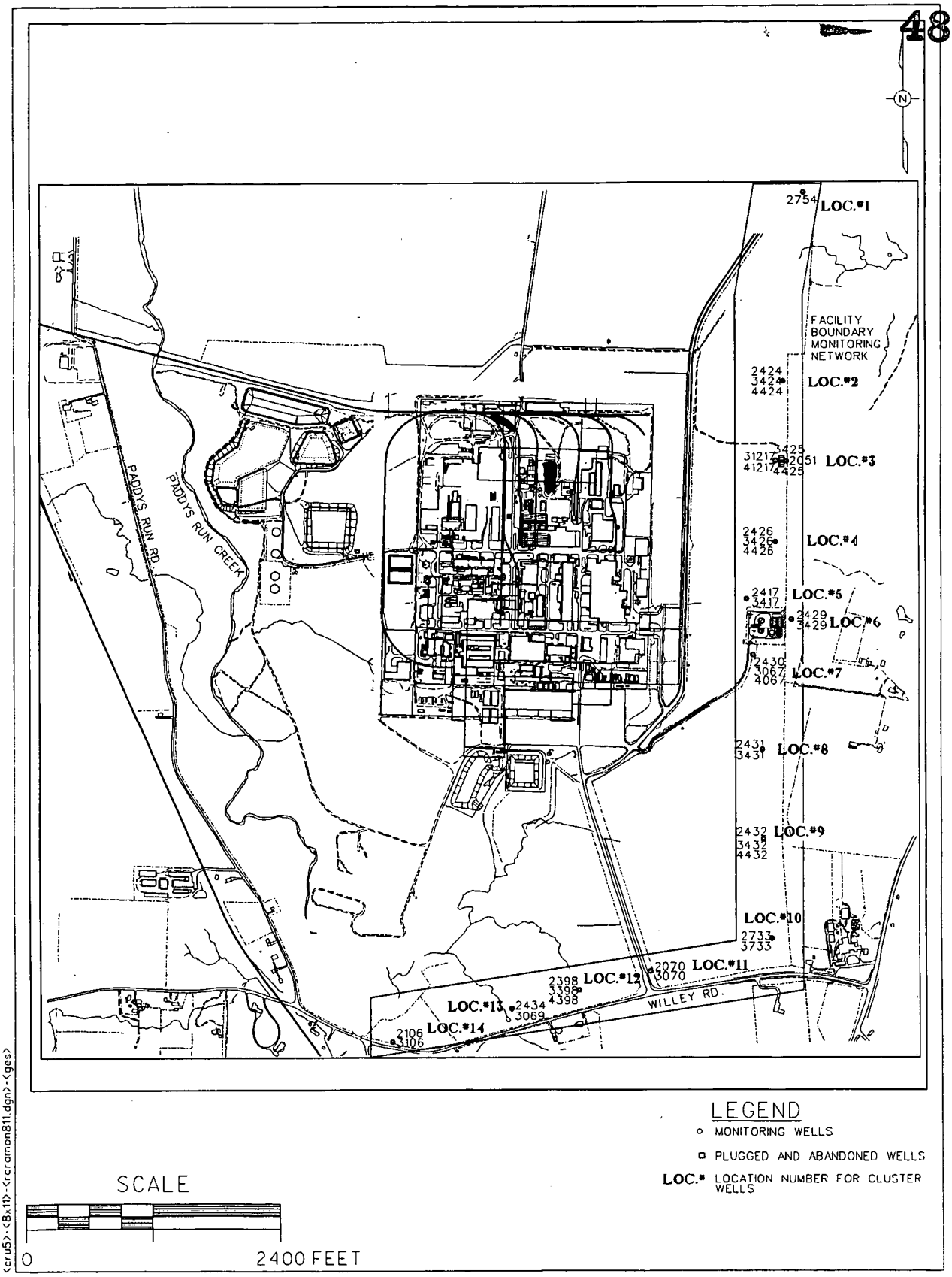


FIGURE 3-1
ROUTINE GROUNDWATER MONITORING LOCATIONS

TABLE 3-1
ROUTINE GROUNDWATER MONITORING WELL NUMBERS

Location	2000 Series Wells	3000 Series Wells	4000 Series Wells
1	2754		
2	2424	3424	4424
3	2051	*3425, 31217	*4425, 41217
4	2426	3426	4426
5	2417	3417	
6	2429	3429	
7	2430	3067	4067
8	2431	3431	
9	2432	3432	4432
10	2733	3733	
11	2070	3070	
12	2398	3398	4398
13	2434	3069	
14	2106	3106	

* Plugged and abandoned

4820

TABLE 3-2
TARGET ANALYTE LIST

Inorganics:

Aluminum	Antimony	Arsenic
Barium	Beryllium	Cadmium
Calcium	Chromium	Cobalt
Copper	Cyanide	Iron
Lead	Magnesium	Manganese
Mercury	Nickel	Potassium
Selenium	Silver	Sodium
Thallium	Vanadium	Zinc

General Chemistry:

Alkalinity	Ammonia	Chloride
Fluoride	Nitrate	pH
Phenols	Phosphorous (total)	Specific conductance
Sulfate	Temperature	Total Organic Carbon (TOC)
Total Organic Halogens (TOX)	Total Organic Nitrogen (TON)	

Volatile Organics:

1,1-Dichloroethane	1,1-Dichloroethene
1,1,1-Trichloroethane	1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane	1,2-Dichloroethane
1,2-Dichloroethene	1,2-Dichloropropane
2-Butanone	2-Hexanone
4-Methyl-2-Pentanone	Acetone
Benzene	Bromodichloromethane
Bromoform	Bromomethane
Carbon disulfide	Carbon tetrachloride
Chlorobenzene	Chloroethane
Chloroform	Chloromethane
cis-1,3-Dichloropropene	Dibromochloromethane
Ethylbenzene	Methylene chloride
Styrene	Tetrachloroethene
Toluene	Total xylenes
trans-1,3-Dichloropropene	Trichloroethene
Vinyl acetate	Vinyl chloride

Radiological:

Gross Alpha	Gross Beta	Radium 226
Radium-228	Technetium-99	Thorium-228
Thorium-230	Thorium-232	*Total Thorium
Total Uranium	Uranium-234	Uranium-235/236
Uranium-238		

*Total Thorium Calculated

the Suitability of Groundwater as a Drinking Water Supply (OAC 3745-81-11(B)/40 CFR 141.11(b)); and Site-Specific Parameters. Non-filtered samples will be collected for analysis of inorganic and radiological parameters. Non-filtered samples were chosen so that the data are conservative and so the analytical results could be used in the risk assessment if necessary. 48 20

3.4 SAMPLING PROCEDURES

The wells will be purged and sampled using sampling procedures specified in SCQ Section 6.2. All analyses will be conducted by the appropriate FEMP or contracted laboratory using procedures which meet the standards for these analytical support levels as established in the SCQ.

3.5 REPORTING REQUIREMENTS

The CRU5 Environmental Group is responsible for generating the RCRA Annual Report for groundwater data.

3.5.1 RCRA Annual Report

The analytical data collected for this PSP will be reported to the OEPA by March 1 of each year as part of the RCRA Annual Report to fulfill the supplementary groundwater section reporting requirements.

The RCRA Annual Report will contain the following items:

- Groundwater Elevation Measurements
- RCRA Groundwater Analytical Results
- CERCLA/RCRA Units Groundwater Activities Update

Groundwater Elevation measurements will be provided both in hydrograph format and as contour maps. Hydrographs will be provided for the 33 downgradient boundary monitoring wells, and groundwater elevation contour maps will be provided for the RCRA quarterly sampling months. RCRA analytical results will be provided in table format and in concentration versus time plots. Concentration versus time plots of the 33 boundary wells will be supplied for Total Uranium, Sulfate, and Specific Conductance. For the first year of reporting on these 33 boundary wells, volatile organics above detection will be listed in a table and concentration versus time plots will be provided where there is sufficient data. If additional parameters of concern are identified in the first year, reporting and concentration versus time plots will be provided for the following year.

48 2 U

3.5.2 Removal Site Evaluation/Removal Action Process

As required in Order number 2(d) of the DFO, upon receiving analytical results for the Routine Sampling Monitoring Wells, a review will be performed to determine whether sample results indicate a potential risk to human health or the environment. In the case of a parameter indicating a potential risk, the OEPA FEMP Site Coordinator will be verbally notified within 48 hours of the determination. The suspect monitoring well will be re-sampled to confirm the elevated results. If elevated results are confirmed, the OEPA FEMP Site Coordinator will be verbally notified within a 48-hour period and a Removal Site Evaluation (RSE) will be initiated. The Director of the OEPA will be notified in writing within a five-day period of the RSE initiation. The RSE will be completed consistent with 40 CFR 300.410 of the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The RSE will be conducted to determine if a Removal Action is necessary. Additional work will be determined through consultation between the U.S. EPA, OEPA, DOE and FERMCO.

3.6 FULFILLING RCRA REQUIREMENTS

The primary objective of the Alternative Monitoring Plan is to fulfill RCRA monitoring regulations. These regulations, however, will not be met by the standard RCRA Monitoring Program. The Alternative Program deviates from the typical Subpart F program in two ways:

- Individual monitoring for each Hazardous Waste Management Unit is not provided. The CERCLA process will ensure characterization and remediation of the entire site; thus, CERCLA groundwater characterization efforts will determine the sitewide nature, rate, and extent of contamination. In addition, the routine quarterly sampling defined in this PSP will serve to monitor contamination exiting the facility boundaries.

- The RI report will define the nature, rate, and extent of migration sufficient to select a remedy; however, this determination will not be made on an annual basis as required by RCRA Subpart F regulations.

Table 3-3 identifies exactly how RCRA monitoring regulation will be met.

TABLE 3-3
RCRA MONITORING REGULATIONS

Regulatory Code	Regulatory Summary	FEMP compliance	Comments:
3745-65-90(A)	Implement groundwater monitoring	Yes	A RCRA Detection Monitoring Program was initiated in 1985 for Waste Pit 4, the only identified regulated unit at that time. A CERCLA RI/FS began monitoring groundwater sitewide in 1988.
3745-65-90(B)	Ensure groundwater monitoring complies with 3745-65-92 through 94	Yes (where applicable)	See following itemized list of rules.
3745-65-90(C)	Waiver of groundwater monitoring	N/A	The FEMP is not applying for a waiver.
3745-65-90(D)	Alternate groundwater monitoring system	Yes	The FEMP applied for an alternate monitoring system as defined in 3745-65-90 (D).
3745-65-90(E)	Waiver of groundwater monitoring due to neutralization of waste in surface impoundments	N/A	The FEMP is not applying for this waiver.
3745-65-91(A)(1)	Upgradient groundwater monitoring	Yes	The CERCLA RI/FS has defined upgradient monitoring wells in the uppermost aquifer that are not affected by the facility. The RI is responsible for determining background groundwater quality, and has submitted a background water quality report. The upgradient wells will not be monitored as part of the routine program.

1-48 20

13

TABLE 3-3
RCRA MONITORING REGULATIONS (continued)

Regulatory Code	Regulatory Summary	FEMP compliance	Comments:
3745-65-91(A)(2)	Downgradient groundwater monitoring	Yes	The RI/FS used over 400 groundwater monitoring wells to characterize groundwater quality at the FEMP. In addition, monitoring wells have been installed along the downgradient boundaries of the facility and will be monitored on a quarterly basis.
3745-65-91(B)(1)	Single landfill site	N/A	The FEMP has more than one regulated unit.
3745-65-91(B)(2)	Multiple waste management units	Yes	The property boundary monitoring wells are downgradient of all waste management units on-site.
3745-65-91(C)	Monitoring wells must be properly constructed	Yes	The RI/FS Work Plan and its addenda follow the monitoring well installation practices identified in this regulation.
3745-65-92(A)	Groundwater Sampling and Analysis Plan	Yes	The RI/FS Work Plan and its addenda, and the Routine Monitoring Plan serve as the sampling and analysis plan.
3745-65-92(B)	Analytical parameter suit	No	The parameter list proposed for routine monitoring is defined in the RI/FS Work Plan addendum, Routine Groundwater Monitoring Program Along the Downgradient Boundary of the FEMP. The parameter list has been defined by previous RCRA monitoring programs and historical groundwater data.
3745-65-92(C)	Establish detection monitoring background and indicator parameters	N/A	The FEMP is in assessment monitoring.
3745-65-92(D)	Routine detection monitoring frequency	N/A	The FEMP is in assessment monitoring.

48 20

14

TABLE 3-3
RCRA MONITORING REGULATIONS (continued)

Regulatory Code	Regulatory Summary	FEMP compliance	Comments:
3745-65-92(E)	Groundwater elevation measurements	Yes	The RI/FS Work Plan and its addenda and the Routine Groundwater Monitoring Plan require water level measurements prior to sampling.
3745-65-93(A)	Outline of groundwater quality assessment program	N/A	The FEMP submitted an assessment monitoring plan outline while in detection monitoring.
3745-65-93(B)	Initial comparisons of indicator parameters	N/A	The FEMP is in assessment monitoring.
3745-65-93(C)	Identification of significant increase in indicator parameters	N/A	The FEMP is in assessment monitoring.
3745-65-93(D)(1)	Notification to Director	Yes	The FEMP has documented groundwater contamination.
3745-65-93(D)(2)	Submittal of Groundwater Quality Assessment Program Plan	Yes	The RI/FS Work Plan and its addenda and the Routine Groundwater Monitoring Plan serve as the Groundwater Quality Assessment Program Plan.
3745-65-93(D)(3)	Groundwater Quality Assessment Program Plan Contents	Yes	The RI/FS Work Plan and its addenda plus the Routine Monitoring Plan contain all of the required information except 3745-65-93(D)(3)(b), the detection monitoring program description.
3745-65-93(D)(4)	Implement Groundwater Quality Assessment Program Plan to determine rate and extent of migration	Yes	The RI/FS Work Plan and its addenda are responsible for determining sitewide rate and extent of groundwater contamination.
3745-65-93(D)(5)	Assessment Report	Yes	The CERCLA RI report submittal will serve as the groundwater quality assessment report.
3745-65-93(D)(6)	Reinstatement of detection monitoring	N/A	The FEMP is not applying for reinstatement of its detection monitoring program.

48 20

TABLE 3-3
RCRA MONITORING REGULATIONS (continued)

Regulatory Code	Regulatory Summary	FEMP compliance	Comments:
3745-65-93(D)(7)	Quarterly assessment monitoring	Yes	Routine quarterly monitoring will be performed at the downgradient boundary of the facility as defined in the RI/FS Work Plan addendum, Routine Groundwater Monitoring Program Along the Downgradient Boundary of the FEMP.
3745-65-93(E)	Assessments prior to closure should be reported	N/A	See comment for 3745-65-93(D)(5).
3745-65-93(F)	Evaluation of potentiometric surface	Yes	The RI report will include an evaluation of the potentiometric surface as will the RCRA Annual Report.
3745-65-94(A)(1)	Record keeping for detection monitoring	N/A	The FEMP is in assessment monitoring.
3745-65-94(A)(2)	Detection monitoring reporting	N/A	The FEMP is in assessment monitoring.
3745-65-94(B)(1)	Record keeping for assessment monitoring	Yes	All analysis and associated surface elevations are retained on-site.
3745-65-94(B)(2)	Assessment monitoring reporting	No	An annual report will be submitted that contains analytical data from the Routine Groundwater Monitoring Program Along the Downgradient Boundary of the FEMP. The sitewide rate and extent of migration determination will be reported in the CERCLA RI report.

F-482

48 20

3.6.1 Plan Objective Summary

The sampling to be conducted under this PSP is designed to integrate the RCRA routine groundwater monitoring requirements with CERCLA RI/FS activities at the FEMP and to fulfill the groundwater monitoring portion of the Alternate RCRA Monitoring Program proposed to the OEPA. The data acquired from the routine groundwater monitoring program, at the downgradient boundary of the facility, will be used to help determine off-FEMP impacts on groundwater quality caused by the FEMP operations. The summary list of objectives for this PSP is provided in Table 3-4.

TABLE 3-4
SUMMARY OF OBJECTIVES FOR ROUTINE GROUNDWATER MONITORING

Activities	Collect quarterly groundwater quality samples at monitoring well locations along the downgradient property boundary of the FEMP.
Objectives	Provide monitoring at the downgradient boundary of the FEMP to determine if constituents affecting groundwater quality are migrating beyond the boundary of the site.
Prioritized Data Uses	Determine the level of contamination in the Great Miami Aquifer at the downgradient boundary of the facility.
Appropriate Analytical Levels	PID field screening: ASL A; radiological field screening: ASL A; radiological: ASL C; inorganics and VOC: ASL C; general chemistry parameters: ASL C; ten percent of analytical results will have ASL D. Field blanks and rinsate samples are required at a frequency of 1 in 20 for all ASL C analyses. Duplicate samples will be collected at a rate of 1 in 10. At least one trip blank will accompany each sample shipment to the laboratory.
Constituents of Concern	Total and isotopic uranium, total and isotopic thorium, radium-226 and 228, gross alpha, gross beta, metals and VOC, and general chemistry in all groundwater samples.
Level of Concern	Results which are a potential immediate risk to human health or the environment.
Required Detection Limits	Detection levels are specified in SCQ Section 9.
Critical Samples	Groundwater analyses will be used to determine groundwater quality at the FEMP property boundary. The overall sampling program should maintain a 90 percent data recovery. A minimum of two complete samples from each monitoring well per year needs to be obtained to achieve the objectives of the sampling program.

48 2 U

4.0 ORGANIZATION AND RESPONSIBILITIES

This PSP has been developed by the CRU5 Groundwater Programs Manager to fulfill a portion of the RCRA alternate monitoring requirements for the FEMP. The CRU5 Groundwater Programs Manager has full responsibility and authority for the content and specifications in this PSP. Any changes to the activities specified in this PSP must have the approval of the CRU5 Groundwater Programs Manager prior to implementation. It is the responsibility of the CRU5 Groundwater Programs Manager to secure any off-FEMP access permits required for the completion of this PSP.

4.1 FIELD ACTIVITIES

Sampling activities are to be conducted by the FEMP Groundwater Monitoring Section using SCQ approved work procedures. Sampling activities include sample handling, preservation, shipment, and notification of laboratories receiving samples. Groundwater sampling will be conducted using the procedures covered in Section 6 and Appendix K of the SCQ. The Groundwater Monitoring Section has full responsibility for the implementation of the groundwater monitoring procedures and the field sampling guidelines in Section 7 of this PSP. In addition, the Groundwater Monitoring Section will assign unique sample identification numbers for all samples collected.

4.2 HEALTH AND SAFETY

The FERMCO Health and Safety Department is responsible for the development, implementation, and monitoring of a site-specific health and safety plan for this PSP. This plan will include specific programs for radiological and nonradiological monitoring and controls as specified by the SCQ and presented in Section 5 "Health and Safety Considerations" of this PSP.

4.3 QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)

The FERMCO QA department will assure that the contents of this PSP conform to the requirements of the SCQ. The FERMCO QC department will monitor field activities to assure that all work conducted in the execution of this PSP conforms to the appropriate standards specified in the SCQ.

5.0 HEALTH AND SAFETY CONSIDERATIONS

Effective health and safety programs for any activity are based on an informative training program. All involved personnel will receive adequate training prior to implementation of the field work for this PSP. This training will make employees aware of all physical, radiological, and chemical hazards which may be encountered during this project.

All FERMCO employees and subcontractor personnel who will be performing field work during this project are required to have completed all applicable Occupational Safety and Health Administration (OSHA)-mandated 1910.120 Hazardous Waste Site Worker training. In addition, personnel must complete all applicable annual refresher training. 48 20

DOE regulations at the FEMP require a series of site-specific training courses. These courses are designed to augment OSHA-required training and provide additional training specific to the hazards which exist at the FEMP. Field personnel participating in the performance of this project will be trained to the SCQ.

5.1 TASK SPECIFIC PLANS

All aspects of this PSP will be performed in accordance with existing applicable DOE, U.S. EPA, OSHA, and the State of Ohio Health and Safety Regulations. Additionally, all activities will be managed in accordance with commonly accepted practices used in the hazardous waste industry.

The routine groundwater monitoring program defined in this PSP has a task-specific health and safety plan, which has been prepared in accordance with the FEMP Site Health and Safety Plan. A health and safety technician will monitor the field crew's activities for the field program presented in this PSP.

Project-specific health and safety plans address the hazards typically encountered by personnel when performing the specified field work. The plans specify proper equipment for health and safety monitoring and personnel protection, and document the criteria used to select monitoring equipment and protective clothing. Each member of a field crew is required to participate in a health and safety training session specific to each field project before beginning the field work.

5.2 RADIOLOGICAL MONITORING AND CONTROLS

Radiological monitoring for this work plan will be achieved using existing institutional controls commonly utilized at the FEMP. For those areas of the FEMP which are under existing institutional radiological controls, any employee who will be entering such areas is required to possess and wear a

thermal luminescent detector (TLD) to monitor for exposure to radiological contamination. In addition, each employee is required to participate in a regularly-scheduled urine analysis program which is designed to monitor for radiological exposure.

For areas which are subject to more restrictive radiological controls where the potential for exposure is greater, Radiation Worker Permits (RWPs) are necessary and will be obtained prior to the field work being performed in those areas. A radiological technician will be assigned to each field crew performing any activities in an area which could be expected or result in site workers being exposed to levels of radiological contamination exceeding DOE requirements.

Ingress and egress of personnel, equipment, and vehicles to and from radiologically-controlled areas will be monitored with "real time" radiation detection instruments. Monitoring results which exceed FEMP-determined exposure guidelines will be further evaluated as to the possible source(s). Measures necessary to remediate radiological contamination sources will be implemented. Such measures may include, but are not limited to, personnel training, decontamination, employee exposure monitoring, increased personnel monitoring, personnel protective equipment, and sampling of suspect materials encountered.

If the responsible radiological technician assigned to the field activities being performed identifies a real or potential condition which could or will result in an unsafe condition, then that person has the responsibility to cease field operations until the unsafe condition has been corrected.

5.3 NONRADIOLOGICAL MONITORING AND CONTROLS

Monitoring of potential health and safety problems associated with nonradiological hazards is conducted by a health and safety technician. Also, all field crews are responsible for hazard awareness and recognition. Task specific training is designed to enhance the performance of all field work using good and safe work practices.

Evaluating the potential for personnel exposure to organic contaminants will be achieved mainly through the use of a photoionization detector. Other equipment which could potentially be used include Drager Tubes, oxygen meters, and combustible gas indicators.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

The primary objectives of the quality assurance and quality control sections of this plan relate to the collection of field information and data which are sufficient to accurately assess current contaminant concentrations in groundwater. To ensure that the information gathered meets data quality objectives, quality control measures will be used to determine conformance with overall CRU5 program objectives.

6.1 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

Field quality control (QC) samples will be taken to evaluate the possibility that some controllable practice, such as decontamination or sampling technique, may be responsible for introducing bias in the project's analytical results. The following types of QC samples will be collected: sampling equipment rinsates, trip blanks, and duplicate samples as outlined in Section 6 and Appendix K of the SCQ.

6.2 TRAINING, RECORDS ADMINISTRATION, AND DOCUMENT CONTROL

All FERMCO employees and subcontractors assigned to this project will be required to participate in a series of regularly-scheduled training sessions. These sessions are intended to enhance the employee's awareness of his or her responsibilities and duties. Field staff will receive comprehensive project and task specific training. Daily project "Tailgate Safety Meetings" will be conducted before the beginning of field work each day to augment health and safety training and reinforce project objectives.

7.0 FIELD ACTIVITY GUIDELINES

This section presents a general description of the sampling activities to be used to fulfill the objectives of this PSP. The goal of these sampling activities is to collect samples representative of groundwater quality. The information derived from the field investigation should suffice to produce a clear understanding of groundwater quality in the Great Miami Aquifer leaving the boundary of the FEMP.

7.1 FIELD ACTIVITIES

All procedures for monitoring well development, sample collection, and shipment will be performed in accordance with directives established in the SCQ.

7.2 FIELD ACTIVITY PROCEDURES

Field activity procedures are listed in Table 7-1. The appropriate field data validation forms from Appendix B of the SCQ must also be completed to assure that the documentation of field activities has been completed correctly.

TABLE 7-1
GROUNDWATER SAMPLING PROCEDURES

Administrative Procedures	Reference Document
Field Procedures	SCQ Section 6.2, Appendix K
Sample Handling Shipment Procedures	SCQ Section 6.7
Decontamination	SCQ Section 6.8

7.3 WASTE DISPOSITION

The following wastes will be generated during characterization activities:

- Purge water
- Contact wastes
- Equipment decontamination solutions

The following subsections provide the proposed disposition methodology for each type of waste generated.

7.3.1 Purge Water and Decontamination Solutions

Groundwater purged from the wells and solutions used to decontaminate equipment used during sampling will be contained and transported to the FEMP for proper disposal. If historic data for a well indicate the purge water is potentially a RCRA waste, the purge water will be drummed at the well and moved to the FEMP's controlled holding area until analytical results are returned indicating the proper method of disposal.

7.3.2 Contact Wastes

Contact wastes such as personal protective equipment (PPE) and rags or wipes (paper towels, Chemwipes, etc.), will be placed in plastic bags or 55-gallon drums and transported to the FEMP for appropriate disposition.

8.0 FIELD SAMPLING PLAN

48 20

Sampling for this project will be performed by the Groundwater Monitoring Section of the FERMCO Environmental Safety and Health Division.

8.1 SAMPLE TEAM ORGANIZATION

Sampling teams will be organized by the Groundwater Monitoring Section according to their requirements for monitoring well sampling.

8.1.1 Organizational Structure

Field sampling crews will be directly supervised by the Groundwater Monitoring Section Field Operations Supervisor. Each field crew will consist of three sampling technicians. Additional sampling custodial staff will interact with the sampling crews and the FEMP or contract laboratory performing the sampling analysis.

8.1.2 Responsibilities of Team Members

The Groundwater Monitoring Section Field Operations Supervisor is responsible for the coordination and effective use of Groundwater Monitoring Section field personnel on site and for proper maintenance of the records of all field activities. In addition, the Groundwater Monitoring Section field coordinator is responsible for field quality control including issuance and tracking of measurement and test equipment.

Field sampling personnel are responsible for the collection of the samples in accordance with the approved PSP. All activities associated with the execution of sampling are to be documented on the appropriate Field Activity Daily Logs (FADLs) which are to be completed by the sampling technicians for each location. The technicians are also responsible for ensuring that the proper sampling equipment is available and in serviceable condition. Also, proper decontamination of equipment between each sampling point is the responsibility of these staff.

Additional sampling custodial staff who interact with the FEMP or contract laboratory are responsible for ensuring that proper sampling containers, preservatives, and sampling coolers are available and in serviceable condition. The sampling custodians are also responsible for sample labeling, handling, storage, and sample-required paperwork, such as a Chain of Custody/Request for Analysis (CC/RFA) Form. These must be completed before the samples are submitted to the appropriate FEMP or

contractor laboratory for analysis. Finally, sampling custodians are responsible for logging in all collected samples, delivering the samples to the FEMP laboratory, or sending the samples with accompanying paperwork to the contract laboratory.

4820

8.1.3 Sampling Schedule

Groundwater sampling activities for this plan were conducted during July and September 1993. Sampling will proceed on a quarterly basis (January, April, July, and October) beginning in 1994. Data from all sampling activities within a calendar year must be available by the first of January in order to meet the submittal deadline to the OEPA for the RCRA Annual Report.

4820

APPENDIX A

DOE Letter to OEPA Requesting an Alternate Monitoring Program

Department of Energy
Fernald Environmental Management Project
P O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6357

48 20

MAY 1 2 1993

DOE-1946-93

Mr. Graham Mitchell and Mr. Paul D. Pardi
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402-2086

Dear Mr. Mitchell and Mr. Pardi:

ALTERNATE APPROACH TO THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING PROGRAM

As requested during the May 7, 1993 meeting between Department of Energy, Fernald Field Office (DOE-FN) and the OEPA in Dayton, the DOE is providing this letter which summarizes the difficulties encountered through efforts to comply with Subpart F requirements and to propose a monitoring program pursuant to OAC 3745-65-90 that will enable groundwater characterization investigations to continue as proposed by the Operable Unit 5 (OU5) Workplan and its Addenda. This alternate monitoring proposal provides an avenue through which the OEPA may apply its Resource Conservation and Recovery Act (RCRA) authority toward activities conducted under this workplan.

The current Groundwater Monitoring Plan (GMP) was negotiated with the Ohio Environmental Protection Agency (OEPA) in order to bring the Fernald Environmental Management Project (FEMP) into compliance with State of Ohio Subpart F Hazardous Waste Rules OAC 3745-65-90 through 94. Three lines of groundwater monitoring wells were proposed at the property boundary, waste pit area, and the production area. Additionally, a till monitoring network with well locations based on results from a till zone hydrogeologic study was proposed to be installed by October 1993. To date, the property boundary line wells have been installed. The waste pit area and production area lines and the till well system have yet to be installed.

As work under the GMP has progressed, it became clear that compliance with all substantive requirements of Subpart F, as provided in the GMP, is impractical. For example, the requirement to immediately determine the rate and extent of contaminant migration cannot be fulfilled due to the complex nature of contamination resulting from many on-site sources. A Remedial Investigation (RI) pursuant to Comprehensive Environmental Response Compensation and Liability Act (CERCLA) has been in progress since 1988 which includes the determination of the nature, rate and extent of contaminant migration in the groundwater. These efforts are both extensive and costly, and could not have been performed within a single year. Additionally, it is anticipated that compliance with the GMP could require rate and extent determinations to progress beyond property boundaries. It is unlikely that FEMP would secure

Recycled and Recyclable

26

property access to complete these investigations within the required one year time frame. Thus, the FEMP could be and has been subject to notices of violation or deficiency for failure to report the full rate and extent of contamination in the following annual report.

Attempts to comply with all substantive requirements of Subpart F have resulted in considerable duplication. Integration of the CERCLA and RCRA field investigations has not been possible since RCRA requires the reporting of investigation results within a one year time frame; whereas, the Remedial Investigation is conducted in accordance with schedules dictated by the Amended Consent Agreement. Thus to maintain RCRA compliance, two field investigations having similar objectives have been carried out in parallel.

The complexity of the investigations required under the Subpart F program have resulted in reporting difficulties. The FEMP's attempts at fulfilling the requirements of the annual report have resulted in the submittal of lengthy, detailed documents that do not fully describe the rate and extent of contaminant migration. As a result, the FEMP has received violations. The RCRA Annual Report is frequently over one thousand pages with appendices. A significant effort and cost is expended to collect, manage, and assess data for this report, yet much of the effort is duplicative to what is concurrently being performed as part of the RI.

Finally, the FEMP data base is incapable of producing data in the newly required Subpart F format for annual reports. Over 100,000 records stored in three separate databases must be joined and reconfigured to supply site data in the new RCRA format. Revising the database for Subpart F reporting would be very costly, and would not provide any additional environmental benefit.

The requirements of Subpart F, although applicable to the regulated waste management units, are inappropriate to the FEMP. The inappropriateness lies in the complex nature of FEMP's waste units and related contamination. Because the units are old and constructed without currently required environmental safeguards, the resulting contaminant plumes are intermingled, complex, and more extensive than those that would exist at newer, appropriately constructed facilities. This situation warrants a complex, time-consuming analysis of the behavior and effects of the hazardous waste constituents in the soil and ground water, which is the function of the CERCLA process at the facility. The original intent of Subpart F was specifically to avoid such complex analyses of environmental impacts and to allow for immediate release detection and rapid corrective action. Attempts to meet the substantive requirements of Subpart F result in competition with the CERCLA RI process for monetary and technical resources which are intended to attain the same goal.

The wells proposed in the GMP, excluding those at the property line, will not provide data critical to select or implement a corrective action, and therefore, do not successfully provide an integrated CERCLA/RCRA monitoring system. A great deal of groundwater data have been obtained in previous years, including metals, organic and radiological parameters. These data have been reported to the OEPA in previous RCRA Annual Reports, and through recent Technical Integration Exchange (TIE) meetings. In addition, a "snapshot" sampling event including nearly all FEMP monitoring wells, will be completed within the next two weeks. The analyses will include HSL inorganics,

organics, total and isotopic uranium, isotopic radium, thorium, and general water quality parameters. This sampling event, in addition to previously collected data, will provide sufficient information to complete the OU5 Remedial Investigation Report. Continual monitoring as proposed in the GMP will not yield data in time to be incorporated into the OU5 RI, and is not critical to remedy selection; therefore, no negative environmental impact will result by discontinuing GMP activities. On the contrary, further implementation of the GMP will compete with resources which could be dedicated to corrective action activities.

To resolve the lack of integration between the RCRA GMP and the CERCLA investigative process, DOE proposes an alternate ground water monitoring program as allowed through OAC 3745-65-90(D). This proposed program consists of the Operable Unit 5 Workplan and its Addenda, which set forth a program for characterization of the nature, rate and extent of contaminant migration sufficient to select an appropriate remedial alternative. In addition, the DOE proposes to continue quarterly monitoring of the property boundary line wells as a means of continually assessing the magnitude of off-site releases from the FEMP. The results of the quarterly monitoring will be reported by March 1 of each calendar year. The proposed approach will facilitate a complete integration of the FEMP's RCRA and CERCLA groundwater investigation and monitoring obligations by providing a mechanism through which Ohio's RCRA authority may be manifested through the CERCLA activities.

The cost savings from using the above approach to Subpart F monitoring amounts to approximately five million dollars during 1993/1994 and approximately three million dollars per year during each following year. The cost savings from implementation of this proposed integration will be used to accelerate the corrective action programs agreed upon by U.S. EPA, Ohio EPA, and DOE.

The remainder of the GMP monitoring wells are scheduled for installation June 1, 1993. To avoid the unnecessary installation of these wells, DOE requests further discussion and resolution of this issue. Kathleen Nickel will be in contact to schedule a mutually agreeable meeting date.

If you or your staff have any questions, please contact Ms. Nickel at (513) 648-3166.

Sincerely,

Tom Rowland

Thomas J. Rowland
Acting Manager

FN:Nickel

cc:

J. J. Fiore, EM-42, TREV
K. A. Hayes, EM-424, TREV
J. Kwasniewski, OEPA-Columbus
P. Harris, OEPA-Dayton

M. Proffitt, OEPA-Dayton
T. Schneider, OEPA-Dayton
J. Michaels, PRC
L. August, GeoTrans
R. L. Glenn, Parsons
P. Clay, FERMCO/19
K. Alkema, FERMCO/65-2
J. W. Thiesing, FERMCO
AR Coordinator, FERMCO

4820

48 20

APPENDIX B

Director's Final Findings and Orders

-3 20

Issue Date: SEP 1 0 1993

Effective Date: SEP 1 0 1993

BEFORE THE
OHIO ENVIRONMENTAL PROTECTION AGENCY

In the Matter of:

U.S. Department of Energy Fernald Environmental Management Project P.O. Box 389705 Cincinnati, Ohio 45239	: : :	**Director's Final Findings and Orders**

PREAMBLE

It is hereby agreed by and among the parties hereto as follows:

I. JURISDICTION

These Director's Final Findings and Orders ("Orders") are issued to the U.S. Department of Energy ("Respondent") pursuant to the authority vested in the Director of the Ohio Environmental Protection Agency ("Ohio EPA") in Ohio Revised Code ("ORC") sections 3734.02(G) and 3745.01.

II. PARTIES

These Orders shall apply to and be binding upon the Respondent, its agents, assigns, successors in interest, and its co-operator, Fernald Environmental Restoration Management Corporation ("FERMCO"). No change in ownership or operation of the Facility will in any way alter the Respondent's responsibilities under these Orders.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 93
ENTERED DIRECTOR'S JOURNAL

31

III. DEFINITIONS

Unless otherwise stated, all terms used in these Orders shall have the same meaning as in ORC Chapter 3734. and the regulations promulgated thereunder. The following terms are defined as:

a. "Alternate Program" shall consist of the portions of the Remedial Investigation ("RI") Work Plans and Addenda that pertain to groundwater characterization and the "Routine System", as specified in Orders number 1, 2 and 3 of these Orders.

b. "Site" shall mean the Fernald Environmental Management Project ("FEMP"), including all areas within the property boundary of the FEMP and any other areas that received or potentially received or released hazardous waste or hazardous waste constituents.

c. "Routine System" shall consist of the monitoring wells that will be located along the downgradient property boundary of the Facility. As of the effective date of these Orders, the Routine System consists of thirty-three (33) monitoring wells.

IV. FINDINGS OF FACT

The Director of the Ohio EPA has determined the following findings of fact:

1. Respondent owns and operates a former industrial facility located approximately twenty (20) miles northwest of Cincinnati, Ohio in Hamilton and Butler Counties ("Facility"). The Site is presently listed on U.S. Environmental Protection Agency's ("U.S. EPA") National Priorities List ("NPL") under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, ("CERCLA"), 42 U.S.C. Sections 9601 et seq. Respondent is investigating and remediating environmental contamination at the site.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
DIRECTOR'S JOURNAL

2. The Respondent is a "person" as defined in ORC Sections 1.59 and 3734.01 and Ohio Administrative Code ("OAC") rule 3745-51-03.

3. The Respondent generates "hazardous waste" as that term is defined by ORC Section 3734.01 and OAC rule 3745-51-03.

4. The Respondent notified U.S. EPA on August 8, 1980 of its hazardous waste activity at the Facility and was issued U.S. EPA Identification Number OH6890008976.

5. The Respondent submitted "Part A" and "Part B" of its permit application pursuant to OAC rule 3745-50-41. The most recent revision of Respondent's "Part B" permit application was submitted on March 26. 1993.

6. There are land-based units at the Facility for which Respondent is required to implement a groundwater monitoring program described in OAC rules 3745-65-90 through 3745-65-94. The Respondent implemented a Resource Conservation and Recovery Act ("RCRA") groundwater monitoring program in 1985 pursuant to OAC rule 3745-65-90.

7. The Respondent is also conducting a groundwater monitoring investigation as part of its Remedial Investigation and Feasibility Study ("RI/FS") under CERCLA. The RI/FS schedules contained in the Amended Consent Agreement ("ACA") are based upon discussions between Respondent and U.S. EPA in consultation with the State of Ohio.

8. An objective of the CERCLA process is to characterize the nature, rate and extent of groundwater contaminant migration to the extent necessary to select and implement response action(s). This process will ensure characterization and remediation of groundwater for the entire Site, including the areas potentially affected by the land-based units identified in Finding number 6., above.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
ENTERED DIRECTOR'S JOURNAL

9. During a May 7, 1993 meeting and in a May 12, 1993 letter, the Respondent asked the Ohio EPA to approve an alternate RCRA groundwater monitoring program ("Alternate Program") for the Facility to replace the existing groundwater monitoring program at the Facility.

10. Ohio EPA and the Respondent desire to avoid duplication and to integrate the groundwater monitoring activities required by OAC rules 3745-65-90 through 3745-65-94 with the site-wide RI/FS groundwater characterization required by the ACA and described in the Respondent's RI/FS Work Plans and Addenda. In order to facilitate integration and avoid duplication, the Ohio EPA will review and approve portions of CERCLA documents for purposes of demonstrating compliance with OAC rules 3745-65-90 through 3745-65-94 and these Orders.

11. The Routine System is an assessment groundwater monitoring system with documented groundwater contamination in the following four stratigraphic levels: the surficial glacial till, the water table, the upper section of the sand and gravel aquifer, and the deep sand and gravel unit.

12. The Respondent, through a federal assistance award administered under 10 CFR Part 600, has agreed to provide Ohio EPA equipment and other support to electronically access environmental data for the Site through the use of the Intergraph System.

13. Pursuant to ORC Section 3734.02(G), the Director may by order exempt any person generating, storing, treating, or disposing of hazardous wastes in such quantities or under such circumstances that, in the determination of the Director, are unlikely to adversely affect the public health or safety or the environment from any requirement to obtain a permit or license, comply with the manifest system or with the requirements of ORC Chapter 3734.

14. If the Respondent conducts its Alternate Program in accordance with the Orders herein, it is unlikely that the public health or safety or the environment will be adversely affected.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
ENTERED DIRECTOR'S JOURNAL

V. ORDERS

1. The Respondent shall comply with the groundwater monitoring requirements in OAC rules 3745-65-90(A) through 90(E), 3745-65-91(B)(2) through 92(A), 3745-65-92(E) through 93(D)(2) and 3745-65-93(D)(7) through 94(B)(1) as applicable to an assessment monitoring program.

2. The Respondent is exempt from complying with the groundwater monitoring requirements in OAC rules 3745-65-91(A)(1) through 91(B)(1), 3745-65-92(B) through 92(D), 3745-65-93(D)(3) through 93(D)(6), and 3745-65-94(B)(2) provided that Respondent complies with these Orders and within ninety (90) days from the date of issuance of these Orders, modifies its groundwater monitoring program as described below to Ohio EPA's satisfaction:

   a. The Respondent shall establish and maintain a groundwater monitoring system capable of yielding groundwater samples for analysis consisting of a total of thirty-three (33) existing and/or any potentially necessary monitoring wells installed hydraulically downgradient at the property boundary of the FEMP within the upper, middle and lower zones of the Great Miami Aquifer (2000, 3000 and 4000-series wells).

   b. The Respondent shall conduct sampling and analysis of the target parameters including analyte metals, radionuclides, water quality parameters and volatile organic compounds on a quarterly basis. The quarterly sampling period for the wells shall normally extend no longer than one week, but shall not exceed two weeks.

   c. The Respondent shall determine the elevation of the groundwater surface at each monitoring well each time a sample is obtained. The groundwater elevations shall be evaluated annually to determine if the downgradient requirements of Order number 2a., above, continue to be met. If the evaluation shows that the requirements of Order number 2a., above, are no longer met, the Respondent shall modify the number, location or depth of the monitoring wells to meet the

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
DIRECTOR'S JOURNAL

downgradient requirements of Order number 2a, above.

d. In the event that initial sample results from the Routine System indicate a potential immediate risk to human health or the environment, the Respondent shall verbally notify Ohio EPA's FEMP Site Coordinator within 48 hours of receipt of laboratory data. In the event that confirmatory sample results from the Route System indicate a potential risk to human health or the environment, the Respondent shall, within 48 hours of receipt of laboratory data, verbally notify Ohio EPA's FEMP Site Coordinator and initiate a Removal Site Evaluation ("RSE") to determine if a Removal Action is warranted. The Respondent shall notify the Director in writing within five (5) days of the RSE initiation. Ohio EPA may request an RSE based upon its technical review of routine monitoring data. The necessity of additional work will be determined in consultation with U.S. EPA, Ohio EPA and the Respondent.

e. The Respondent shall conduct other site-wide groundwater monitoring and characterization activities throughout the CERCLA process as necessary to implement appropriate response action(s), including determining background groundwater quality.

f. When the Respondent submits the OU 5 RI Report, it shall be analogous to the groundwater quality first determination assessment report described in OAC rule 3745-65-93(D)(5).

g. The Respondent shall submit by March 1 of each year an annual report of groundwater monitoring activities which includes: groundwater surface level elevations; analytical data from the Routine System; an update of groundwater-related activities for each operable unit from the previous calendar year; graphical representation delineating any changes in target parameter contaminant levels for each boundary well that shows changes in groundwater quality, as specified in the Alternate Program plan required in Order number 3 of these Orders; and changes in plume boundary configurations or concentrations related to the Routine System wells as determined by OU 5 data from

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
DIRECTOR'S JOURNAL

the previous calendar year.

h. The Respondent shall provide Ohio EPA electronic access to the environmental databases for the site.

3. Within forty-five (45) days from the effective date of these Orders, the Respondent shall submit a plan to Ohio EPA for its Alternate Program. The plan shall incorporate both the Routine Property Boundary Groundwater Monitoring Program and appropriate portions of the OU 5 RI/FS Work Plan. The assessment monitoring portion of the plan shall be analogous to the plan required by OAC rule 3745-65-93(D)(3) and shall contain an identification of the wells included in the Routine System; a well construction diagram for each well; a sampling and analyses plan meeting the requirements of OAC rule 3745-65-92(A); a sampling schedule and parameter list including target analyte metals, radionuclides, water quality parameters and volatile organic compounds; a description of the RSE/Removal Action process for addressing potential immediate risks to human health and the environment that may be identified through reviewing and evaluating groundwater monitoring data; a list of items that will be contained in the annual groundwater monitoring report; and a description of how compliance with the OAC rules required in Order number 1. and the conditions of Order number 2., above will be achieved.

4. If the Ohio EPA provides the Respondent with a written statement of deficiencies in the Alternate Program plan, the Respondent shall modify the plan or submit a new plan for approval that addresses the deficiencies within thirty (30) days of receiving such a written statement.

5. The Respondent shall determine to Ohio EPA's satisfaction the full nature, rate and extent of contaminant migration prior to implementation of any remedial design.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 93
ENTERED DIRECTOR'S JOURNAL

6. Future site activities may necessitate changes to the approved Alternate Program plan including but not limited to activities such as the duration of monitoring, sampling frequency, and sampling parameters and locations. No such changes or modifications shall be made by the Respondent without written notification to and written approval of Ohio EPA. Any notification of proposed changes to the Alternate Program under this section shall set forth the nature and basis for the proposed changes or modifications to the approved Alternate Program plan

7. The Respondent, by its acceptance of this exemption, agrees to comply with all conditions of the exemption and acknowledges that the Respondent's failure to so comply may result in immediate revocation of this exemption and further legal action by Ohio EPA. The Respondent also acknowledges this exemption may be revoked upon finding that such revocation is necessary to protect the public health or safety or the environment.

VI. MODIFICATIONS

These Orders may be modified by the Director upon written notification to the Respondent. The notification shall set forth the nature and basis for any modifications.

VII. RESERVATION OF RIGHTS

Nothing contained herein shall be construed to prevent Ohio EPA from seeking legal or equitable relief to enforce the terms of these Orders or from taking other authorized administrative, legal or equitable action as deemed appropriate and necessary against the Respondent for noncompliance with these Orders. Nothing herein shall be construed as an admission by Respondent or its co-operator or otherwise restrict the right of the Respondent or its co-operator to raise any administrative, legal or equitable claim or defense with respect to such further actions which the Ohio EPA may seek to require of the Respondent. Nothing in these Orders shall be construed to limit the authority of Ohio EPA to seek relief for violations not addressed in these Orders.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 93
ENTERED DIRECTOR'S JOURNAL

48 20

In addition, no provision in this Order shall be interpreted to require obligation or payment of funds in violation of the of the Anti-Deficiency Act, 31 U.S.C. 1341.

VIII. TERMINATION AND SATISFACTION

These Orders shall terminate: (1) when the Respondent demonstrates in writing and certifies to the satisfaction of Ohio EPA that all obligations under these Orders have been performed and the Ohio EPA Division of Hazardous Waste Management acknowledges, in writing, the Ohio EPA's acceptance of this demonstration and certification; or (2) upon notification that the Respondent is no longer required to maintain the groundwater monitoring systems at the FEMP.

The certification required under this Section shall be signed by a responsible official of the Respondent. The certification shall make the following attestation: "I certify that the information contained in or accompanying this certification is true, accurate and complete."

IX. EXPIRATION

These Orders shall expire upon the effective date of any state-issued post-closure permit for the Facility .

IX. SIGNATORIES

Each signatory to these Orders certifies that he or she is fully authorized to enter into these Orders and to legally bind such signatory to this document.

IT IS SO ORDERED:

Donald R. Schregardus
Director

SEP 10 1993
Date

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 93
ENTERED DIRECTOR'S JOURNAL

48 20

X. WAIVER

The Respondent agrees that these Orders are lawful and reasonable and that the schedules provided herein are reasonable. The Respondent agrees to comply with these Orders. Compliance with these Orders shall be in full accord and satisfaction for the Respondent's and FERMCO's potential liability for any alleged violations of those specific OAC rules outlined in Order number 2 which may have occurred since December 20, 1991 or which occur at the Facility until the date that these Orders terminate or expire.

Except as provided in Section VII, above, the Respondent hereby waives the right to appeal the issuance, terms and service of these Orders and it hereby waives all rights its might have to seek judicial or administrative review of said Orders either in law or equity. The Respondent expressly waives any and all rights it has to request an adjudication hearing of any proposed revocation of these Orders or to appeal any final action of the Director revoking these Orders.

Notwithstanding the preceding, the Ohio EPA and the Respondent agree that in the event that these Orders are appealed by any other party to the Environmental Board of Review, or any court, the Respondent retains the right to intervene and participate in such appeal. In such event, the Respondent shall continue to comply with these Orders notwithstanding such appeal and intervention unless these Orders are stayed, vacated, or modified.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 '93
ENTERED DIRECTOR'S JOURNAL

48 20

IT IS SO AGREED:

U.S. Department of Energy

Raymond J. Hansen — September 10, 1993

By — Date

Acting Manager

Title

Fernald Environmental Restoration Management Corporation

MCR — 9/10/93

By — Date

President FERMCO

Title

Ohio Environmental Protection Agency

Donald R. Schregardus — SEP 10 1993

Donald R. Schregardus — Date

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Mary Cavin Date 9-10-93

OHIO E.P.A.
SEP 10 93
ENTERED DIRECTOR'S JOURNAL

41

48 20

APPENDIX C

Monitoring Well Boring Logs and Construction Information

48 20

Monitoring Well 2754

Location #1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Ecum		
BORING NUMBER: 2754	COORDINATES:	DATE 3/26/92	
ELEVATION:	GWL: Depth NA Date/Time 4-22-92	DATE STARTED: 3/26/92	
ENGINEER/GEOLOGIST. D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/26/92	
DRILLING METHODS: Cable Tool		PAGE 1 OF 22	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1610 101632 3/26/92	2	4	Loose 10YR (4/6) Brownish yellow sand poorly graded w/ some silt & organics. Dry	SP	NA	HNU = 0 ppm BG = 60 cpm Archive
		3	0	No Recovery	NA	NA	
1		3	0	SAA	NA	NA	
		2	0	SAA	NA	NA	
2	1615 101633 101634 3/26/92	2	6	Soft 10YR (4/3) brown silty clay w/ sand. No plasticity, dry.	CL	.5	HNU = 0 ppm BG = 40 cpm Geochemical
	1615 101635 101636 3/26/92	3	6	V. Stiff. 10YR (3/4) Yellowish brown silty clay, little sand, low plasticity, slight moist.	CL	2.5	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment H3 Cyclone

Logger: Joe Barile, Craig Coulter

SAA - same as above
NA - not applicable
Bkgd: HNU = 0 ppm
BG - 40-60 cpm

Samples collected per ASTM Standard Penetration Test
Colors identified by using Munsell Color Chart

REVIEWED BY QA DATE 5/28/92

402-11-06

44

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Equipment		
BORING NUMBER: 2754	COORDINATES:		DATE 3/24/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/24/92
ENGINEER/GEOLOGIST. D.O'Brien	Depth	Date/Time	DATE COMPLETED: 3/22/92
DRILLING METHODS: Cable Tool			PAGE 2 OF 22

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
	1615 10 1637 10 1638 3/24/92	6	6	V. Stiff. 10YR (3/4) yellowish brown silty clay, low plasticity slightly moist	CL	2.5	Geochemical
		9	0	No Recovery	NA	NA	
4	1630 10 1639 3/24/92	11	6	V. Stiff. 2.5Y (4/6) Olive yellow silty clay w/gravel no plasticity, slightly moist.	CL	3.5	HNU = 0ppm BX = 40cpm Dist. Geotech
		14	6	SAA	CL	4.0	
5		21	6	SAA	CL	3.25	
		29	0	No Recovery.	NA	NA	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Cyclone
ller: Joe Basile
Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.01.04	PROJECT NAME: Fernald RI/FS Equipt		
BORING NUMBER: 2754	COORDINATES:		DATE 3/24/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/24/92
ENGINEER/GEOLOGIST: D.O'Brien	Depth	Date/Time	DATE COMPLETED: 3/22/92
DRILLING METHODS: Cable Tool			PAGE 3 OF 3

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
	1630 ~~101639~~ 101640 3/24/92	2	6	Soft. 2.5Y(6/6) Olive yellow silty clay w/gravel, low plasticity, slightly moist	CL	.5	HNU=0 ppm BS=600cpm
		5	6	SAA, mod. stiff	CL	.75	
7		5	4	SAA, stiff	CL	1.5	
		13	0	No Recovery	NA	NA	
8	0830 101641 3/24/92		17	V. stiff. 2.5Y (6/6) Olive yellow clay w/gravel, low plasticity slightly moist	CL	2.5	HNU=0 ppm BS=800cpm Archived Shelby

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Cyclone
Driller: Joe Barile
Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA DATE 5/29/9

402-11-46

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Event		
BORING NUMBER: 2734	COORDINATES:	DATE 3/27/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/26/92	
ENGINEER/GEOLOGIST. D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/27/92	
DRILLING METHODS: Cable Tool		PAGE 4 OF 32	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
		1					
		2					
		2					
10		2					
		2		DSO (5YR2) (6/6) Olive yellow			
		2		V. Stiff. 2.5Y (7/4) Clay w/ grave, low plasticity slightly moist	Cl	2.5	
11	0835						
	101642 101644 RAD ISOTOPE 3/27/92	8	6	V. Stiff. 10YR (6/3) Pale brown, silty clay low plasticity, slightly moist	Cl	2.0	HNU = 0 ppm BX = 40 cpm Dist. Geotech
		9	6	SAA	Cl	2.0	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Cyclone
Driller: Joe Basile
Craig Coulter

See p. 1

SAA - same as above
NA - not applicable

REVIEWED BY QA [illegible] DATE 5/29/92

47

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.03.01.04	PROJECT NAME: Fernald RI/FS Fluor		
BORING NUMBER: 2754	COORDINATES:	DATE 3/27/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/26/92	
ENGINEER/GEOLOGIST: D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/27/92	
DRILLING METHODS: Cable Tool		PAGE 5	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
		15	6	3/27/92 V. Stiff 10YR(6/3) Pale brown ~~Stiff~~ silty clay low plasticity, slightly moist	CL	2.0	
		29	6	SAA	CL	2.5	
13	0905 ~~101643~~ ~~101643~~ ~~C 3/26/92~~ 3/27/92	6	6	SAA	CL	3.25	HNU = 0 ppm Bq = 60 cpm
		12	6	SAA, hard	CL	4.0	
14	0905 101643 3/27/92	10	6	Stiff, 10YR(5/1) Gray silty clay, low plasticity slightly moist	CL	1.5	
		13	6	SAA	CL	1.5	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Basile

Craig Coulter

SAA - same as above

NA - not applicable

See p. 1

REVIEWED BY QA [signature] DATE 5/29/92

48

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Equipt		
BORING NUMBER: 2754	COORDINATES:	DATE 3/27/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/26/92	
ENGINEER/GEOLOGIST. D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/27/92	
DRILLING METHODS: Cable Tool		PAGE 6 OF 330	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0940 101645 101646 3/27/92	3	6	Stiff. 10YR(5/1) Gray clay, mod. plasticity slightly moist.	CI	1.75	HNU = 0 ppm BG = 40cpm Geochem
	0940 101647 101648 3/27/92	4	6	SAA, V. Stiff	CI	2.0	
16		6	0	No Recovery	NA	NA	
		8	0	No Recovery	NA	NA	
17	0955 101649 3/27/92	4	6	V. Stiff. 10YR(5/1) Gray clay, low plasticity slightly moist	CI	2.5	HNU = 0ppm BG = 60cpm
		7	6	SAA, Stiff	CI	1.0	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Basile
Craig Coultis

SAA - same as above
NA - not applicable

See p. 1

REVIEW BY QA DATE 5/29/92

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Elutr		
BORING NUMBER: 2754	COORDINATES:		DATE 3/27/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/24/92
ENGINEER/GEOLOGIST. D.O'Brien	Depth	Date/Time	DATE COMPLETED: 3/25/92
DRILLING METHODS: Cable Tool			PAGE 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
1	0955 101650 3/27/92	8	6	Stiff. 10YR(5/3) brown silty clay, low plasticity slightly moist	CL	1.5	
		11	6	SAA	CL	1.25	
19	1020 101651 101652 3/27/92	↑ Rock Shelby	25	V.Stiff. 10YR(5/1) Gray gravelly clay, no plasticity slightly moist	CL	3.75 1.75	HNu = 0 ppm RX = 40 cpm Undist. Geotech.
25							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Barile, Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA DATE 3/28/92

402-11-06

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Equipt		
BORING NUMBER: 2754	COORDINATES:	DATE 3/27/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/21/92	
ENGINEER/GEOLOGIST. D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/22/92	
DRILLING METHODS: Cable Tool		PAGE 8 OF 22	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
		1					
	1010 101653 3/22/92	3		V. Stiff. 10YR(5/1) Gray gravelly clay, no plasticity slightly moist.	Cl	3.75	
22	1050 101654 3/22/92	4	6	V. Stiff 2.5Y(N4/1) Dark gray gravelly silty clay no plasticity, slightly moist	Cl	2.0	HNU=0ppm RS=60cpm Dist. Geotech.
		8	6	SAA	Cl	2.0	
23		11	6	SAA	Cl	2.75	
		15	5	SAA	Cl	2.5	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Basile

Craig Coulter

See p. 1

SAA - same as above
NA - not applicable

5/29/92

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Event		
BORING NUMBER: 2754	COORDINATES:	DATE 3/27/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/26/92	
ENGINEER/GEOLOGIST. D.O'Brien	Depth Date/Time	DATE COMPLETED: 3/22/92	
DRILLING METHODS: Cable Tool		PAGE 9 OF 22	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
	1120 ~~101657~~ 2/22/92	12	4	Stiff. 2.5Y (N4/) Dark gray gravelly silty Clay, no plasticity slightly moist	CL	1.25	HNU=0 ppm BG=40cpm
		10	0	No Recovery	NA	NA	
25		13	0	No Recovery	NA	NA	
		12	0	No Recovery	NA	NA	
30	~~101658~~ 101655 RAD Screen	8	6	Stiff. 2.5Y (N4/) Dark gray gravelly silty clay no plasticity, slightly moist	CL	1.15	HNU = 0ppm BG = 50cpm
		4	0	No Recovery	NA	NA	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Barile
Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA DATE 5/29/92

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Equipt		
BORING NUMBER: 2744	COORDINATES:		DATE 3/30/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/26/92
ENGINEER/GEOLOGIST. D.O'Brien	Depth	Date/Time	DATE COMPLETED: 4/22/92
DRILLING METHODS: Cable Tool			PAGE 10 OF 22

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
		4	0	No Recovery	NA	NA	
		9	0	No Recovery	NA	NA	
28	0935 101654 101655	7	6	Very Dense. 5Y(5/1) Gray sand well graded slightly moist.	SW	NA	HNu= 0 ppm BG= 40 cpm Geochem
	0935 101658 101659	11	6	SAA	SW	NA	
29		50	0	No Recovery	NA	NA	
		50/3	0	No Recovery	NA	NA	

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Barile
Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA DATE 8/29

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Event		
BORING NUMBER: 2754	COORDINATES:		DATE 3/30/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 3/26/92
ENGINEER/GEOLOGIST. D.O'Brien	Depth	Date/Time	DATE COMPLETED: 3/27/92
DRILLING METHODS: Cable Tool			PAGE 11 OF 33

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0960 101660 3/30/92	18	6	Mud 10m Dense 5Y (5/1) Gray med graded sand, slightly moist	SW	NA	HNU = 0 ppm BG = 50 cpm
		17	6	SAA	SW	NA	
31		13	6	Stiff. 5Y (5/1) Gray clayey silt, high plasticity slightly moist	ML et CY 5/4/92	1.0	
		15	6	SAA	ML et CY 5/4/92	1.25	
32 1	1000 101661 3/30/92	7	6	Stiff. 5Y (5/1) Gray silty clay, ~~mod. p~~ slightly some gravel, (mod. plasticity moist	CL	1.0	HNU = 0 ppm BG = 50 cpm
		7	6	SAA	CL	1.0	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Cudione
Driller: Joe Borile
Craig Coulter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA DATE 5/29/92

402-11-46

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1102.03.01.04	PROJECT NAME: Fernald RI/FS Elutr		
DRILLING NUMBER: 2754	COORDINATES:	DATE 3/31/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92	
DRILLING METHODS: Cable Tool		PAGE 12 OF 22	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
		10	6	Stiff. 5Y(5/1) Gray silty clay with gravel, med. plasticity, moist	cl	1.25	
		16	6	SAA	cl	1.0	
34	0850 101662 3/31/92	3	6	DSO 3/31/92 ~~SA~~ Med. Stiff. 5Y(5/1) Gray clayey silt with gravel med. plasticity, moist	ML et 5/4/92	.75	HNO= 0ppm RX= 40cpm
		8	2	SAA	ML et 5/4/92	.5	
35		7	0	No Recovery	NA	NA	
		15	0	No Recovery	NA	NA	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Cirlane
Joe Barile
Craig Coulter

See p. 1

REVIEWED BY QA [signature] DATE 3/31/93

402-11-86

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS FLUOR		
BORING NUMBER: 2754	COORDINATES:	DATE 3/31/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92	
ENGINEER/GEOLOGIST. D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92	
DRILLING METHODS:		PAGE 13 OF 22	

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	0930 101663 3/31/92	13	6	Dense. 5Y(5/1) Gray clayey sand, poorly graded, moist	SC ~~SP~~ 5/4/92	NA	HNu=0ppm RS=60cpm
		21	0	No Recovery	NA	NA	
37		15	0	No Recovery	NA	NA	
		25	0	No Recovery	NA	NA	
38	1200 101664 3/31/92	8	4	V. St., ff. 5Y(5/1) Gray gravelly clayey sand moist	SC ~~SP~~ 5/4/92	NA	HNu=0 ppm RS=40cpm
		19	0	No Recovery	NA	NA	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment 43 Rig Ones
Joe Barile
Craig Coulter

See p. 1

REVIEWED BY GA DATE 3/6/93

402-11-46

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 102.03.01.04	PROJECT NAME: FWMF		
BORING NUMBER: 27BH	COORDINATES:	DATE 3/31/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92	
DRILLING METHODS: Cable Tool		PAGE 14 OF 22	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
		35	0	No Recovery	NA	NA	
		36	0	No Recovery	NA	NA	
40	1018 101663 3/31/92	4	6	Stiff. 5Y (5/1) Gray. gravelly clay, no plasticity moist	Cl	1.5	HNU = 0 ppm BG = 50 cpm
		7	6	SAA	Cl	2.0	
41		17	0	No Recovery	NA	NA	
		27	0	No Recovery	NA	NA	

NOTES:
Drilling Contractor Pennsylvania Drilling
Drilling Equipment HB Cyclone
Joe Parrill
Craig Carter

See p. 1

REVIEWED BY: [illegible] DATE 5/22/95

402-11-06

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.02.03 01.04	PROJECT NAME: Fernald RI/FS FLUMP	
BORING NUMBER: 27H4	COORDINATES:	DATE 3/31/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/31/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92
DRILLING METHODS: Cable Tool		PAGE 13 OF 22

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1050 101666 3/31/92	8	6	V. Stiff. 10YR(3/3) Dark brown clayey silt with gravel & organics. No plasticity, slightly moist	ML	2.25	HNU = 0 ppm RS = 60 cpm
		10	6	SAA	ML	20	
43		23	6	SAA * Bottom of till at 43.5 Ft	ML	2.25	
		23	6	Dense. 5Y(5/1) Gray poorly graded sand, dry	SP	NA	
44 1	1045 101667 3/31/92	5	6	Dense. 5Y(5/1) Gray poorly graded sand, dry	SP	NA	HNU = 0 ppm RS = 60 cpm
		17	4	SAA	SP	NA	

Till
Bot

NOTES:
Drilling Contractor: Ben Drill
Drilling Equipment: 43 Cyclone
Driller: Joe Boyle
Craig Carter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA: [signature] DATE: 3/28/93

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 1002.03.01.04	PROJECT NAME. Fernald RI/FS ELWMF	
RING NUMBER: 2754	COORDINATES:	DATE 3/31/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92
ENGINEER/GEOLOGIST. D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92
DRILLING METHODS: Cable Tool		PAGE 16 OF 22

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
		21	0	No Recovery	NA	NA	
		25	0	No Recovery	NA	NA	
46				Begin sampling every 5 ft.			
47							

NOTES:
Drilling Contractor Ann Drill
Drilling Equipment 43 Cyclone
BY: Joe Bonie
Greg Coulter

SAA - same as above
NA - not applicable

see p. 1

402-11-66

REVIEWED BY GA [illegible] DATE [illegible]

RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.08.01.04	PROJECT NAME: Fernald RI/FS EWMF		
BORING NUMBER: 2754	COORDINATES:	DATE 3/31/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92	
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/92	
DRILLING METHODS: Cable Tool		PAGE 17 OF 22	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
/	1400 101648 3/31/92	12 18 18 22	6	V. Dense 5Y(5/1) Gray. Silty clayey sand, dry 050 5/8/92	SM ~~SC~~	NA	HNU=0ppm BG=60cpm
55 /	1425 101649 3/31/92	22 22 21 44	10	V. Dense 5Y(5/1) Gray Silty sand poorly graded, dry 050 5/8/92	~~SC~~ SM	NA	HNU=0ppm BG=60cpm
60 /	1520 101650 3/31/92	6 8 11 15	10	Med. Dense. 10YR(4/6) Dark yellowish brown, sand, fine poorly graded, dry	SP	NA	HNU=0ppm BG=60cpm
65 /	1645 101651 3/31/92	17 50/6	5	V. Dense, SAA	SP	NA	HNU=0ppm BG=40cpm
70 /	0910 101672 4/1/92	49 50/3	12	V. Dense. 10YR(4/6) Dark yellowish brown, coarse sand poorly graded slightly moist	SP	NA	HNU=0ppm BG=50cpm
75 /	0945 101673 4/1/92	9 17 50/5	8	V. Dense. 10YR(4/6) Dark yellowish brown, coarse sand w/ gravel poorly graded slightly moist	SP	NA	HNU=0ppm BG=40cpm

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 43 Cyclone

Driller: Joe Boyd
Craig Carter

SAA - same as above
NA - not applicable

See p. 1

402-11-66

60

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.03.01.04	PROJECT NAME. Fernald RI/FS Elutr		
BORING NUMBER: 2754	COORDINATES:	DATE 4/1/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 3/24/92	
ENGINEER/GEOLOGIST. D. O'Brien	Depth Date/Time	DATE COMPLETED: 4/22/93	
DRILLING METHODS: Cable Bad		PAGE 18 OF 22	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
80 /	1015 101674 4/1/92	17 50/3	7	V. Dense 10YR (4/6) Dark yellowish brown coarse sandy gravel poorly graded, slightly moist	SP	NA	HNU = 0 ppm BS = 40 cpm
85 /	1415 101675 4/1/92	50/3	3	SAA Bottom 1" 5Y(5/1) Gray clayey sand w/gravel moist	SC	NA	HNU = 0ppm BS = 60cpm
90 /	1445 101676 4/1/92	8 50/3	8	Hard 5Y(4/3) Olive silty gravelly clay, no plasticity, slightly moist	CL	>4.5	HNU = 0ppm BS = 40cpm
95 /	1015 101677 4/1/92	30 50/3	50/4 50/1	SAA	CL	>4.5	HNU = 0 ppm BS = 60 cpm
100 /	1030 101678 4/1/92	37 49 50/2	12	SAA, mottled w/ gray	CL	>4.5	HNU = 0ppm BS = 60cpm
105 /	1455 101679 4/2/92	10 25 37 50	3	BS 4/2/92 V. Stiff 5Y(4/3) Olive silty clay w/ gravel, no plasticity, slightly moist	CL	2.25	HNU = 0 ppm BS = 60 cpm

NOTES:

Drilling Contractor Penn Drill

Drilling Equipment HS Cyclone

Driller: Jim Brown
Craig Carter

SAA - same as above
NA - not applicable

See p. 1

REVIEWED BY QA _____ DATE 6/28/93

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 102.03.01.04	PROJECT NAME: FEMP		DATE 4/2/92 4/2/92
BORING NUMBER: 2TH	COORDINATES:		DATE STARTED: 3/31/92
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 4/2/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	PAGE 19 OF 22
DRILLING METHODS: Cable Tool			

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1015 101089 4/2/92	50/2	2	Stiff. 5Y(4/3) Olive mottled w/ gray gravelly clay low plasticity slightly moist	cl	1.0	HNU=0ppm RS=40cpm
115	1045 101081 4/3/92	30 50/1	8	Hard. 5Y(4/3) Olive weathered shale, dry	Sh	>4.0	HNU=0ppm RS=50cpm
				End soil boring at 117'. Core soft rock see Rock Log			
120							

NOTES:

Drilling Contractor: Ann Drill

Drilling Equipment: 43 Cyclone

Driller: Joe Barile, Craig Coulter

See p. 1

SAA - same as above
NA - not applicable

402-11-86

REVIEWED BY GA: DATE

48 20

FERNALD RI/FS

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER 1002.03.01.04 FIELD ENG./GEO D. O'Brien PAGE 20 OF 22

PROJECT NAME FMPF BORING NO. 2754

APPROX. ELEV. _____ CORE SIZE 2 inch DATE 4/8/92

DRILLING METHOD Cable Tool / Auger DATE STARTED 4/8/92

COORDINATES _____ DATE COMPLETED 4/8/92

CASING INFORMATION		GROUNDWATER LEVEL DATA			
SIZE	DEPTH	ACTUAL TIME	DEPTH	ACTUAL TIME	DEPTH

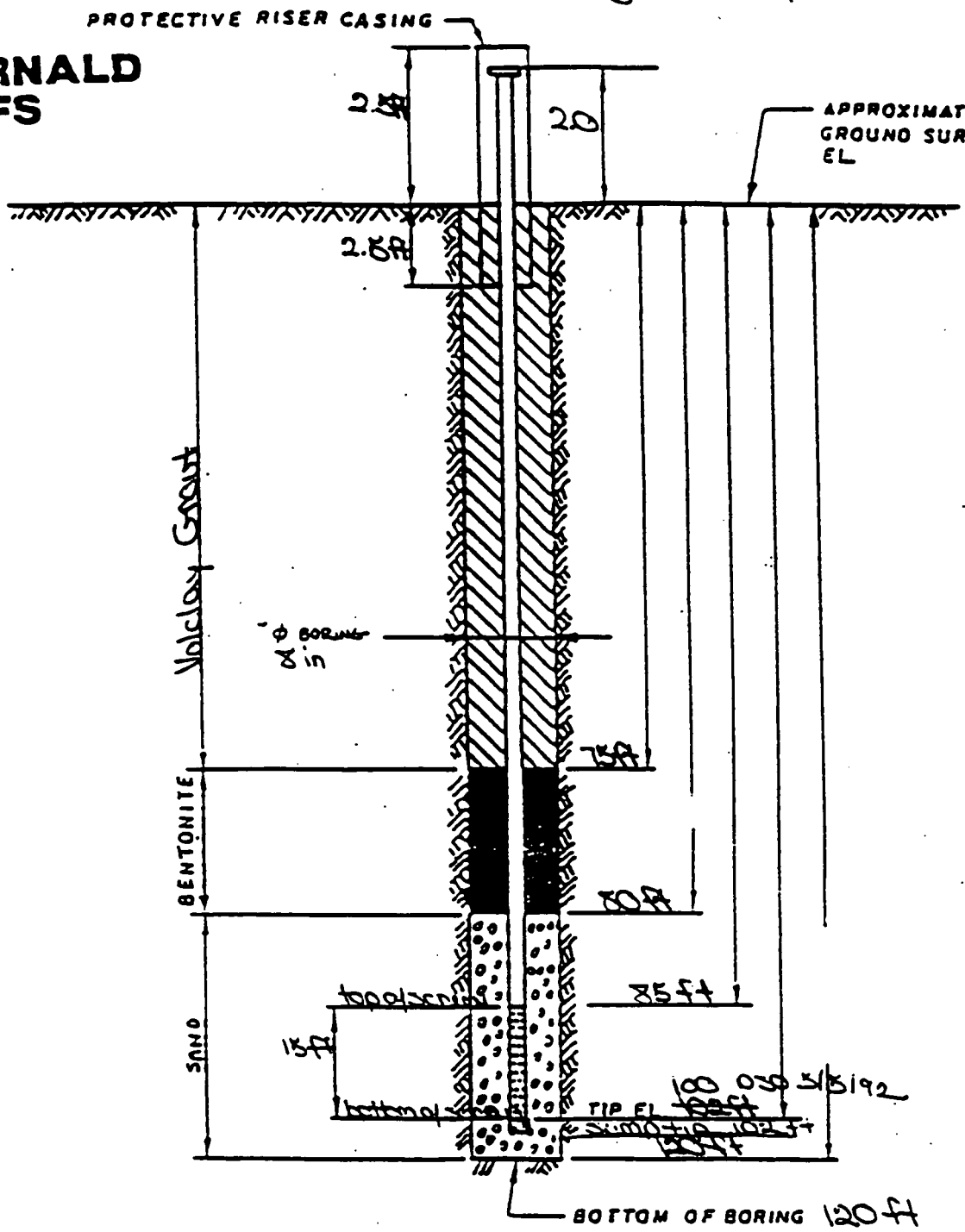
RUN NUMBER	DEPTH (FT)	RECOVERY (IN)	% RECOVERED	% RQD	DESCRIPTION	JOINT SPACING MAXIMUM	MINIMUM	AVERAGE	REMARKS
1625 101682 4/8/92	115		6		Very hard. 5Y (5/1) Gray Clayey weathered shale, thinly laminated.				HNu = 0 ppm BG = 50 cpm
			6		SAA				
	116		6		SAA				
			6		SAA				
	117		6		SAA				
			6		SAA				
	118		6		SAA				
			6		SAA				
	119		6		SAA.				
			0		No Recovery				
	120				Boring terminated at 120'				

REVIEWED BY QA _____ DATE _____

48 20 21 0 22

Hinge cover w/padlock

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. SCH 5 PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL NA Dry
5. WATER LEVEL READING ON 4/22/92

INSTALLATION DETAILS
MONITORING WELL 2754

PREPARED FOR EWMF

Materials used during drilling
11 bags sand
3 buckets bentonite
15 bags volclay
1000 gal. water

Geologist: D. O'Brien

16 Drums generated on this boring/monitoring well

DRAWING NUMBER

CHECKED BY

APPROVED BY

DATE 4/22/92

DI. BY

REVIEWED BY QA

DATE 5/29/92

64

FERNALD RI/FS

22 of 22

MONITORING WELL/ PIEZOMETER INSTALLATION SHEET 48 20

PROJECT NAME FLUXX
PROJECT NO. 102.03.01.04
BORING NO. 2754
GW 5/14/92 ~~PIEZOMETER~~ Monitoring Well NO. 2754

FIELD ENG./GEO. D. O'Brien DATE 4/22/92
CHECKED BY C. Brien DATE 5/21/92
DATE OF INSTALLATION 4/22/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Chum Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0.0 TO 120 Ft	SIZE 8.0 inch FROM 0 TO 115 Ft
FLUID NA FROM — TO —	SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION ~~0.016~~ 4.0 inch DSP 5/6/92	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in. I.D. 4.0 in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10 Ft
AVERAGE SIZE OF PERFORATIONS 0.016 in	JOINING METHOD Flush mount
TOTAL PERFORATED AREA 15 Ft	threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 Ft	OTHER PROTECTION Hinged locking cover
PROTECTIVE PIPE O.D. 10 3/4 inch	with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 75	TOP	BOTTOM
BENTONITE	TOP 75	BOTTOM 80	TOP	BOTTOM
SAND	TOP 80	BOTTOM 104	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 85	BOTTOM 100	TOP	BOTTOM
PIEZOMETER TIP	102'			
BOTTOM OF BOREHOLE	120'			
GWL AFTER INSTALLATION	NA			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

	Initial	Date
1st Key in	[illegible]	[illegible]
2nd Key in	AK	6/5/92
Hard Copy		

REVIEWED BY [illegible] REVIEWED BY QA [illegible] DATE [illegible]/92

65

48 20

Monitoring Well 2424

Location #2

RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 2424	COORDINATES	DATE 1/27/93	
ELEVATION:	GWL: Depth 94.8 Ft Date/Time 1/25/93	DATE STARTED 1/6/93	
ENGINEER/GEOLOGIST B. Yeardley	Depth Date/Time	DATE COMPLETED: 1/25/9	
DRILLING METHODS Cable Tool		PAGE	OF 6

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				For classification of soil see footage logs for 4424 (VC05)			
107.0				Bottom of hole at 107 Ft			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 38 Cyclone

Driller Chris Coulter

David Holmes

SAA - Same as above

NA - Not Applicable

* Sieve Analysis sample # 104692 collected from 90.5 to 1

Samples collected per ASTM standard penetra

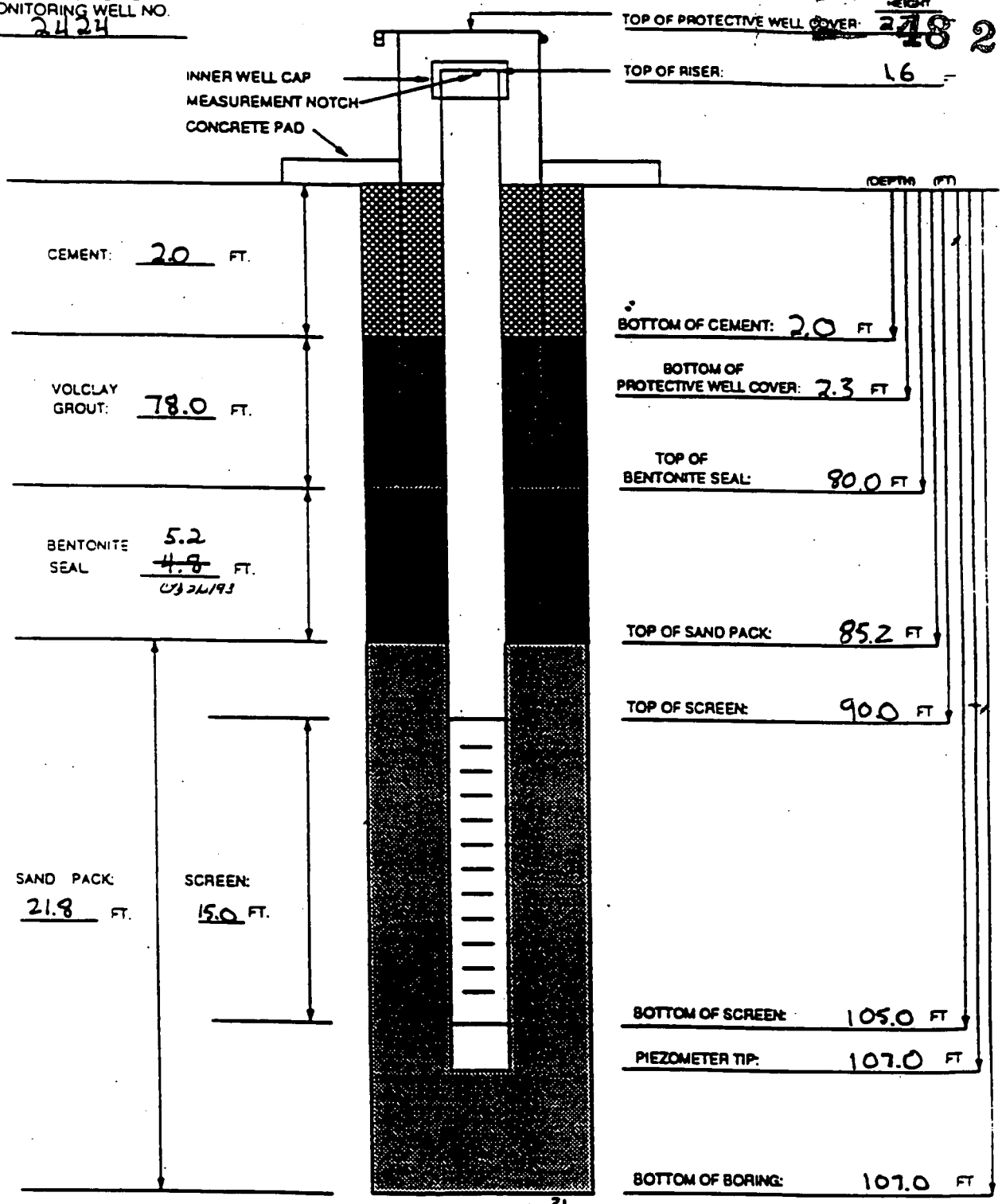
Colors identified using Munsell Color C

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2424

INSTALLATION DATE: 1/6/93 - 1/25/93

TOP OF PROTECTIVE WELL COVER: HEIGHT ~~2.8~~ 20

TOP OF RISER: 16



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 25 bags coarse (#20)
BENTONITE PELLETS (5-GALLON BUCKETS): 6 buckets
BAGS OF VOLCLAY GROUT: 16 bags
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 1000 gal.
OTHER: 17 drums soil
TASK: WEA-05 (04.27)

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.02 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 9.48 FT/1/
5) TOP OF CASING IS SECURED W/ STAINLESS STEEL CAP
6) PARENTHESIS INDICATE DEPTH GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK

GEOLOGIST/ENGINEER: Brian Yeardley

ASI FORM 0157 REV. (0)

FERNALD RI/FS

.48 20

3 of 6

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. WEA-05
BORING NO. 2424
PIEZOMETER NO. 2424

FIELD ENG./GEO. B. Yearsley DATE 1/27/93
CHECKED BY C Brier DATE 2/2/93
DATE OF INSTALLATION 1/6/93 - 1/25/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0 TO 95.0
FLUID NA FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10 in ID FROM 0.0 TO 110.0
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4 in ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.02 in
TOTAL PERFORATED AREA 15.0 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 I.D. 4.0 in
LENGTH OF PIPE SECTIONS 9-10 ft 2-2 ft
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	1.6			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.3			
BOREHOLE FILL MATERIALS:	TOP 0.0	2.0		
Volclay CEMENT GROUT / ~~SLURRY~~ By 1/27/93	TOP 2.0	BOTTOM 80.0	TOP	BOTTOM
BENTONITE Pellets	TOP 80.0	BOTTOM 85.2	TOP	BOTTOM
SAND	TOP 85.2	BOTTOM 107.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 90.0	BOTTOM 105.0	TOP	BOTTOM
PIEZOMETER TIP	107.0			
BOTTOM OF BOREHOLE	107.0			
GWL AFTER INSTALLATION	94.8 (ground elev.)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS

48 20% 6

Monitor Well 2424 Brian Yeard

Sand Pack and Sieve Size Determination

I. Wemco values for grain size

40% value = 0.10

50% value = 0.10

90% value = 0.064

II. Uniformity Coefficient 40%/90% Ratio

0.100 in / .064 = 1.56 which is < 3

Use factor of 5

III. 50% value × 5

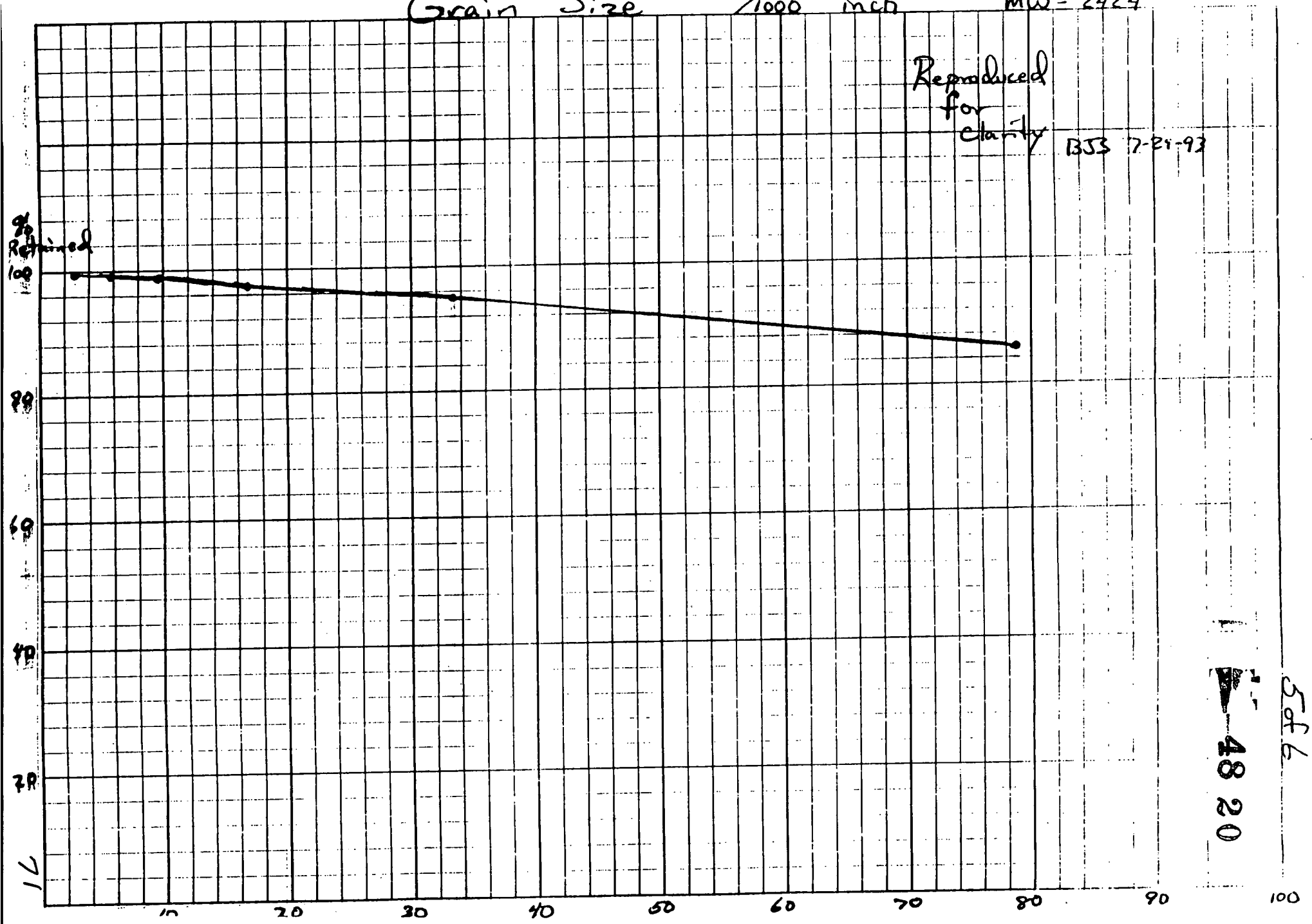
0.10 in × 5 = 0.5

IV. 0.50 falls to left of both medium and coarse grain size distribution curves. However, this value is closer to coarse grain curve and therefore the coarse grain sand with the 20 slot (0.02in) screen will be used. This allows for maximum flow of water into well and also retain formation.

Grain Size 1/1000 inch

MW-2424

Reproduced for clarity BJS 7-24-93



48 20

5 of 6

10 x 10

GRAIN SIZE 1/1000 inch

MW-2424

48 20

00

10

0

0

0

%

10

20

30

77

Customer Number ~~930114~~ 1046

MATERIAL: Soil

SAMPLE NUMBER: 930114-028

DETERMINATION: Particle Size

METHOD: Sieve Analysis

Sample weight: 179.8

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	155.27	86.4	86.4	78.7
20	15.63	8.7	95.1	33.5
40	4.45	2.5	97.6	16.7
60	1.43	0.8	98.4	9.8
100	0.61	0.3	98.7	5.9
200	0.80	0.4	99.1	3.0
Pan	0.80	0.4	99.5	

$\frac{W_2 \times 100\%}{W_1} = R$

$\left|\frac{\text{Original} - \text{Duplicate}}{\text{Average}}\right| \times 100\% = \text{RPD}$

Analyzed by: [signature]

Checked by: [signature]

Date analyzed:

GRAIN SIZE 70% RETAINED > 100 .001 inch

50% > 100

90% 64

73

4820

Monitoring Well 3424

Location #2

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

ECT NUMBER 602 04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER 3424	COORDINATES.	DATE 12/30/92
ELEVATION:	GWL: Depth 9.50 Date/Time 12/30/92	DATE STARTED: 11/18/92
ENGINEER/GEOLOGIST B Yeardley	Depth Date/Time	DATE COMPLETED: 12/30/92
DRILLING METHODS: Cable Tool		PAGE 1 OF 3

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				For soil classification logs see #4424			
				PRELIMINARY			
172.0				Bottom of Boring at 172.0 ft			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 38 Cyclone
Driller Chris Coulter
David Holmes

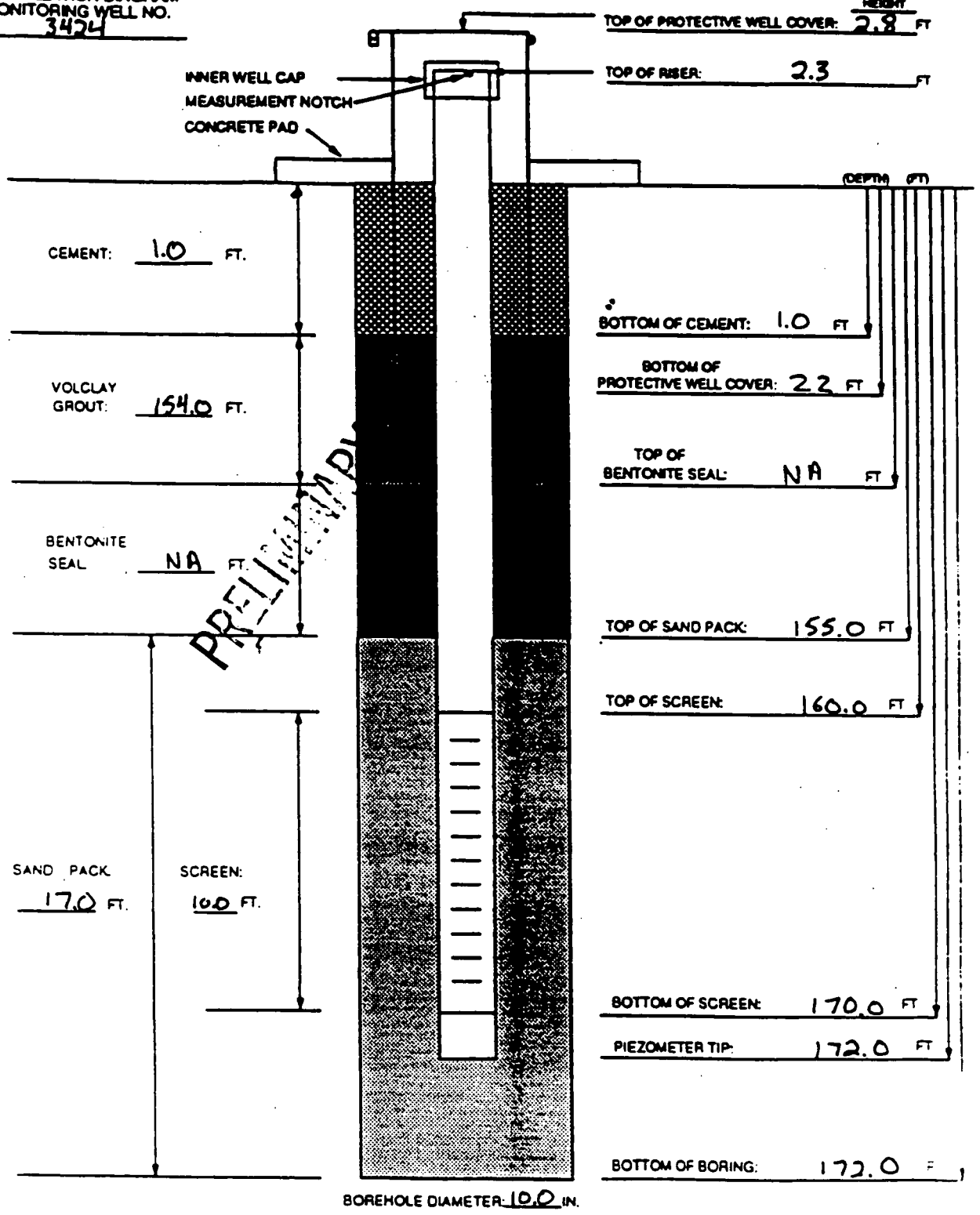
SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

402-11-86

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 3424

INSTALLATION DATE: 12/21/92 - 12/30/92



BOREHOLE DIAMETER: 10.0 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 17 bags of 4/30 coarse
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 52 bags
BAGS OF CEMENT: 1 bag
AMOUNT OF WATER USED: 1750 gals.
OTHER: 31 soil drums, 0 water
TASK: 602.04.27

NOTES:

1) RISER PIPE IS 4 in IN. ID. 316 STAINLESS STEEL PIPE. FLUSH-THREADED JOINTS.
2) SCREEN IS 4 in IN. ID. 316 STAINLESS STEEL PIPE WITH 0.002 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 95.0 12/30
5) TOP OF CASING IS SECURED W/ STAINLESS STEEL CAP
6) PARENTHESIS INDICATE DEPTH GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK

GEOLOGIST/ENGINEER: Brian Yeardley

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 602 04.27
BORING NO. 3424
PIEZOMETER NO. 3424

FIELD ENG./GEO. B. Yeardley DATE 12/30/92
CHECKED BY C. Bauer DATE 12/30/92
DATE OF INSTALLATION 12/21/92 – 12/30/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0 TO 95.0
FLUID — FROM — TO —

TYPE OF BIT —
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 TO ~~172.0 ft~~ 175.0 ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.02 in
TOTAL PERFORATED AREA 10.0 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 16 – 10 ft, 2 – 2 ft
JOINING METHOD Flush Joint threaded

PRELIMINARY

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.3			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.2			
BOREHOLE FILL MATERIALS:	0.0	1.0		
CEMENT GROUT / ~~SLURRY~~ By 12/30/92	TOP 1.0	BOTTOM 155.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 155.0	BOTTOM 172.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 160.0	BOTTOM 170.0	TOP	BOTTOM
PIEZOMETER TIP	172.0			
BOTTOM OF BOREHOLE	172.0			
SWL AFTER INSTALLATION	95.0			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS A variance was written on this well – a five (5) foot sand pack was installed above the top of the screen.

48 20

Monitoring Well 4424

Location #2

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		48 20
BORING NUMBER: 4424	COORDINATES:		DATE: 9/8/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/15/92
DRILLING METHODS: Cable Tool			PAGE 1 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1025 102927 9/8/92	3 3 3	8	V. Stiff. 2.5Y(4/3) Light yellowish brown clayey silt, w/ organics no plasticity, dry	CL ML	3.25	HNu=0ppm BZ=20cpm
2 3	1027 102928 9/9/92	16 14 14	11	Hard. 2.5Y(6/6) Olive yellow silty clay, no plasticity dry	CL	4.5	HNu=0ppm BZ=60cpm
4	1030 102929 9/9/92	8 23 48	14	Hard. 2.5(6/6) Olive yellow silty clay, no plasticity, dry	CL	4.5	HNu=0ppm BZ=60cpm
5 6	1035 102930 9/9/92	48 50	15	SAA	CL	4.0	HNu=0ppm BZ=60cpm
	1420 102931 9/9/92	19 21 28	15	Hard. 2.5Y(6/6) Olive yellow mottled w/gray silty clay w/gravel. No plasticity, dry	CL	4.5	HNu=0ppm BZ=60cpm
8 9	1430 102932 9/9/92	11 13 20	0	No Recovery	NA	NA	HNu=NA BZ=NA
10	1445 102933 9/9/92	11 17 21	11	Hard. 10YR(5/8) Yellowish brown mottled w/gray silty clay w/some gravel, low plasticity, slightly moist	CL	4.0	HNu=0ppm BZ=60cpm
11 12	1525 102933 9/9/92	13 13 17	15	SAA	CL	4.5	HNu=0ppm BZ=60cpm
13	1535 102934 9/9/92	10 10 13	0	No Recovery	NA	NA	HNu=NA BZ=NA
14	1545 102934 9/9/92	5 13 15	16	V. Stiff. 2.5Y(4/1) Gray gravelly clay, low plasticity, slightly moist	CL	2.25	HNu=0ppm BZ=50cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Background: HNu=0ppm BZ=40cpm-60cpm

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/9/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/14/92
DRILLING METHODS: Cable Tool			PAGE 2 OF 21

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1610 102935 9/9/92	6 7 9	8	Stiff. 2.5Y(N5/) Gray gravelly clay, low plasticity, slightly moist.	cl	1.5	HNu = 0ppm BG = 40cpm
17	1620 102936	4 8 12	13	Stiff. 2.5(N5/) gray to gravelly clay, low plasticity, slightly moist	cl	1.25	HNu = 0ppm BG = 60cpm
18 19	1630 102937	4 5 11	10	SAA	cl	1.5	HNu = 0ppm BG = 40cpm
20 21	0840 102938 9/10/92	5 7 8	9	SAA, mod. stiff	cl	.75	HNu = 0ppm BG = 60cpm
22	0850 102939 9/10/92	3 8 10	6	SAA, stiff	cl	1.5	HNu = 0ppm BG = 60cpm
23 24	0905 102940 9/10/92	5 8 11	10	SAA, stiff	cl	1.0	HNu = 0ppm BG = 60cpm
25	0915 102941 9/10/92	8 13 12	4	SAA, v. stiff	cl	2.0	HNu = 0ppm BG =
26 27	0930 102942 9/10/92	7 8 11	5	SAA	cl	2.25	HNu = 0ppm BG = 60cpm
28	0935 102943 9/10/92	5 8 11	7	SAA, stiff	cl	1.25	HNu = 0ppm BG = 60cpm
29	1045 102944	8 6 21	5	SAA	cl	1.5	HNu = 0ppm BG = 60cpm

PRELIMINARY

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/10/92
LOCATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 9/15/92
DRILLING METHODS: Cable Tool			PAGE 3 OF 21

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	1315 102945 9/10/92	3 X X	14	Stiff. 2.5Y(N5/1) Gray, silty gravelly clay, low plasticity ~~slightly~~ moist	cl	1.25	HNu=0ppm BG=40cpm
32	1320 102946 9/10/92	3 X 15	15	SAA	cl	1.25	HNu=0ppm BG=40cpm
33 34		4 X 15	0	No Recovery	NA	NA	HNu=~~0ppm~~ NA BG=NA
35 36	1335 102947 9/10/92	9 X 16	15	V. Stiff. 2.5Y(N5/1) Gray gravelly clay low plasticity, moist	cl	2.25	HNu=0ppm BG=40cpm
	1120 102948 9/15/92	7 12 20	5	Stiff. 2.5Y(N5/1) Gray gravelly clay, low plasticity, moist	cl	1.5	HNu=0ppm BG=40cpm
38 39	1130 102949 9/15/92	4 10 20	12	SAA, V Stiff Bottom 2" sand mud in	cl	2.25	HNu=0ppm BG=40cpm
40	1320 102950 9/15/92	19 17 16	10	Dense. 2.5Y(N5/1) Gray clayey sand, very fine	SC	NA	HNu=0ppm BG=40cpm
41 42	1345 102951 9/15/92	6 10 17	9	V. Stiff. 2.5Y(N5/1) Gray silty gravelly clay w/ fine sand. No plasticity moist.	cl	2.0	HNu=0ppm BG=40cpm
43	1400 102952 9/15/92	10 12 19	15	Hard. 2.5Y(N5/1) Gray gravelly clay, no plasticity, moist	cl	4.0	HNu=0ppm BG=40cpm
44	1410 102953 9/15/92	10 15 19	3	V. Stiff. 2.5Y(N5/1) Gray gravelly silty clay, low plasticity moist	cl	2.5	HNu=0ppm BG=40cpm

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PRELIMINARY

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/13/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/13/92
DRILLING METHODS: Cable Tool			PAGE 4 OF 21

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	1425 102954 9/13/92	8 17 22	17	V. Stiff. 2.5Y(N5/1) Gray silty gravelly clay, low plasticity, moist	Cl	2.5	HNu = 0 ppm BG = 60 cpm
47 48	1445 102955 9/13/92	20 30 32	14	SAA	Cl	2.25	HNu = 0 ppm BG = 40 cpm
49	1505 102956 9/13/92	16 27 36	18	SAA	Cl	2.5	HNu = 0 ppm BG = 60 cpm
50 51	1620 102957 9/13/92	16 20 20	8	V. Stiff. 2.5Y(N5/1) Gray, sandy gravelly clay, low plasticity, moist.	Cl	2.5	HNu = 0 ppm BG = 60 cpm
52	1650 9/13/92 102958 9/13/92	7 13 21	0	No Recovery	NA	NA	HNu = NA BG = NA
53 54	1645 102959 9/13/92	11 17 30	12	V. Stiff. 2.5Y(N5/1) gray silty gravelly clay, low plasticity moist	Cl	2.25	HNu = 0 ppm BG = 60 cpm
55	1655 102959 9/13/92	7 12 22	16	SAA	Cl	2.0	HNu = 0 ppm BG = 60 cpm
56 57	1700 102960 9/13/92	8 12 16	14	SAA	Cl	2.0	HNu = 0 ppm BG = 60 cpm
58	1710 102961 9/13/92	4 8 13	18	Stiff. 2.5Y(N5/1) gray clay mod. plasticity, moist.	Cl	1.5	HNu = 0 ppm BG = 60 cpm
59	1725 102962 9/13/92	20 50/2	9	Top 2" SAA V. Dense. 10YR(5/6) Yellowish brown, clayey silt, moist	ml	NA	HNu = 0 ppm BG = 60 cpm

PRELIMINARY

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/16/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/15/92
DRILLING METHODS: Cable Tool			PAGE 5 OF 21

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	1025 102963 9/16/92	20 28 30	8	V. Dense, 2.5Y (6/4), light olive brown, silty sand, poorly graded, dry, [illegible]	SP	NA	HNu = 0ppm BG = 40ppm
62				Begin sampling every 5ft. See next page			HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =
							HNu = BG =

PRELIMINARY

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:	DATE 9/16/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 9/9/92	
ENGINEER/GEOLOGIST D. O'Brien	Depth Date/Time	DATE COMPLETED: 10/15/92	
DRILLING METHODS: Cable Tool		PAGE 11 OF 21	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16.5	1115 102964 9/16/92	50/5	5	V. dense. 2.5Y(5/4) Light olive brown, med. grained sand, poorly graded, dry	SP	NA	HNU = 0 ppm BZ = 10 ppm
20	1505 102965 9/16/92	15 20 25	7	SAA, dense	SP	NA	HNU = 0 ppm BZ = 10 ppm
25							
25	1345 102966 9/16/92	7 50/3	5	SAA, v. dense.	SP	NA	HNU = 0 ppm BZ = 10 ppm
26.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Crew: Craig Coulter, Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/16/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/14/92
DRILLING METHODS: Cable Tool			PAGE 7 OF 21

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
81.5	1415 102967 9/16/92	30 50/2	6	V. Dense. 2.5Y(5/4) Light olive brown ~~gray~~ ~~9/16/92~~ medium grained sand ~~ulgrank, poorly~~ graded, dry	SP	NA	HNU=0ppm BS=60ppm
88							
88.5	1540 102968 9/16/92	20 50/2	5	V. Dense. 2.5Y ~~(5/4)~~ Light olive brown sand ~~medium~~ well graded, moist	SW	NA	HNU=0ppm BS=40cpm
90							
91.5	1615 102969 9/16/92	36 50/4	8	SAA, wet	SW	NA	HNU=0ppm BS=40cpm ~~Wet water table~~ OSD 9/16/92

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/17/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/13/92
DRILLING METHODS: Cable Tool			PAGE 8 OF 21

DEPTH (ft) DSS	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
9/17/92	0924K 1029T1 9/17/92	16 27 50	5	V. Dense. 2.5Y (5/4) Light olive brown, gravel w/sand, wet	SW	NA	HNU = 0 ppm BZ = 40 ppm
96.5							
				PRELIMINARY			
100	0988 1029T2 9/17/92	20 32 40	5	V. Dense. 2.5Y (5/4) Light olive brown, med. grain sand, with gravel, wet	SP	NA	HNU = 0 ppm BZ = 100 ppm
103							
103	1035 1029T3 9/17/92	20 30 45	5	V. Dense. 2.5Y (5/4) Light olive brown, gravel w/sand, wet	SP	NA	HNU = 0 ppm BZ = 100 ppm
105.5							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/17/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/12/92
DRILLING METHODS: Cable Tool			PAGE 9 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
102977 9/19/92	23 20	23 20 16	10	Dense. 2.5Y (5/4) Light olive brown coarse sand w/ gravel, well graded, wet	SW	NA	HNU=0ppm BG=60cpm
111.5							
113							
	08335 102976 9/13/92	6 9 11	18	M. Dense. 2.5Y (6/1) Gray med. grain sand with gravel well graded, wet	SP	NA	HNU=0ppm BG=40cpm
120							
	0925 102977 9/13/92	18 32 42	18	V. Dense. SAA		NA	HNU=0ppm BG=40cpm
121.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Crew: Craig Coulter, Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE: 9/18/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/1/92
DRILLING METHODS: Cable Tool			PAGE 10 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
124.5	1050 102970 9/18/92	5 7 10	18	M. Dense, Dry (6/1) Gray mud grained sand w/gravel, poorly graded, loose	SP	NA	HNU = 0 ppm BG = 40 cpm
				PRELIMINARY			
130	1135 102978 9/18/92	10 13 23	18	SAA	SP	NA	HNU = 0 ppm BG = 40 cpm
135	1205 102980 9/22/92	7 13 22	~~18~~ 10 ~~9/22/92~~	SAA	SP	NA	HNU = 0 ppm BG = 40 cpm
136.5							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 8/22/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 9/13/92
DRILLING METHODS: Cable Tool			PAGE 11 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 FOOT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
141.5	1110 102881 9/9/92	7 13 16	18	Med. Dense 5Y(6/1) Gray, med. fine sand w/gravel, (poorly graded, wet	SP	NA	HNU=0ppm BZ=0ppm
143							
1.5	1130 102883 9/9/92	15 13 21	13	SAA Bottom 2" large gravel	SP	NA	HNU=0ppm BZ=0ppm
150							
151.5	1630 102884 9/9/92	12 29 37	8	V. Dense 5Y(6/1) gray coarse sand w/some fine gravel well graded, wet	SW	NA	HNU=0ppm BZ=0ppm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

89

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/22/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/18/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/15/92
DRILLING METHODS: Cable Tool			PAGE 12 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
115.5	0900 12983 9/23/92	10 20 22	10	Dense BY (6/1) Gray coarse sand w/gravel, well graded, wet	SW	NA	HNU = 0 ppm BZ = 60 cpm
160	0935 12986 9/23/92	11 13 22	10	SAA	SW	NA	HNU = 0 ppm BZ = 40 cpm
165.5	1445 9/23/92	89/3	0	No Recovery	NA	NA	

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE: 9/23/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/14/92
DRILLING METHODS: Cable Tool			PAGE 13 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
171.5	1746 10289 9/23/92	50 50/3	8	V. Dense. 5Y(6/1) Gray coarse sand to gravel, poorly sorted wet	SP	NA	HNU = 0ppm BS = 100cpm
175	1748 10289 9/23/92	50 50 50	13	V. Dense. 5Y(5/1) Gray med ground sand w/gravel, some silt, poorly sorted, wet 9/23/92	SP	NA	HNU = 0ppm BS = 100cpm
180	1750 10290 9/24/92	22 24	12	Dense 5Y(6/1) Gray med grain sand w/gravel, some silty, poorly sorted, wet			
181.5							

PRELIMINARY

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602..04.27	PROJECT NAME: RCRA Phase I		
ING NUMBER: 4424	COORDINATES:	DATE 9/24/92	
ATION:	GWL: Depth Date/Time	DATE STARTED: 9/9/92	
E INEER/GEOLOGIS D. O'Brien	Depth Date/Time	DATE COMPLETED: 10/15/92	
DRILLING METHODS: Cable Tool		PAGE 14 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
17	0930 102991 9/24/92	50/3	10	V. Dense. 5Y(4/1) Gray med. grained sand, poorly graded wet	SP	NA	HNU=0ppm BS=60cpm
190	0930 102992 9/25/92	9 34 50	11	V. Dense 5Y(4/1) Gray coarse sand, well graded, wet Bottom 3" v. fine sand	SW	NA	HNU=0ppm BS=60cpm
195	0940 102994 9/25/92	15 30 55	18	V. Dense 5Y(4/1) Gray coarse sand w shell fragments, wet	SW	NA	HNU=0ppm BS=60cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/25/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/1/92
DRILLING METHODS: Cable Tool			PAGE 13 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
198	1805 102995 9/25/92	95 73	16	V. Dense. 5Y (4/1) Gray med grain to coarse & then fine, well graded, wet	SW	NA	HNU = 0 ppm BG = 60 cpm
199 199.5	1625 102996 9/25/92	7 9 15	14	m. dense 5Y (6/1) Gray, med. grain to coarse gravelly sand, well graded, wet	SW	NA	HNU = 0 ppm BG = 60 cpm
200 201	1700 102997 9/25/92	8 12 15	18	m. dense 5Y (6/1) Gray coarse to fine to medium sand w/ trace gravel, well graded, wet	SW	NA	HNU = 0 ppm BG = 60 cpm
201.5 202 203	0925 102998 9/28/92	20 43 50	13	V. Dense, SAA	SW	NA	HNU = 0 ppm BG = 60 cpm
203	0945 102999 9/28/92	23 24 50	12	V. Dense, 5Y (6/1) Gray medium sand w/ fine gravel, well graded, wet	SW	NA	HNU = 0 ppm BG = 60 cpm
204 205	1050 103000 9/28/92	25 32 49	16	SAA	SW	NA	HNU = 0 ppm BG = 60 cpm
				Resume 5ft. sampling see next page			HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter, Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PRELIMINARY

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/28/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/15/92
DRILLING METHODS: Cable Tool			PAGE 11 OF 21

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
211.5	1145 10309 9/28/92	7 14 21	18	M. Dense. 5Y(6/1) Gray mud grained to fine w/gravel ~~[illegible]~~ well sorted, ~~[illegible]~~ ~~[illegible]~~	SW	NA	HNU = 0 ppm BZ = 40 cpm
215							
216.5	1480 103003 9/28/92	5 16 46	18	SAA	SW	NA	HNU = 0 ppm BZ = 40 cpm
220							
221.5	1530	23 24 40	0	No Recovery.	NA	NA	

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/28/92
LOCATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/15/92
DRILLING METHODS: Cable Tool			PAGE 17 OF 21

DEPTH 1:41	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
000 9/28/92	1645	13 16 27	0	No Recovery	NA	NA	
226.5							
				PRELIMINARY			
230	1625	50 62	0	No Recovery	NA	NA	
233				Begin continuous sampling on next page.			
235							
236.5							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48.20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 9/30/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/1/92
DRILLING METHODS: Cable Tool			PAGE 18 OF 21

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
232	1405 103004 9/30/92	50/0	13	V. Dense Sy(oli) Gray fine sand poorly sorted, wet	SP	NA	HNU = 0 ppm BG = 60 cpm
233 234	1430 103005 9/30/92	16 33 50	18	SAA	SP	NA	HNU = 0 ppm BG = 60 cpm
235 236	1445 103006 9/30/92	20 37 50	13	SAA	SP	NA	HNU = 0 ppm BG = 60 cpm
237	0930 103008 10/1/92	35 47 50	12	SAA	SP	NA	HNU = 0 ppm BG = 60 cpm
238	0945 103009 10/1/92	42 50 50	13	SAA	SP	NA	HNU = 0 ppm BG = 40 cpm
239 240	1015 103010 10/1/92	15 34 46	18	SAA	SP	NA	HNU = 0 ppm BG = 40 cpm
	~~1240 103011~~	~~4 24 50~~	~~18~~	~~SAA~~ DSO 10/1/92 5ft. sampling [illegible] see next page	~~SP~~	~~NA~~	HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =

PRELIMINARY

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4424	COORDINATES:		DATE 10/1/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 9/9/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/1/92
DRILLING METHODS: Cable Tool			PAGE 19 OF 21

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
246.5	1340 103011 10/1/92	16 24 50	18	V. Dense. 5Y (6/1) Gray fine to med. grained sand. poorly sorted. Wet	SP	NA	HNU=0 ppm BZ=60 ppm
				PRELIMINARY			
250	1310 03017 10/1/92	171/3	2	Weathered limestone	NA	NA	
				Boring terminated at 250 ft.			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

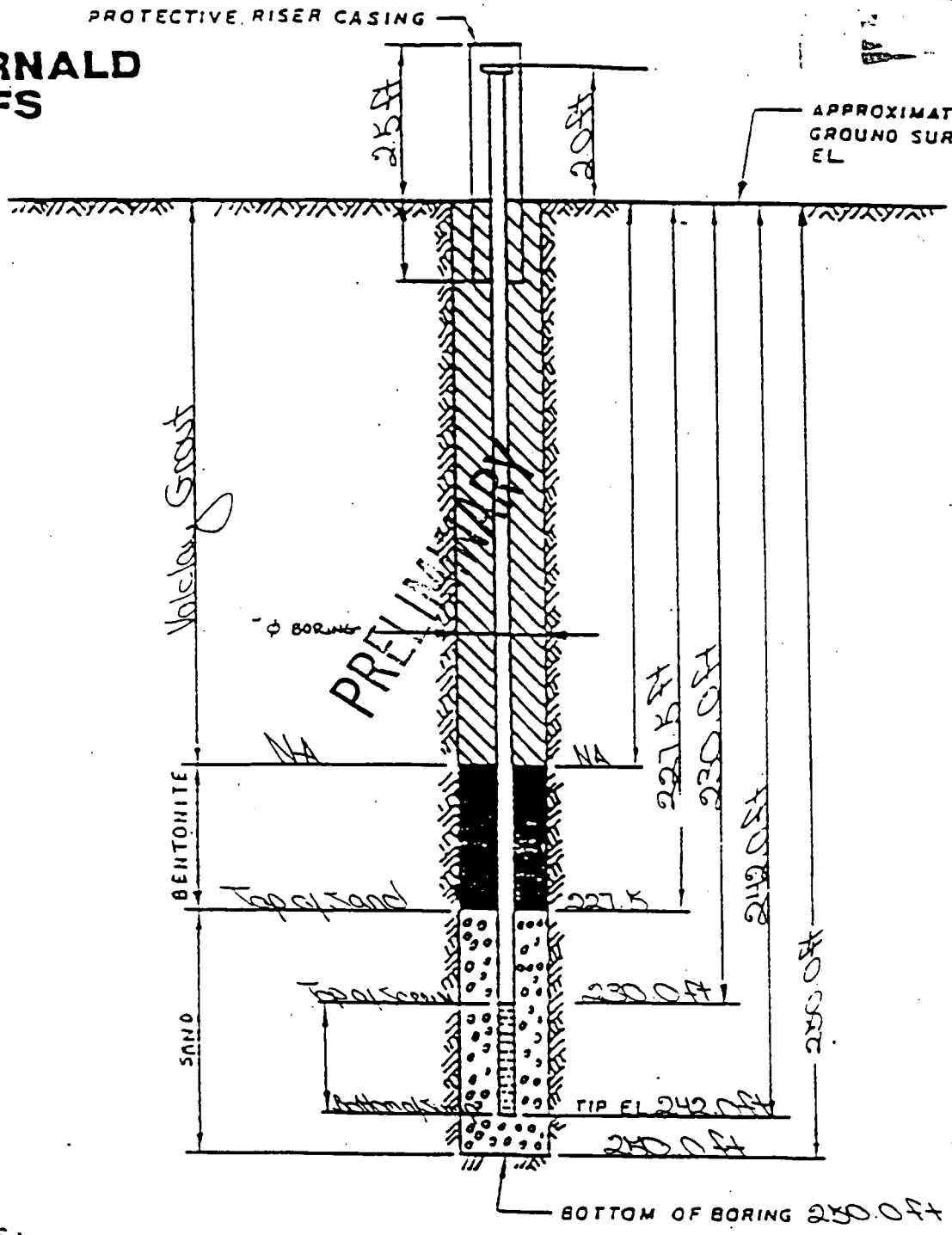
Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

20 of 21

48 20

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D. 316 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 96.7 ft
5. WATER LEVEL READING ON 10-7-92

Materials Used During Installation

22 bags of 10/20 sand
75 bags of volclay grout
3000 gallons of water

37 soil drums 2 water drums

INSTALLATION DETAILS
MONITORING WELL # 4424

PREPARED FOR
FMPC RI/FS

DRAWING NUMBER

CHECKED BY

APPROVED BY

98

FERNALD RI/FS

21 0421

PIEZOMETER INSTALLATION SHEET 48 20

PROJECT NAME RCRA Phase 1 FIELD ENG./GEO. D. O'Brien DATE 10/15/90
PROJECT NO. 1002 04 27 CHECKED BY _____ DATE _____
BORING NO. 4424
PIEZOMETER NO. 4424 DATE OF INSTALLATION 10/15/90

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Chisel Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID water FROM 0.0 ft TO 100 ft	SIZE 8 in FROM 0.0 ft TO 250 ft
FLUID ____ FROM ____ TO ____	SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 23-10ft 1-2ft
AVERAGE SIZE OF PERFORATIONS 0.010 in	JOINING METHOD Flush joint
TOTAL PERFORATED AREA ____ ft	threaded

PRELIMINARY

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION hinged locking cover
PROTECTIVE PIPE O.D. 10 3/4 in	with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 227.5	TOP	BOTTOM
BENTONITE	~~TOP 0.0~~	BOTTOM 227.5	TOP	BOTTOM
SAND	TOP 227.5	BOTTOM 242.0	TOP	BOTTOM
GRAVEL	TOP 227.5	BOTTOM 242.0	TOP	BOTTOM
PERFORATED SECTION	TOP 230.0	BOTTOM 240.0	TOP	BOTTOM
PIEZOMETER TIP	242.0			
BOTTOM OF BOREHOLE	250.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

48 20

B4424

Customer Number 103013

MATERIAL: _____ SAMPLE NUMBER: 921002-001

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 171.2

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	4.59	2.7	2.7	78.7
20	5.13	3.0	5.7	33.5
40	37.21	21.7	27.4	16.7
60	72.35	42.3	69.7	9.8
100	26.22	15.3	85.0	5.9
200	14.03	8.2	93.2	3.0
Pan	10.72	6.3	99.5	

PRELIMINARY

$\frac{W_2 \times 100\%}{W_1} = R$

$\left| \frac{\text{Original} - \text{Duplicate}}{\text{Average}} \right| \times 100\% = \text{RPD}$

Analyzed by: John Robert

Checked by: [signature]

Date analyzed: 10-2-92

Grain Size 40% Retained ~~21~~ 13 .001 inch

50% ~~17~~ 11

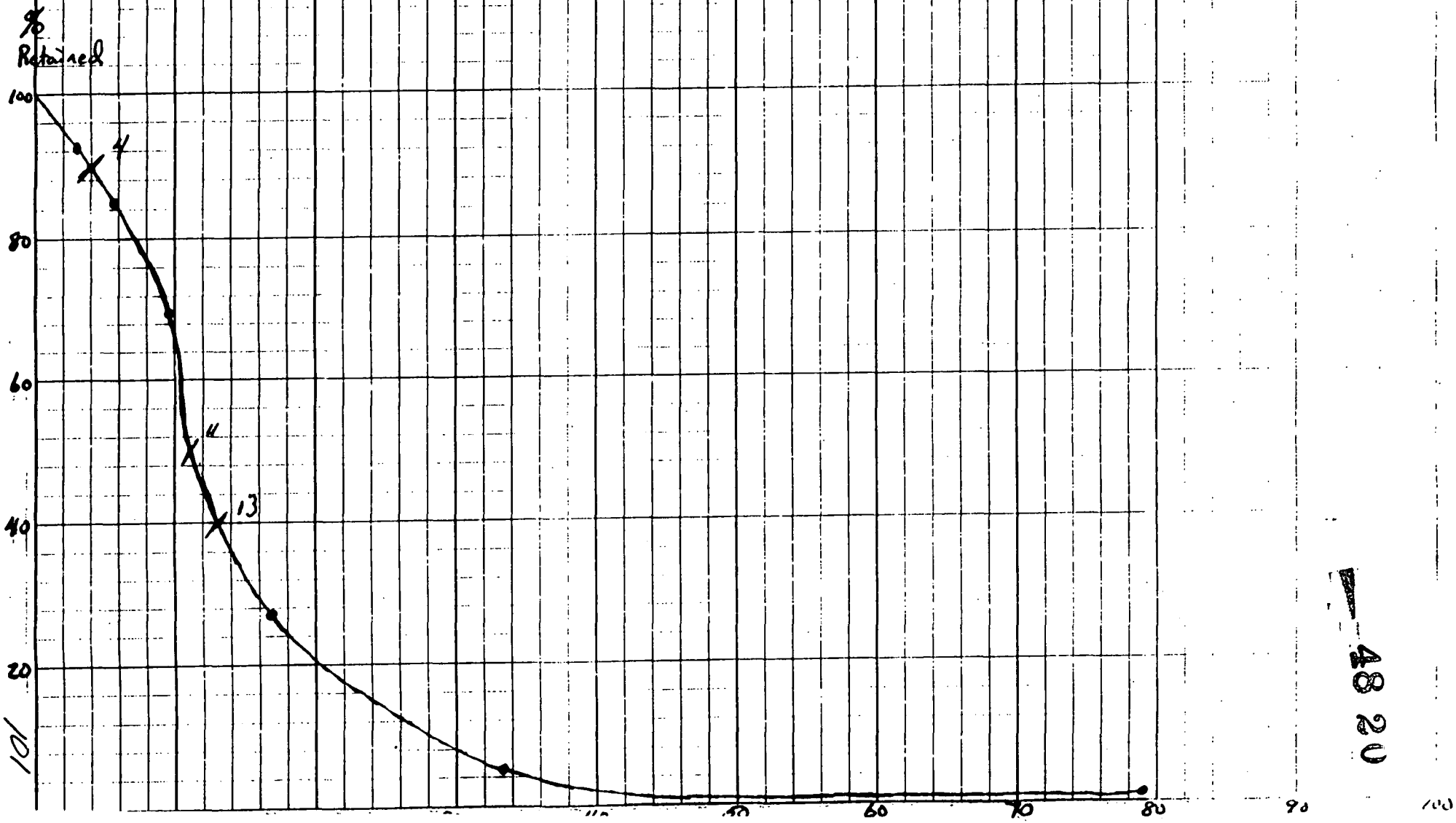
90% 4

JLR 10-2-92

MW-4424

Reproduced For Clarity

BJS 7-24-93



48 20

101

48 20

Sieve Analysis Calculations

40% = 13 50% = 11

90% = 4

40%90% ratio = $\frac{13}{4}$ = 3.25

3.25 > 3 use factor of

.011 x 4 = .44

PRELIMINARY

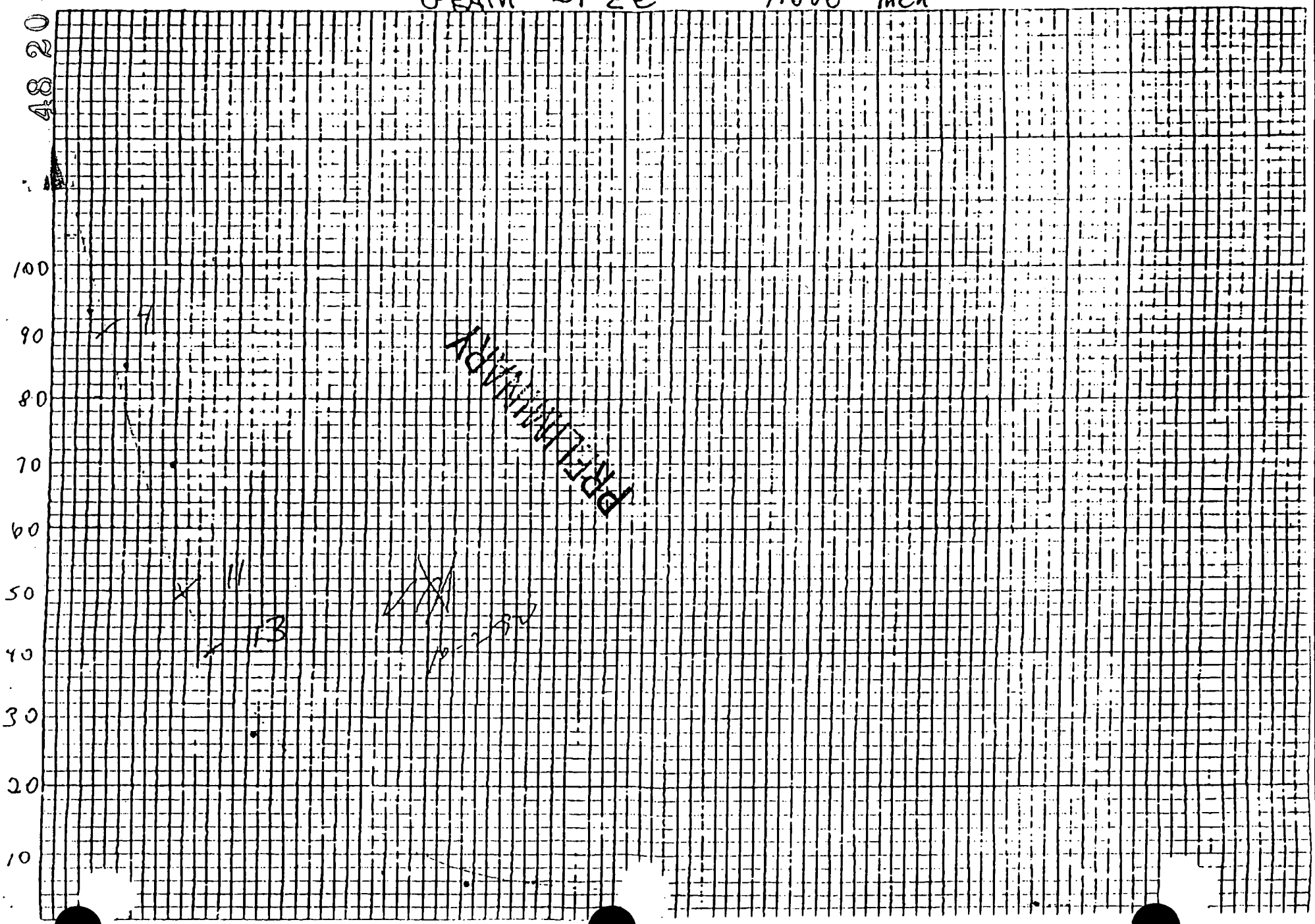
use mid sand

NO 340/ .10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.

U 77.7

103

Grain Size 1/1000 inch



FAX NO. 5137395667
WMCO ANALYTICAL
P. 01

48 20

Monitoring Well 2051

Location #3

Write out correction were made by L. W. Willis at the time

FERNALD RI/FS 2/4/89

48 20 #24

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B2051 B2051, UD	COORDINATES: N 481597.05 E 1383279.97	DATE: Nov 12, 1987
ELEVATION: 607.38 ground	GWL: Depth Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable tool		PAGE 1 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				Detailed Soil Classification refer to Boring 3051			Consistency and density based on relative soil texture
5				hard brownish yellow 10YR 6/8 clay, some silt, and gravel, trace sand and pebbles-dry	cl	NA	
10	ST Dry	1.0	1.0				Sample # 07425 10-14-87 @ 0800
				16.0			
				hard gray 10YR 5/1 clay, some gravel and silt, trace sand and pebbles-dry			
15					cl	NA	
20	ST	1.0	0.0				pushed shelby tube at 20 ft, NO RETURN, tried again at 22.0 ft. 10-14-87 @ 1115 sample # 07426
	ST Dry	1.0	0.9				
25							

NOTES:
Pennsylvania Drilling Co
Driller Dave Neumann
Helper Bob Johnson
Drilling Rig Bucyrus Erie W24
water added to boring: 450 gallons

Shelby tube sampling follow ASTM Standard for undisturbed 2 in diameter, thin wall, 2 foot sampling tube
Background γ: 2cpm HNU: 0ppm
2B: 140cpm

105

FERNALD RI/FS

yp 2/4/89

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B251~~ B2051	COORDINATES: See p1		DATE: Nov 18, 1987
ELEVATION: See p1	GWL: Depth	Date/Time	DATE STARTED: Nov 12, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth	Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable Tool			PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
35				stiff gray 10YR 5/1 ~~g30~~ mottled brown 10YR 4/2 gravelly clay some silt and gravel, trace pebbles-dry	cl	NA	No ~~soil~~ soil samples collected
40							
45				46.0			
50				dense gray 5YR 5/1 sand and gravel mixed with gray silty clay, some pebbles-dry	SM	NA	
				53.0			
55				dense gray 5YR 5/1 sand and gravel some silt, clay and pebbles-moist	SM	NA	

NOTES:

FERNALD RI/FS JJ 2/4/89

48

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B25+ B02 B2051	COORDINATES: See p1		DATE: Nov 19, 1987
ELEVATION: See p1 BB 1-5-89	GWL: Depth	Date/Time	DATE STARTED: Nov 2, 1987
ENGINEER/GEOLOGIST: Lowell Witte	Depth	Date/Time	DATE COMPLETED: Nov 19, 1987
DRILLING METHODS: Cable tool			PAGE 3 OF 4

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (NA)	RECOVERY (NA)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				dense gray 5YR 5/1 sand and gravel, some silt and clay - trace pebbles - moist			no soil samples collected
65							
					SW	NA	
70							
75							
80				very dense gray 5YR 5/1 sand, some gravel and silt, trace clay and pebbles - moist	SW		very hard drilling
85						NA	

NOTES:

FERNALD RI/FS

JJ 2/4/89

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B251~~ B205/ BB 1-54	COORDINATES: See p1	DATE: Nov 16, 19, 87	
ELEVATION: See p1	GWL: Depth Date/Time	DATE STARTED: Nov 12, 1987	
ENGINEER/GEOLOGIST: Lowell Wille	Depth Date/Time	DATE COMPLETED: Nov 19, 1987	
DRILLING METHODS: Cable Tool		PAGE 4 OF 4	

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
95				dense gray 7½YR 6/0 sand and gravel, some silt, clay and pebbles – ~~dr~~ wet	Sm	NA	No soil samples collected
100							
105				105.0			
				bottom of boring			
110							
115							

NOTES

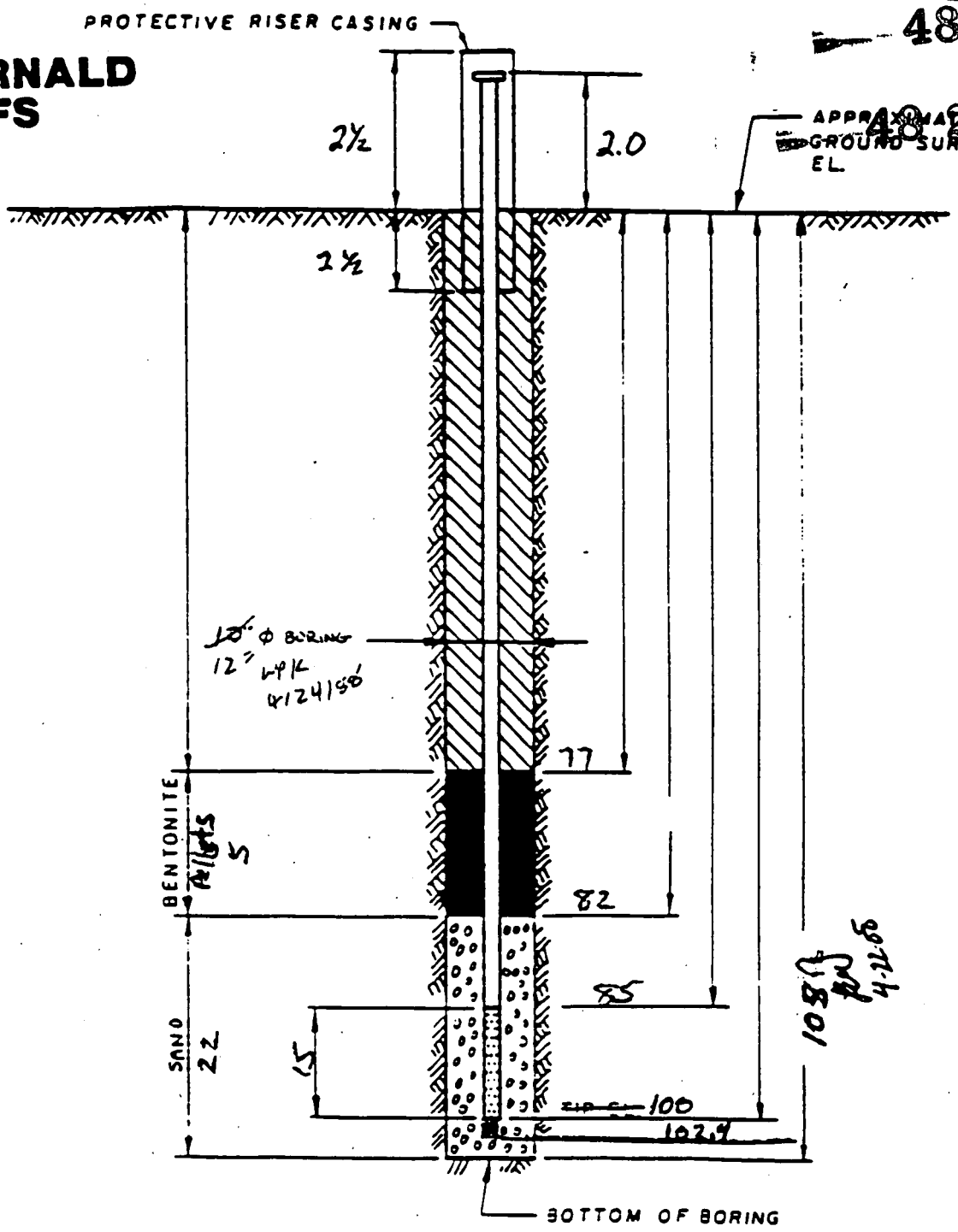
108

2/4/89

WELL ~~251~~ 2051 BB 1-5-89 #24

48 20

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. stainless steel PIPE CONTINUOUS SLOT SCREEN (0.010 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED. Stainless steel
4. ELEVATION OF WATER LEVEL 91.7 below top of casing
5. WATER LEVEL READING ON Aug 19, 1987

INSTALLATION DETAILS
MONITORING WELL ~~251~~ 2051

PREPARED FOR BB 1-5-89

DRAWING NUMBER

CHECKED BY

APPROVED BY

109

FERNALD RI/FS

2/4/89

48 20

	Initial	Date
File Copy		
File Copy		
Hard Copy Transmittal		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS
PROJECT NO. 602.3.2
BORING NO. ~~B251~~ B2051 BB 1-5-89
PIEZOMETER NO. 2051

FIELD ENG./GEO. Lowell Wille DATE Nov 19, 1987
CHECKED BY R Galbreith DATE 2/6/89
DATE OF INSTALLATION Nov 17, 18 and 19

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED:
FLUID NA FROM ____ TO ____
FLUID — FROM — TO —

TYPE OF BIT NA
CASING SIZE (S) USED NB 3-21-90
SIZE ~~[illegible]~~ FROM NA TO ____
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA ____

RISER PIPE MATERIAL Stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in
LENGTH OF PIPE SECTIONS 10 ft
JOINING METHOD Screw FLUSH JOINT THREADS.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION NA locking cap and lock.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION (FT) MSL	
TOP OF RISER PIPE	~~2.5~~ 2.0 RMT 2/6/89		609.38	
GROUND SURFACE	0.0		607.38	
BOTTOM OF PROTECTIVE PIPE	2.5		604.88	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP RMT 2/6/89 0	BOTTOM RMT 2/6/89 77 ~~78~~	TOP 607.38	BOTTOM 530.38
BENTONITE	TOP 77 ~~78~~	BOTTOM 82	TOP 530.38	BOTTOM 525.38
SAND	TOP 82	BOTTOM 105 ~~100~~ 3-21-91	TOP 525.38	BOTTOM 502.38
NO GRAVEL USED.	TOP NA	BOTTOM NA	TOP NA	BOTTOM NA
PERFORATED SECTION	TOP 85	BOTTOM 100	TOP 522.38	BOTTOM 507.38
PIEZOMETER TIP	102.4		504.98	
BOTTOM OF BOREHOLE	~~103.5~~ 105	4-22-88	502.38	
GWL AFTER INSTALLATION	91.7 top of casing			

THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

110

48 20

Monitoring Well 3425

Location #3

///

FEMP
WELL PLUGGING & ABANDONMENT RECORD

4820

ATTACH COPIES OF FIELD ACTIVITY LOGS

TIME/DATE INITIATED:	TIME/DATE COMPLETED:
9-7-93 @ 1030	9-10-93 @ 1500

SUBCONTRACTOR/DRILLER AND ADDRESS: Fernco Site Characterization, 7400 Willey Rd., Fernald, Ohio 45030 — Field activities preformed by Pennsylvania Drilling Co.

WEATHER CONDITIONS: Cool + Sunny 68°-74°F

WELL LOCATION	WELL ID: 3425	STATE PLANAR COORDINATES: N481598.06 E1383269.05
	GEOGRAPHIC DESCRIPTION: FERMCO east field, east side, near fence line.	

WELL DESCRIPTION: 4 inch I.D. Stainless steel casing to depth of 164 feet.

REASON FOR ABANDONMENT: The well is grout contaminated.

TOTAL DEPTH OF WELL:	CALCULATED TOTAL WELL VOLUME:
164 ft	13.18 cubic feet

DEPTH AND DESCRIPTION OF EACH LAYER OF SEALING AND BACKFILL MATERIAL USED INCLUDING AMOUNT USED: 10 bags of Volclay grout used to seal borehole from 2.5 to 51 feet. 23 gallons of water mixed with each bag of grout. 3'x3'x24 inch concrete cap with metal pin and number (3425) painted on top. 6 inches of soil over concrete cap leveled to grade.

DEVIATIONS FROM THE P&A PLAN OUTLINED ON THE "WELL PLUGGING & ABANDONMENT REQUEST FORM": The hole was not overdrilled per CRUS request.

DOES INSTALLATION DIAGRAM CONCUR WITH WELL CHARACTERISTICS NOTED IN FIELD? PROVIDE DETAIL: Yes. No deviations noted.

DESCRIBE DISPOSITION OF MATERIALS REMOVED FROM WELL SITE: Riser pipe and well protective casing removed by Penn Drill. 3 drums comprising of a mixture of grout + soil to be moved to Bldg 64. Concrete pad to be picked up by construction.

COMMENTS AND OBSERVATIONS: None

ON-SITE GEOLOGIST (OR DESIGNEE):

NAME PRINTED	DATE	SIGNATURE	DATE
Robert Thomas	9/13/93	Robert Thomas	9/13/93

RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 102 04.27	PROJECT NAME: RCRA phase I	
BORING NUMBER: 3428	COORDINATES:	DATE 12/3/92
ELEVATION:	GWL: Depth 70.74 ft Date/Time 12/14/92 1030	DATE STARTED: 11/20/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth Date/Time	DATE COMPLETED: 12/14/92
DRILLING METHODS: Cable Tool		PAGE 1 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				For descriptions of soils to 150.0 ft refer to boring log 4428			
75.0							
150.0							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cirkne

Driller: Craig Coulter, Kevin Myers

SAA - Same as above
NA - Not Applicable

FWPC 0/5 3/16/93

113

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 3425	COORDINATES:		DATE 11/30/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 11/30/92
ENGINEER/GEOLOGIST K. Geiger	Depth	Date/Time	DATE COMPLETED 12/14/92
DRILLING METHODS Cable Tool			PAGE 2 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150	0920 11/30/92	26 35 50/5	7	Very Dense Grayish Brown (10YR 5/2) Poorly Graded medium Sand with some Gravel, wet	SP	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
151.5	103086 1000 11/30/92	19 37 50/5	12	Very Dense Grayish Brown (10YR 5/2) Poorly Graded Gravelly Sand wet	SP	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
153.0	103086 1030 11/30/92	31 41 50/5	13	Very Dense Grayish Brown (10YR 5/2) well Graded Medium Sand with some Gravel wet	SW	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
154.5	103086 1110 11/30/92	27 34 50/5	14	Very Dense Grayish Brown (10YR 5/2) well Graded Medium Sand with Trace of Gravel wet	SW	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
156	103086 1405 11/30/92	50/4	4	Very Dense Grayish Brown (10YR 5/2) well Graded medium Sand with some Gravel wet	SW	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
157.5	103086 1440 11/30/92	36 41 50/5	16	Very Dense Grayish Brown (10YR 5/2) well Graded medium Sand with Trace of Gravel wet	SW	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
159.0	103086 1530 11/30/92	37 45 50/5	12	Very Dense Grayish Brown (10YR 5/2) well Graded medium Sand with Trace of Gravel, wet	SW	N/A	HNU = 1 ppm BZ = 40 cpm α = 0 cpm
160.5				For descriptions of soils refer to boring log 4425			
162							
163.5							
165				Boring terminated at 165.0 ft			

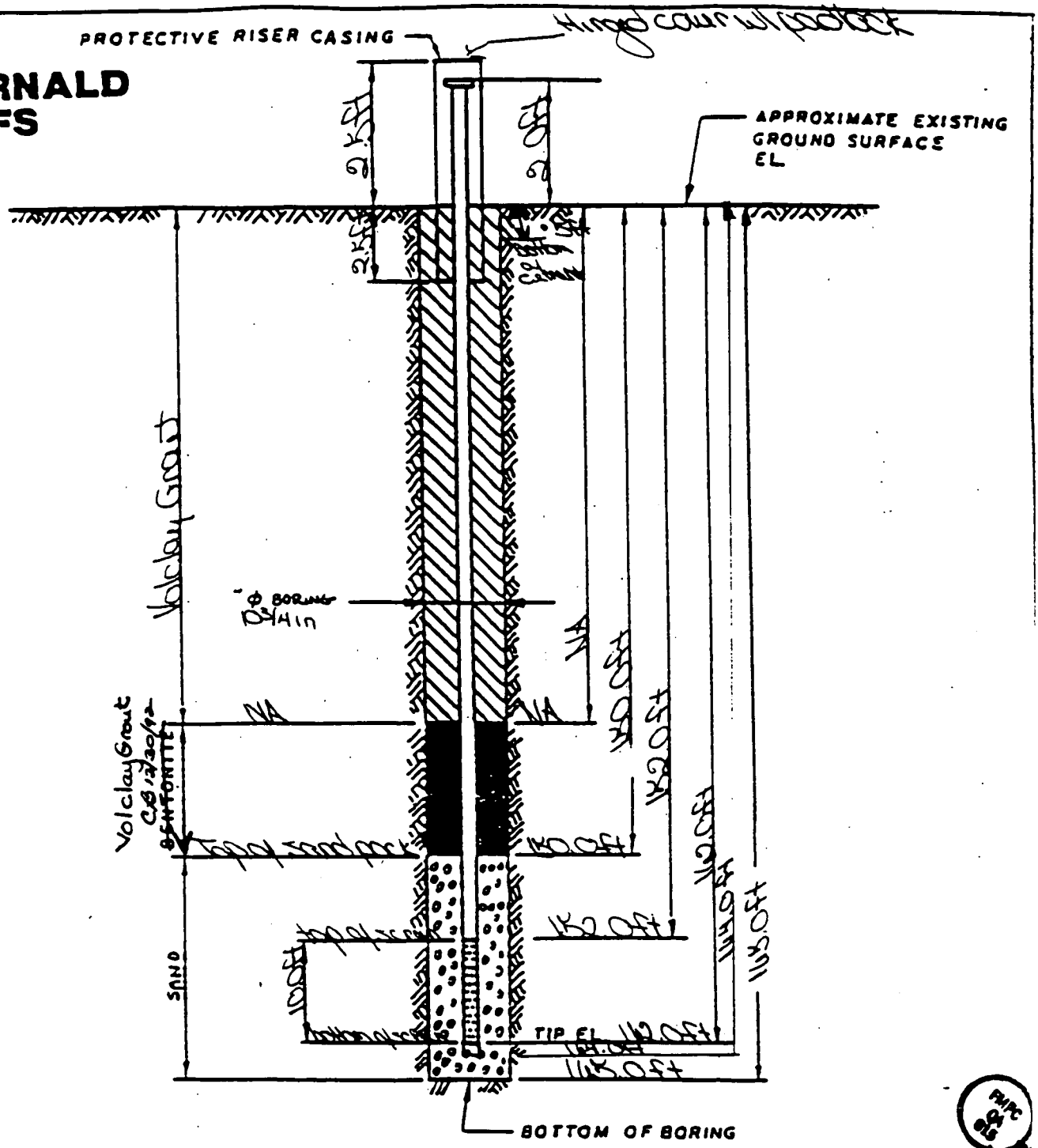
NOTES

114

3/10/93

48 20 30/4

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE 316SS PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN 316SS PIPE CONTINUOUS SLOT SCREEN (0.020 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 80.74 ft
5. WATER LEVEL READING ON 12/14/92

Materials used during well installation:
15 bags of sand
50 bags of volclay grout
2500 gal. of water

INSTALLATION DETAILS
MONITORING WELL ~~7345~~

PREPARED FOR
FEMP RI/FS

115

316 S. pipe: 1-10ft screen w/ 2.0ft sump, 15-10ft, 2-2ft 20-soil drums

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRN BY

FERNALD RI/FS

404

PIEZOMETER INSTALLATION SHEET

48 20

PROJECT NAME RCRA phase 1 FIELD ENG./GEO. D. O'Brien DATE 12/14/92
PROJECT NO. 102.04.27 CHECKED BY C. Brien DATE 12/30/92
BORING NO. 3423
PIEZOMETER NO. 3423 DATE OF INSTALLATION 12/14/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Chisel Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID water FROM 0.0 ft TO 90.0 ft	SIZE 10 in FROM 0.0 ft TO 100 ft
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 stainless steel
DIAMETER OF PERFORATED SECTION 4 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in.
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 13-10 ft 2-3 ft
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD Flush joint threaded
TOTAL PERFORATED AREA 10 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 3 ft	OTHER PROTECTION hinged locking cover
PROTECTIVE PIPE O.D. 10 3/4 in	with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	CB 12/30/92 ~~2.5~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
volcanic GROUT/SLURRY	TOP 0.0	BOTTOM 0.5	TOP	BOTTOM
	TOP 0.5	BOTTOM 1100	TOP	BOTTOM
BENTONITE did not use	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND 4/30	TOP 1100	BOTTOM 1164.0	TOP	BOTTOM
GRAVEL - none used	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 1132.0	BOTTOM 1162.0	TOP	BOTTOM
PIEZOMETER TIP	1164.0 ft			
BOTTOM OF BOREHOLE	1165.0 ft			
GWL AFTER INSTALLATION	70.74 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

	Initial
Field Check	CB
1st Review	
2nd Review	
Hard Copy Verification	

FMPC QA 115

48 20

Monitoring Well 31217

Location #3

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER. 04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER. 31217	COORDINATES:	DATE 8-10-93
ELEVATION:	GWL: Depth 94.94' Date/Time 8-20-93/830	DATE STARTED 8-10-93
ENGINEER/GEOLOGIST Ken Geiger	Depth 87.95 Date/Time 8-30-93/850	DATE COMPLETED 8-25-93
DRILLING METHODS Cable Tool		PAGE 1 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0				For Description see Log for Boring 3425 0.0' – 152.0'			
152.0							

NOTES

Drilling Company: Pennsylvania Drilling
Driller: Craig Coulter
Helper: Rick Thomas

Samples collected per ASTM standard Penetration Test. Colors Identified Using Munsell Color Chart

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 0427	PROJECT NAME. RCRA Phase I	
BORING NUMBER 3/217	COORDINATES.	DATE 8-18-93
ELEVATION:	GWL: Depth 94.94' Date/Time 8-20-93/830	DATE STARTED 8-10-93
ENGINEER/GEOLOGIST Ken Geiger	Depth 87.95 Date/Time 8-30-93/850	DATE COMPLETED: 8-25-93
DRILLING METHODS: Cable Tool		PAGE 2 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6"	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
152	104751 1100 8-18-93	36 50/2	7	Very Dense, Dark Gray (2.5Y, 4/1) well Graded Sand with Some Gravel, wet	SW	NA	mT = 0ppm βγ = 60 cpm
153.5	104752 1420 8-18-93	14 50/3	6	Very Dense, Dark Gray (2.5Y, 4/1) Poorly Graded Fine Sand with a Trace of Gravel, wet	SP	NA	mT = 0ppm βγ = 60 cpm
155.0	104753 1455 8-18-93	15 20 50/3	7	Very Dense, Dark Gray (2.5Y, 4/1) well Graded Sand with Some Gravel, wet	SW	NA	mT = 0ppm βγ = 60cpm
156.5	104754 1535 8-18-93	47 50/3	7	Very Dense, Dark Gray (2.5Y, 4/1) well Graded Sand with Some Gravel, wet	SW	NA	mT = 0ppm βγ = 60cpm
158.0	104755 1605 8-18-93	50/4	4	Very Dense, Dark Gray (2.5Y, 4/1) well Graded Sand with Some Gravel and a Trace of Clay, wet	SW	NA	mT = 0ppm βγ = 60-80cpm
159.5	104756 0905 8-19-93	50/4	4	Very Dense, Dark Gray (2.5Y, 4/1) well Graded Sand with some Gravel and a Trace of Clay, wet	SW	NA	mT = 0ppm βγ = 60-80cpm
161.0	104757 1545 8-19-93	7 13 24	18	Dense, Dark Gray (2.5Y, 4/1) Poorly Graded Coarse Sand with Some Gravel, wet	SP	NA	mT = 0ppm βγ = 60-80cpm
162.5				Boring Drilled out to 170.0'			Sieve Sample # 104758

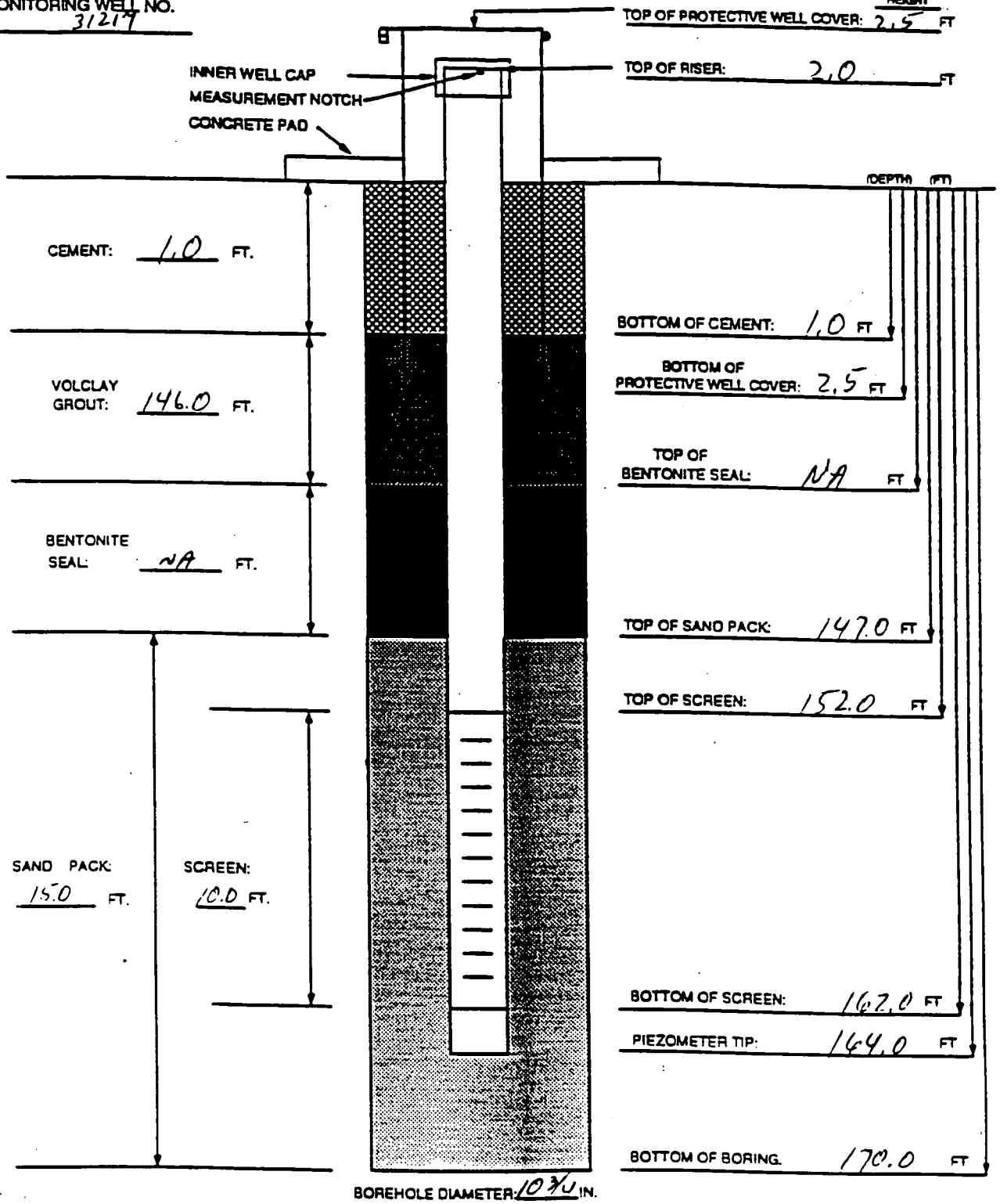
NOTES

See page 1

Background levels
mT = 0ppm
βγ = 60-80cpm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 31217

INSTALLATION DATE: 8-25-93



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20 Sand 21 Bags
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 36 Bags
AMOUNT OF CEMENT: 1/2 Bag
AMOUNT OF WATER USED: 10.25 gal / 928 gal (grout mix) / 0 gallons
OTHER: 1 Drum Micronodule 27 Drums Drill cuttings
TASK: 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 9/8/94 FT: 5
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: [illegible]

ASI FORM 1157 REV. 10

RI/FS

48 20

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 04.27
BORING NO. 31217
PIEZOMETER NO. 31217

FIELD ENG./GEO. Ken Geiger DATE
CHECKED BY DATE
DATE OF INSTALLATION 8-25-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0' TO 50.0'
FLUID NA FROM NA TO NA

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10" FROM 0.0' TO 170.0
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0" ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.010
TOTAL PERFORATED AREA 10.0

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8" I.D. 4.0"
LENGTH OF PIPE SECTIONS 15-10', 1-10' screen with 2' sump, 2-2' Sections
JOINING METHOD Screw Type Flush Joint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4"

OTHER PROTECTION Hinged well cover with Lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
Concrete GROUT / SLURRY	TOP 1.0	BOTTOM 147.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 147.0	BOTTOM 164.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 152.0	BOTTOM 162.0	TOP	BOTTOM
PIEZOMETER TIP	164.0			
BOTTOM OF BOREHOLE	170.0			
GWL AFTER INSTALLATION	87.95'			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Well Allowed To Collapse from 170' To 164' Sand Added from [illegible] To [illegible]

48 20

Monitoring Well 4425

Location #3

FEMP
WELL PLUGGING & ABANDONMENT RECORD

ATTACH COPIES OF FIELD ACTIVITY LOGS

TIME/DATE INITIATED:	TIME/DATE COMPLETED:
8-17-93 @ 0800	9-7-93 @ 0900

SUBCONTRACTOR/DRILLER AND ADDRESS:
FERMCO SITE CHARACTERIZATION GROUP
7400 Willey Road
Fernald Ohio 45030

Field Activities preformed by:
Pennsylvania Drilling Co.

WEATHER CONDITIONS:
Sunny, Hot + Humid 70°F-95°F.

WELL LOCATION	WELL ID: 4425	STATE PLANAR COORDINATES: N 481588.14 E 1383268.07
	GEOGRAPHIC DESCRIPTION: FERMCO East Field, East Side, Near Fence Line	

WELL DESCRIPTION:
4 inch I.D. Stainless Steel Casing to depth of 232 ft

REASON FOR ABANDONMENT:
Well is grout contaminated

TOTAL DEPTH OF WELL:	CALCULATED TOTAL WELL VOLUME:
232 feet	18.65 cubic feet

DEPTH AND DESCRIPTION OF EACH LAYER OF SEALING AND BACKFILL MATERIAL USED INCLUDING AMOUNT USED:
16 bags of volclay grout used to seal abandoned hole from 3ft to 51 feet below grade. 23 gallons of water mixed with each bag of volclay grout. 3ft x 30in concrete cap with metal pin and number painted (4425) to seal top. 6 inches of soil over concrete cap leveled to grade.

DEVIATIONS FROM THE P&A PLAN OUTLINED ON THE "WELL PLUGGING & ABANDONMENT REQUEST FORM":
When over drilling casing was broken at 51 ft. 3 attempts were made to collect remaining 181 ft of casing. CRV-5 determined that this will suffice and to grout and seal the ~~open borehole~~ JPD 9-13-93 open borehole.

DOES INSTALLATION DIAGRAM CONCUR WITH WELL CHARACTERISTICS NOTED IN FIELD? PROVIDE DETAIL:
No. 4 ft depth of cement was removed from ground level where grout was stated on installation sheet.

DESCRIBE DISPOSITION OF MATERIALS REMOVED FROM WELL SITE:
8 Drums were filled with a combination of grout, clay, sand and soil. To be moved to Bldg 64. Riser pipe returned to Penn Drill. Concrete pad to be disposed of by construction

COMMENTS AND OBSERVATIONS:
None

ON-SITE GEOLOGIST (OR DESIGNEE):

NAME PRINTED	DATE	SIGNATURE	DATE
Robert Thomas	9/12/93	Robert Thomas	9/12/93

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/19/92
ELEVATION:	GWL: Depth 30.4	Date/Time 11/18/92 1430	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIS D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 1 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1420 103016 10/20/92	3 6 14	5	V Stiff. 10YR(5/4) yellowish brown silty clay, no plasticity, dry	CL	3.5	HNU = 0 ppm BG = 80 cpm
2	1425 10/20/92	17 21 17	0	No Recovery	NA	NA	HNU = NA BG = NA
3	1430 103017 10/20/92	6 15 29	10	V. Stiff 10YR(5/4) yellowish brown silty clay, no plasticity, dry	CL	3.5	HNU = 0 ppm BG = 80 cpm
5	1445 103018 10/20/92	10 14 27	12	Hard. 10YR(5/4) yellowish brown silty clay w/limestone fragments, no plasticity, dry	CL	4.5	HNU = 0 ppm BG = 100 cpm
7	1500 103019 10/20/92	10 13 19	10	SAA, V. Stiff	CL	2.75	HNU = 0 ppm BG = 80 cpm
8 9	1510 10/20/92	15 25 30	0	No Recovery	~~CH~~ NA	NA	HNU = NA BG = NA
10	1520 103020 10/20/92	10 18 22	4	Hard. 10YR(5/4) yellowish brown silty clay w/ limestone fragments no plasticity, dry	CL	4.5	HNU = 0 ppm BG = 100 cpm
11 12	1535 10/20/92	12 16 20	0	No Recovery	NA	NA	HNU = NA BG = NA
13	1540 103021 10/20/92	6 14 20	10	V. Stiff. 10YR (5/4) yellowish brown, silty clay w/gravel low plasticity, slightly moist Bottom 1" gray clay	CL	3.5	HNU = 0 ppm BG = 80 cpm
14	1550 103022 10/20/92	2 7 11	8	Stiff. 2.5Y (5/1) gray gravelly clay, low plasticity slightly moist	CL	1.5	HNU = 0 ppm BG = 80 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter, Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

BKGD: HNU = 0 ppm BG = 60-80 cpm

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		48 20
BORING NUMBER: 4425	COORDINATES:		DATE 10/20/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 2 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1555 10/20/92	7 12 18	0	No Recovery	NA	NA	HNU = NA BZ = NA
17	1630 10/20/92	7 12 11	0	No Recovery	NA	NA	HNU = NA BZ = NA
18 19	1710 10/20/92	3 9 12	0	No Recovery	NA	NA	HNU = NA BZ = NA
20 21	1720 10/20/92	9 16 12	3	Hard. 2.5(5/1) Gray gravelly clay, no plasticity, slightly moist	CL	4.5	HNU = 0ppm BZ = 80cpm
22	1730 10/20/92	6 9 16	9	SAA, stiff	CL	1.75	HNU = 0ppm BZ = 80cpm
23 24	0845 10/21/92	5 10 15	9	SAA, stiff	CL	1.5	HNU = 0ppm BZ = 60cpm
25	0855 10/21/92	15 16 17	4	SAA, v. stiff	CL	2.0	HNU = 0ppm BZ = 60cpm
26 27	0900 10/21/92	6 10 17	3	SAA, stiff	CL	1.5	HNU = 0ppm BZ = 80cpm
28	1010 10/21/92	50/4	0	No Recovery	NA	NA	HNU = NA BZ = NA
29	1030 10/21/92	8 5 7	6	V. stiff. 2.5(5/1) Gray gravelly clay, no plasticity, slightly moist	CL	2.5	HNU = 0ppm BZ = 80cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/21/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIS D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/15/92
DRILLING METHODS: Cable Tool			PAGE 3 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	1035 103529 10/21/92	6 11 13	10	V. Stiff 2.5Y(5/1) Gray gravelly clay, no plasticity ~~slightly moist~~	CI	3.75	HNU = 0 ppm BG = 80 cpm
32	1045	4 7 9	0	No Recovery	NA	NA	HNU = NA BG = NA
33	1120						
34	103530 10/21/92	2 6 13	4	Stiff 2.5Y(5/1) Gray gravelly clay, no plasticity ~~slightly~~ moist.	CI	1.5	HNU = 0 ppm BG = 80 cpm
35	1430 103531 10/21/92	3 6 11	3	SAA	CI	1.5	HNU = 0 ppm BG = 80 cpm
36							
37	1145 10/21/92	3 6 11	0	No Recovery	NA	NA	HNU = NA BG = NA
38	1455 103532 10/21/92	4 11 11	15	V. Stiff 2.5Y(5/1) gray gravelly clay, no plasticity ~~slightly~~ moist.	CI	2.5	HNU = 0 ppm BG = 80 cpm
39							
40	1505 103533 10/21/92	7 13 19	12	SAA, Stiff	CI	1.5	HNU = 0 ppm BG = 80 cpm
41	1515 10/21/92	7 11 14	0	No Recovery	NA	NA	HNU = NA BG = NA
42							
43	1525 103534 10/21/92	5 12 ~~50/4"~~	15	V. Stiff. 2.5Y(5/1) gray gravelly clay, low plasticity ~~slightly~~ moist.	CI	2.25	HNU = 0 ppm BG = 80 cpm
44	1545 103535 10/21/92	5 20 15	8	SAA	CI	2.25	HNU = 0 ppm BG = 80 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter, Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PRELIMINARY

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/21/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIS D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/21/92
DRILLING METHODS: Cable Tool			PAGE 34 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
46	1600 / 030830 / 10/21/92	8 / 11 / 14	16	V Stiff 2.5Y(5/1) Gray gravelly clay, low plasticity slightly moist	CL	2.5	HNU = 0 ppm BG = 40 cpm
47	1635 / 030832 / 10/21/92	8 / 8 / 8	6	SAA, stiff	CL	1.25	HNU = 0 ppm BG = 60 cpm
48	1655 / 0 / 10/21/92	8 / 15 / 27	0	No Recovery	NA	NA	HNU = NA BG = NA
50	1710 / 030833	20 / 25	18	Stiff. 2.5Y(5/1) gray sandy clay, mod. plasticity moist. Bottom 12" 10YR(5/6) yellowish brown fine sand, poorly graded, dry	CL / SP	1.5	HNU = 0 ppm BG = 60 cpm
51	10/20/92	30		Begin sampling every 5 ft.			
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS — 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/21/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/22/92
DRILLING METHODS: Cable Tool			PAGE 4 5 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	REC/VERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
56.5	1123 103039 10/22/92	19 50/2	4	V Dark 10YR (3/6) Yellowish Brown sand poorly ~~sorted~~ graded dry	SP	NA	HNU = 0 ppm BS = 40 cpm
60.0	1125 103040 10/22/92	50/6	5	SAA	SP	NA	HNU = 0 ppm BS = 100 cpm
61.5							
65	1100 103041 10/22/92	9 50 50/1	8	V. Dark 2.5Y (3/4) Olive Brown coarse sand w/gravel, poorly graded dry.	SP	NA	HNU = 0 ppm BS = 100 cpm
66.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/22/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 5/11 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
71.5	1448 03042 [illegible]	50/4	10	V. Dark 2.5Y (3/4) Light olive brown, sand, poorly graded medium [illegible]	SP	NA	HNU=0 ppm BS=100 ppm
75							
76.5	1448 03043 [illegible]	9 13 17	8	SAA, dry	SP	NA	HNU=0 ppm BS=100 ppm
80							
81.5	1450 03044 [illegible]	50/4	5	V. Dark 2.5Y (3/4) Light olive brown coarse sand & gravel well graded, moist	SW	NA	HNU=0 ppm BS=100 ppm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE: 48 20
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/17/92
DRILLING METHODS: Cable Tool			PAGE 17 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
86.5	1140 10/23/92	50/3	0	No Recovery	NA	NA	HNU = NA BZ = NA
90.0	0930 1030 10/23/92	20 50/4	16	V. Dense 2.5Y(5/4) Light olive brown, coarse sand with gravel, moist	SW	NA	HNU = 0ppm BZ = 100cpm
93.5	0920 1030 10/23/92	50/4	10	SAA, wet	SW	NA	HNU = 0ppm BZ = 100cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/23/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 18 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
101.5	0950 / 102347 / 102348	11 / 17 / 30	18	Dense. 2.5Y(5/4) Light olive brown coarse-sand, poorly graded, well graded, wet	SW	NA	HNU=0ppm BX=80cpm
105							
106.5	1000 / 102349 / 102350	23 / 38 / 40	18	SAA, V. Dense	SW	NA	HNU=0ppm BX=60cpm
110							
111.5	1400 / 103351	50/5	18	Dense. 2.5Y(5/4) light olive brown fine sand, poorly graded, wet	SP	NA	HNU=0ppm BX=80cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 2c

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/23/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 19 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
116.5	15B 103092	6 32 50	18	V Dense 2.5Y(5/4) Light olive brown coarse sand & gravel, wet	SW	NA	HNU = 0 ppm BZ = 500 cpm
120	15B 103093	3 7 11	18	SAA, M Dense	SW	NA	HNU = 0 ppm BZ = 600 cpm
121.5							
125	16B 103094	15 50/4	18	SAA, V Dense	SW	NA	HNU = 0 ppm BZ = 600 cpm
126.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:	DATE 10/23/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/19/92	
ENGINEER/GEOLOGIST D. O'Brien	Depth Date/Time	DATE COMPLETED: 11/15/92	
DRILLING METHODS: Cable Tool		PAGE 9 10 OF 20	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	1115 103056 10/26/92	15 23 50	10	Dense 2.5Y (5/4) Light olive brown coarse sand, well graded, wet	SW	NA	HNU = 0 ppm BZ = 40 cpm
136	0900 103057 10/27/92	50/2	7	V. Dense 2.5Y (5/4) light olive brown, fine sand, some silt poorly graded, wet	SP	NA	HNU = 0 ppm BZ = 40 cpm
140	0945 10/27/92	19 50/2	0	No Recovery	NA	NA	
141.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 10/27/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/17/92
DRILLING METHODS: Cable Tool			PAGE 11 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
146.5	1405 103958 11/2/92	50/2	5	V. Dense 2.5Y(5/4) Light olive brown coarse sand w/ some clay & silt, poorly graded, wet	SW	NA	HNU = 0 ppm BZ = 60 cpm
150							
151.5	1440 11/2/92	50/4	0	No Recovery	NA	NA	
155							
156.5	0830 103000 11/4/92	22 50/3	18	V. Dense 2.5Y(5/4) Light olive brown coarse sand & gravel well graded, grading to fine poorly graded sand, wet	SP SW	NA	HNU = 0 ppm BZ = 60 cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 11/4/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/13/92
DRILLING METHODS: Cable Tool			PAGE 12 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
161.3	0900 10300 11/4/92	50/4	15	V. Dense 2.5Y(5M) Light olive brown mud to coarse sand. (2) limestone chunks on the bottom, well graded. wet	SW	NA	HNu=0ppm BX=40cpm
165							
166.3	1035 10302 11/4/92	21 27 32	15	V. Dense 2.5Y(5M) Light olive brown mud sand w/gravel. well graded wet	SW	NA	HNu=0ppm BX=60cpm
170							
171.3	1110 1030 11/4/92	50/4	0	No Recovery	NA	NA	

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PRELIMINARY

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:	DATE 11/4/92	
ELEVATION:	GWL: Depth 80.64 Date/Time 11/18/92 1400	DATE STARTED: 10/19/92	
ENGINEER/GEOLOGIST D. O'Brien	Depth Date/Time	DATE COMPLETED: 11/15/92	
DRILLING METHODS: Cable Tool		PAGE 13 OF 20	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
176.5	1405 103043 11/4/92	59/4	12	V. Dense 2.5Y (5/4) Light olive brown coarse sand w/ limestone chunks poorly graded, wet	SP	NA	HNU = 0ppm BX = 60cpm
180							
181.5	1443 103064 11/4/92	17 50/3	16	SAA	SP	NA	HNU = 0ppm BX = 40cpm
185							
186.5	1015 103066 11/5/92	10 25 36	18	V. Dense 2.5Y (5/4) Lt. olive brown, coarse to medium sand, poorly graded, wet	SP	NA	HNU = 0ppm αβ = 40cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:	DATE 11/5/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/19/92	
ENGINEER/GEOLOGIST D. O'Brien	Depth Date/Time	DATE COMPLETED: 11/18/92	
DRILLING METHODS: Cable Tool		PAGE 14 OF 20	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
190	1040 103067 11/5/92	25 50/5	12	V. Dense 2.5Y(5/4) lt olive brown, medium sand w/ minor gravel, poorly graded, wet	SP	NA	HNU = 0ppm αβ = 60cpm
191.5							
195	1440 103068 11/5/92	50/3	14	SAA	SP	NA	HNU = 0ppm αβ = 60cpm
196.5							
200	1525 103069 11/5/92	7 7 5	18	SAA	SP	NA	HNU = 0ppm αβ = 60cpm
201.5							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter
Kevin Myers

SAA Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 11/6/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/6/92
DRILLING METHODS: Cable Tool			PAGE 15 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
205'	1040	50/3"	0	No recovery	n/a	n/a	n/a
206.5	11/6/92						
210							
	1105	40-50/3"	0	No recovery	n/a	n/a	n/a
211.5	11/6/92						
215							
216	1500	32-50/2"	12"	very dense dark gray (10YR 4/1) medium sand, trace gravel, some silt, poorly graded, wet	SP	n/a	Hnu = 0 ppm βγ = 80 cpm
216.5	11/6/92						

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 11/6/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/17/92
DRILLING METHODS: Cable Tool			PAGE 16 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
220 220 221.5	1600 ~~103072~~ ~~103077~~ 11/6/92	72- 50/3"	9"	very dense, dark gray (10YR 4/1) medium to coarse sand, trace gravel some silt, poorly graded, wet	SP	n/a	Hnu = 0 ppm BG = 80 cpm
225 226.5	1605 103074 11/6/92	50/3	8"	V. Dense. 2.5Y(5/4) ~~light olive brown fine sand, trace gravel some silt, poorly graded, wet~~	SP	NA	HNu = 0 ppm BG = 100 cpm
				Begin continuous sampling			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 11/9/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 17 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1425 103075 11/9/92	50/3	15	V Dense 2.5Y(5/4) Light Olive Brown, coarse sand & gravel with silt, well graded sand	SW	NA	HNU = 0 ppm BG = 50 cpm
228	1445 103076 11/9/92	50/5	18	SAA	SW	NA	HNU = 0 ppm BG = 60 cpm
229.5	1500 103077 11/9/92	50/5	15	SAA	SW	NA	HNU = 0 ppm BG = 60 cpm
231				Resume SSA sampling			HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =
							HNU = BG =

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA Same as Above

NA Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

PRELIMINARY

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4425	COORDINATES:		DATE 11/9/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/19/92
ENGINEER/GEOLOGIST D. O'Brien	Depth	Date/Time	DATE COMPLETED: 11/18/92
DRILLING METHODS: Cable Tool			PAGE 17 18 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
235	1615 103078 11/9/92	45 50/3	7	V. Dark Gray 2.5Y (5/4) Light olive brown, reduced to coarse grained sand some gravel, poorly graded wet	SP	NA	HNU=0 ppm RS=60 cpm
236.5							
				DRY			
240	1715 103079 11/9/92	17B/1	10	V. Dark Gray 2.5Y (5/4) Light olive brown, coarse sand & gravel well graded, wet [illegible] weathered shale	SW	NA	HNU=0 ppm RS=60 cpm
241.5				Boring terminated at 240 ft			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Craig Coulter

Kevin Myers

SAA Same as Above

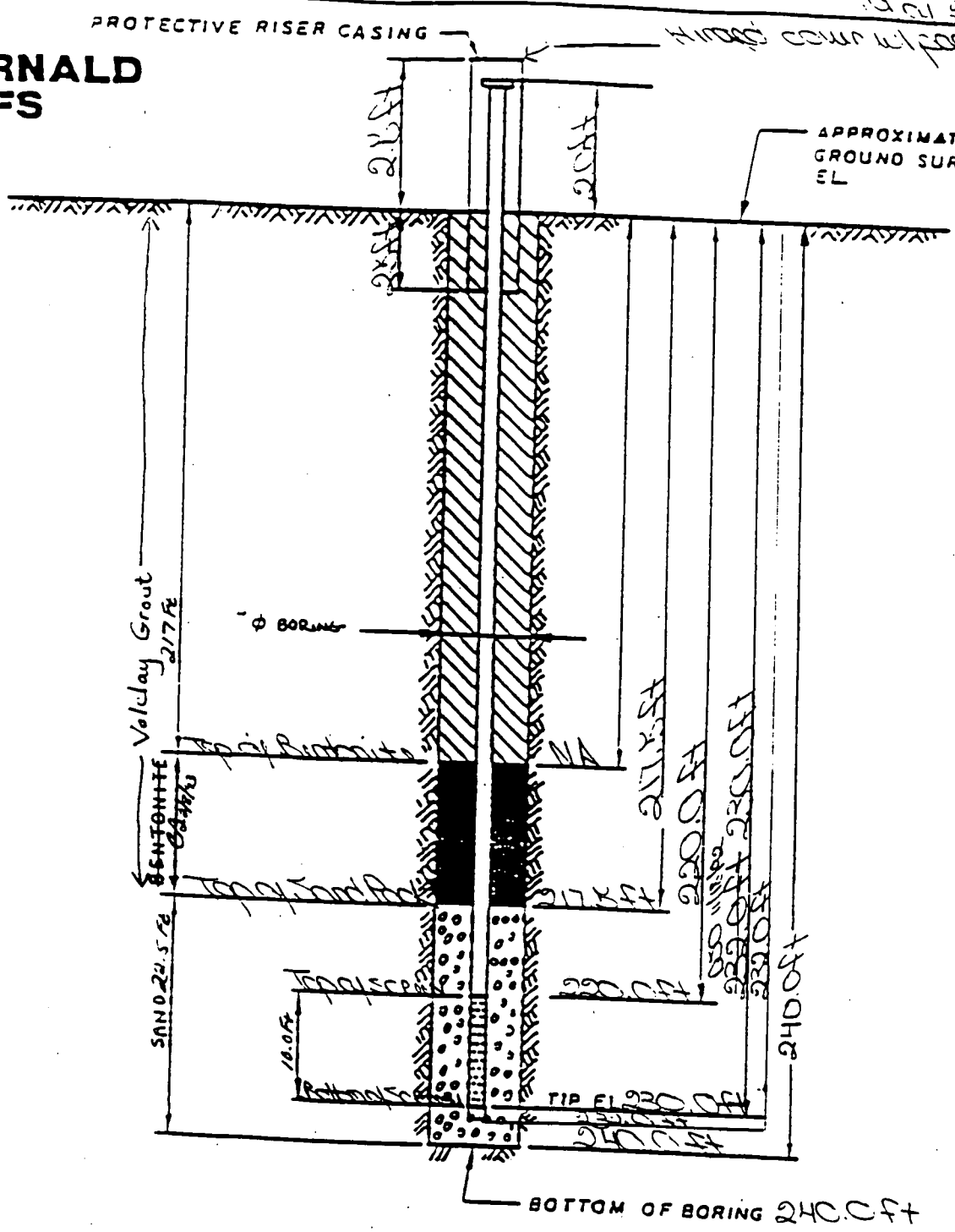
NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

48 20

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. STEEL PIPE CONTINUOUS SLOT SCREEN (0.020 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED (with welded silt trap)
4. ELEVATION OF WATER LEVEL 70.65 ft
5. WATER LEVEL READING ON 11/15/92

Materials Used During Well Installation:
23 bags of 4130 sand
163 bags of Volclay grout
3000 gallons of water used during grouting & drilling
316 stainless steel pipe sections: 22-10ft; 1-2ft, 1-10ft screen w/2ft sump
30 gal drums; 2 little drums

DRAWING NUMBER

CHECKED BY / APPROVED BY

DRAWN BY

INSTALLATION DETAILS
MONITORING WELL #442K

PREPARED FOR
FEMP RI/FS

141

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

48 20

PROJECT NAME RCRA phase 1 FIELD ENG./GEO. D. Rose DATE 11-17
PROJECT NO. WG-2 CW 27 CHECKED BY C. Ziner DATE 2/17/9
BORING NO. 44-2K
PIEZOMETER NO. 44-2K DATE OF INSTALLATION 11/17/90

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Chisel Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID water FROM 0.0 ft TO 97.0 ft	SIZE 10 in FROM 0.0 ft TO 240.0
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless steel
DIAMETER OF PERFORATED SECTION 4.0 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 20-10 ft 1-2 ft
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD Flush joint thread
TOTAL PERFORATED AREA 10.0 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 2.0 ft	OTHER PROTECTION Hinged bolted cover with padlock
PROTECTIVE PIPE O.D. 10 3/4 in	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 217.5	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP 217.5	BOTTOM 230.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 230.0	BOTTOM 230.0	TOP	BOTTOM
PIEZOMETER TIP	232.0 ft			
BOTTOM OF BOREHOLE	240.0 ft			
GWL AFTER INSTALLATION	10.15 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS

Monitoring Well 41217

Location #3

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 04.27	PROJECT NAME KCRA Phase 1	
BORING NUMBER 41217	COORDINATES:	DATE 8-11-93
ELEVATION:	GWL: Depth 86.90 Date/Time 9-1-93/1415	DATE STARTED 8-11-93
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED 9-1-93
DRILLING METHODS Cable Tool		PAGE 1 OF 5

DEPTH	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY	REMARKS
				FOR VISUAL CLASSIFICATION OF SOIL FROM 0-220 FT SEE BORING LOG FOR BORING #4425			
220							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 72 Speedstar
Driller Joe Barile
Bill Anderson

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER. 04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER. 41217	COORDINATES:	DATE 8-22-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 8-11-93
ENGINEER/GEOLOGIST Keith Payne	Depth Date/Time	DATE COMPLETED: 9-1-93
DRILLING METHODS Cable Tool		PAGE 2 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
221	1400 8-22-93	18 27 30	0	No Recovery	N/A	N/A	M-tip = N/A ppm; BG = N/A cpm
222 223	104767 1415 8-22-93	[illegible] 21 [illegible]	12	Dense (5Y, 4/3) Olive. Poorly Graded Fine Sand, wet	SP	N/A	M-tip = 0.0 ppm; BG = 60 cpm
224	104768 1430 8-22-93	10 20 22	10	Dense (5Y, 4/3) Olive. Poorly Graded Fine Sand, wet	SP	N/A	M-tip = 0.0 ppm; BG = 70 cpm
225 226	104769 1340 8-23-93	40 50/.2	5	Very Dense (5Y, 4/3) Olive, Well Graded Sand with trace gravel, wet	SW	N/A	M-tip = 0.0 ppm; BG = 40 cpm
227	1420 8-23-93	30 50/.4	0	No Recovery	N/A	N/A	M-tip = N/A ppm; BG = N/A cpm
228 229	104770 1515 8-23-93	42 47 50/.3	8	Very Dense (5Y, 4/3) Olive, Well Graded Sand with trace gravel, wet	SW	N/A	M-tip = 0.0 ppm; BG = 50 cpm
230	104771 1610 8-23-93	46 50 50/.4	10	SAA	SW	N/A	M-tip = 0.0 ppm; BG = 60 cpm; Sieve 221.5 - 230.5 #104772
231							
232							
233							
234							
235							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 72 Speedstar
Driller Joe Barile
Bill Anderson
Dave Neuman
Michael Leon

SAA - Same as above
NA - Not Applicable
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

Background Readings
9-22-93 { M-tip = 0.0 ppm, BG = 50 cpm
8-23-93 { M-tip = 0.0 ppm, BG = 60 cpm

402-11-88

145

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 04.27	PROJECT NAME RCRA Phase I	
BORING NUMBER 41217	COORDINATES:	DATE 8-23-93
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 8-11-9
ENGINEER/GEOLOGIST Keith Payne	Depth Date/Time	DATE COMPLETED 9-1-93
DRILLING METHODS Cable Tool		PAGE 3 OF 5

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
236							
237				BOTTOM OF BORING 237.0 FT BED ROCK			
238							
239							

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 22 Specostar

Driller Joe Barile

Ed Wilber

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell Color Chart

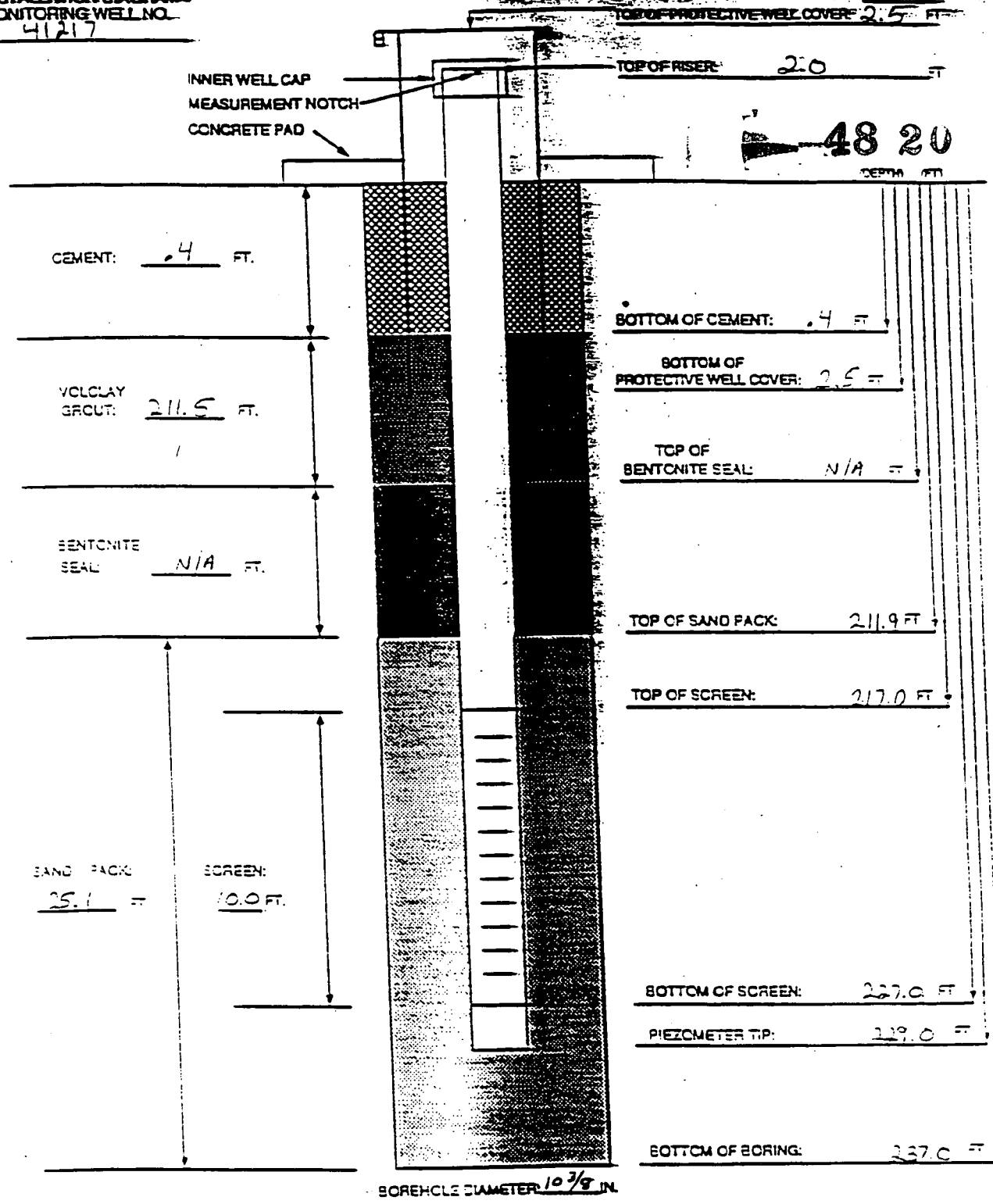
Background readings (HNU) 0.0 ppm

[illegible] 00 cpm

FERNALD FUSE

INSTALLATION DIAGRAM

MONITORING WELL NO. 41217



MATERIALS USED

SAND TYPE AND QUANTITY: 1020 23 bags @ 50 lb.

BENTONITE PELLETS (5-GALLON BUCKETS): N/A

BAGS OF VOLCLAY GROUT: 57 bags @ 50 lbs each

AMOUNT OF CEMENT: 2 sacks

AMOUNT OF WATER USED: 2200 gallons

OTHER: 27 Drums Soil

TASK: 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.

2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.

3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.

GEOLOGIST/ENGINEER: K. Payne

4) WATER DEPTH AND DATE: 40

5) TOP OF CASING IS SECURED W/ STAINLESS STEEL CAP

6) PARENTHESIS INDICATE DEPTH GROUND LEVEL

7) WELL CASING HAS A PROTECT COVER WITH PADLOCK

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 04.27
BORING NO. 41217
PIEZOMETER NO. 41217

FIELD ENG/GEO. Keith Payne DATE 9-1-9
CHECKED BY 48420
DATE OF INSTALLATION 9-1-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 90.0 FT
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion
CASING SIZE (S) USED:
SIZE 10.0 I D FROM 0.0 FT TO 237.0
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 I D
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 stainless st
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN
LENGTH OF PIPE SECTIONS 22.10 FT 1.2 FT
JOINING METHOD Screw type-flush join

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION Hinged Locking Cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: CEMENT GROUT/SLURRY	TOP 0.0 FT	BOTTOM 0.4 FT		
	TOP 0.4 FT	BOTTOM 211.9 FT	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP 211.9 FT	BOTTOM 237.0 FT	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 217.0 FT	BOTTOM 227.0 FT	TOP	BOTTOM
PIEZOMETER TIP	229.0 FT			
BOTTOM OF BOREHOLE	237.0 FT			
GWL AFTER INSTALLATION	86.90 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Cement was placed from 0.0 to ~~0.9~~ 0.4 FT to hold the protective cover in place

48 20

Monitoring Well 2426

Location #4

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2426	COORDINATES:	DATE 1/27/93	
ELEVATION:	GWL: Depth 78.8 Date/Time 2/4/93 1330	DATE STARTED: 1/27/93	
ENGINEER/GEOLOGIS D. O'Brien	Depth Date/Time	DATE COMPLETED: 2/4/93	
DRILLING METHODS: Cable Tool		PAGE 1 OF 4	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				For descriptions of soils refer to boring 4426.			
74.0							

PRELIMINARY

NOTES.

Drilling Contract: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Jim Saccani

Dan Jameson

SAA - Same as Above

NA - Not Applicable

Bkgd: HNU=0ppm BX=40-100ppm

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER: 602..04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2426	COORDINATES:		DATE 1/28/93
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 1/27/
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 2/4
DRILLING METHODS: T. Robison Cable Tool			PAGE 2 OF 4

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 FOOT	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
74							
75.5	1/27/93	30 47 49	18	V. Dense. 10YR(6/2) Light brownish gray, fine to coarse sand, trace gravel (fine to coarse), no lst well graded	SW	NA	HNU= 0 ppm BG= 60 cpm
77.0	1/27/93	27 37 40	18	SAA	SW	NA	HNU= 0 ppm BG= 40 cpm
78.5	1/27/93	47 60/3 10	9	V. Dense. 10YR(6/2) Light brownish gray, fine to coarse sand w/ coarse gravel, poorly, wet well graded on 1/28/93	SW	NA	HNU= 0 ppm BG= 40 cpm
80.0		31 48 15	0	No Recovery	NA	NA	HNU= NA BG= NA Tried to sample 4
81.5	1/27/93	19 27 35	16	V. Dense. 10YR(5/1) gray, fine to coarse sand, trace gravel, poorly graded, wet.	SP	NA	HNU= 0 ppm BG= 40 cpm
83.0	1/27/93	47 48 47	18	SAA	SP	NA	HNU= 0 ppm BG= 40 cpm
84.5	2/1/93 0000	8 12 21	15	Dense. 10YR(6/1) Gray, fine to coarse sand w/ gravel, well graded, wet. 2/1/93	SW	NA	HNU= 0 ppm BG= 60 cpm
86.0	2/1/93 0935	9 16 22	17	Dense. 10YR(6/1) Gray, fine to coarse sand, w/ gravel, well graded, wet.	SW	NA	HNU= 0 ppm BG= 40 cpm
87.5	2/1/93 0940	10 10 14	18	M. Dense. 10YR(6/1) Gray, coarse sand, w/ gravel, well graded wet	SW	NA	HNU= 0 ppm BG= 60 cpm
89.0	2/1/93 1010	5 6 10	18	SAA Boring terminated at 91.0 ft	SW	NA	HNU= 0 ppm BG= 60 cpm

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 42 Cyclone

Driller: Jim Saccani, Dan Jameson

SAA - Same as Above

NA - Not Applicable

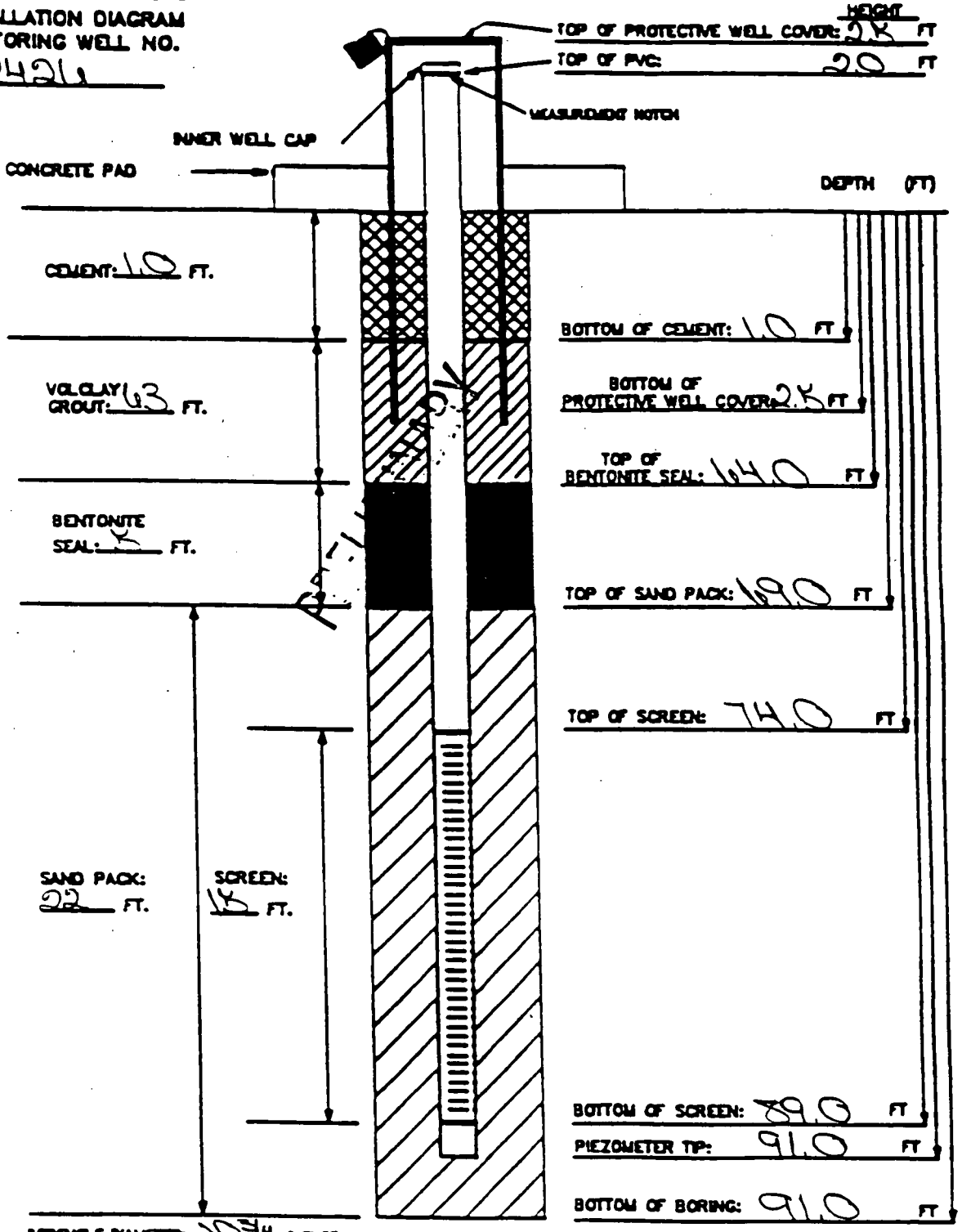
Samples collected per ASTM standard penetration t

Colors identified using Munsell Color Chart

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 2421

INSTALLATION DATE: 2/4/93



BOREHOLE DIAMETER: 10 3/4 INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY: 4/30 25 bags
BENTONITE PELLETS (5-GALLON BUCKETS): 4 buckets
BAGS OF VOLCLAY GROUT: 17 bags
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 600 gal
OTHER: 14 soil drums

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS. DATE 2/4/93 316 S.S
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS. 316 S.S
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: 78.84 2/4/93

TASK: 1C2 04 27

GEOLOGIST/ENGINEER: D. O'Brien

FERNALD RI/FS

48 20

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA phase 1 FIELD ENG./GEO. D. O'Brien DATE 2/4
PROJECT NO. 100 CH127 CHECKED BY _____ DATE _____
BORING NO. 2426
PIEZOMETER NO. 2426 DATE OF INSTALLATION 2/4/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Chisel bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0.0 ft TO 91.0 ft	SIZE 10 3/4 in FROM 0.0 TO 91.0
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 stainless steel
DIAMETER OF PERFORATED SECTION 4.0 in	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in I.D. 4.0 in
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 1-10 ft, 1-5 ft
AVERAGE SIZE OF PERFORATIONS 0.020 in	JOINING METHOD Flush joint thre
TOTAL PERFORATED AREA 15 ft	

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION Lined boring co
PROTECTIVE PIPE O.D. 10 3/4 in	with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
Cement GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP 1.0	BOTTOM 14.0	TOP	BOTTOM
SAND	TOP 14.0	BOTTOM 89.0	TOP	BOTTOM
GRAVEL	TOP 89.0	BOTTOM 91.0	TOP	BOTTOM
PERFORATED SECTION	TOP NA	BOTTOM NA	TOP	BOTTOM
PIEZOMETER TIP	TOP 74.0	BOTTOM 89.0	TOP	BOTTOM
BOTTOM OF BOREHOLE	91.0			
GWL AFTER INSTALLATION	91.0			
	78.8			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS _____

48 20

Monitoring Well 3426

Location #4

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I	
BORING NUMBER 3426	COORDINATES	DATE 12-21-92
ELEVATION:	GWL: Depth ~~TB~~ ~~SS~~ Date/Time 1/28/93	DATE STARTED 12-14-92
ENGINEER/GEOLOGIST Kevin J Fogle / D O'Brien	Depth Date/Time	DATE COMPLETED 1/20/93
DRILLING METHODS Cable Tool		PAGE 1 OF 24

DEPTH 0 FT	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1/4	RECOVERY 1/4	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* For Soil Characterization of 0.0 to 145.0 ft See boring Log for well 4426			
75							
145				* Continuous sampling will begin at 145.0 ft through 155.0 ft for Sieve screen Analysis			

FMPC 4/12/93

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment

Driller Jim Saccani

Kevin Cavanaugh

Samples collected per ASTM standard penetration test

All Colors identified by the Munsell Color Chart.

Background { HNU 0 ppm, BX = 30 cpm, IX = 0 cpm

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I	
BORING NUMBER 3426	COORDINATES.	DATE 12/21/92
ELEVATION:	GWL: Depth See p.1 Date/Time	DATE STARTED 12/14/92
ENGINEER/GEOLOGIST Kevin Sullak/D. O'Brien	Depth Date/Time	DATE COMPLETED 12/20/92
DRILLING METHODS Cable Tool		PAGE 2 OF 4

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
145.0	14:26 103376 12-21-92	24 67 53	18	Very Dense (5Y 4/2) Olive gray well graded gravelly sand wet	SW	N/A	HNU = 0 PPM BG = 50 CPM
146.5	15:46 103376 12-21-92	21 19 14	18	Dense (5Y 4/2) Olive gray well graded gravelly sand wet	SW	N/A	HNU = 0 PPM BG = 50 CPM
148.0	16:17 103376 12-21-92	33 57 34	16	Very Dense (5Y 4/2) Olive gray well graded sandy gravel wet	GW	NA	HNU = 0 PPM BG = 50 CPM
149.5	0910 103376 11/6/93	31 30 32	15	V. Dense (5Y 4/2) Olive gray med. to coarse sand w/ gravel, poorly graded, wet	SP	NA	HNU = 0 PPM BG = 40 cpm
151.0	1020 103376 11/6/93	42 43 49	13	V. Dense 5Y (4/2) Olive gray coarse sandy gravel, poorly graded, wet	GW	NA	HNU = 0 PPM BG = 40 cpm
152.5	1080 103376 11/6/93	33 42 37	17	V. Dense 5Y (4/2) Olive gray coarse sand w/ gravel, poorly graded, wet	SP	NA	HNU = 0 PPM BG = 60 cpm
154	1045 103376 11/6/93	30 43 43	15	SAA	SP	NA	HNU = 0 PPM BG = 40 cpm
155.5							
157				Boring terminated at 157.0 ft			

NOTES:
Drilling Company: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Jim Saccani
Kevin Cavanaugh

* Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart
Background { HNU = 0 PPM, BG = 50 CPM, β = 0 CPM } as Sample # 103376 - Sieve Analysis
SAA Same as above
NA Not Applicable

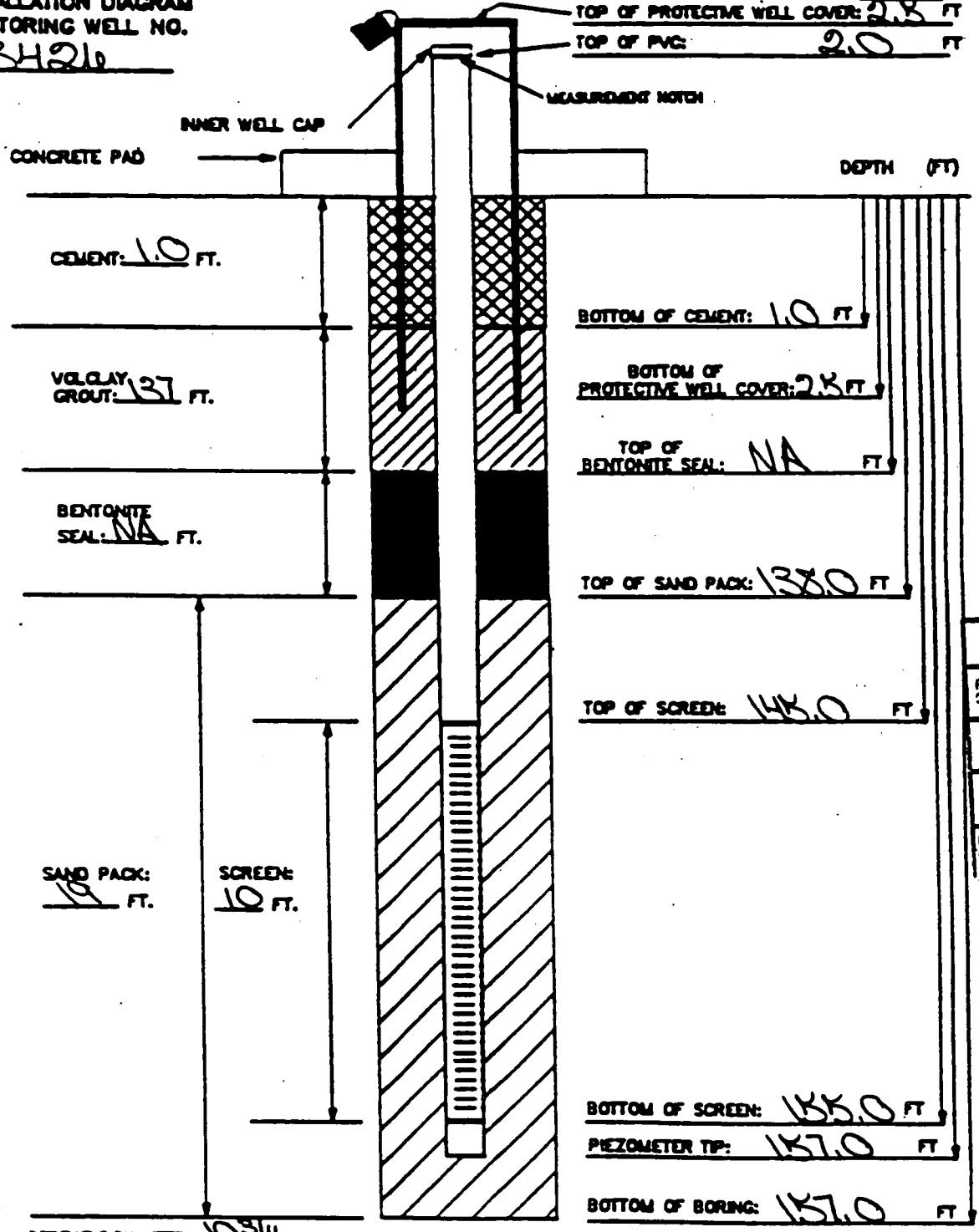
156

48 20 3014

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 34216

INSTALLATION DATE: 1/25/93



BOREHOLE DIAMETER: 10 3/4 INCHES

	Initial	Date
Field Check	CB	2/10/93
1st Key in		
2nd Key in		
Hard Copy Verification		

MATERIALS USED:
SAND TYPE AND QUANTITY: 31 bg. 4/30, 6 bg 10/20
BENTONITE PELLETS (5-GALLON BUCKETS): NA
BAGS OF VOLCLAY GROUT: 1500 lbs 1/25/93
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 250 gal
OTHER: 27 soil drums
1 water drum

NOTES:
1) RISER PIPE IS 4 inch stainless steel —PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4 inch stainless steel —PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: 18.34' 1/25/93

TASK: 04.27

GEOLOGIST/ENGINEER: D. O'Brien

157

2117

FERNALD RI/FS

4 of 4

PIEZOMETER INSTALLATION SHEET

48 20

PROJECT NAME RCRA phase 1 FIELD ENG./GEO. D. O'Brien DATE 1/20/
PROJECT NO. 1002.04.27 CHECKED BY C. Brill DATE 2/2/93
BORING NO. 3H26
PIEZOMETER NO. 3H26 DATE OF INSTALLATION 1/20/93

BOREHOLE DRILLING

DRILLING METHOD cable tool
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0.0 Ft TO 80 Ft
FLUID NA FROM — TO —

TYPE OF BIT churn bit
CASING SIZE (S) USED:
SIZE 10 3/4 in FROM 0.0 Ft TO 157.0 Ft
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION ~~0.020~~ 4.0 in
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 10.0 ft

RISER PIPE MATERIAL 316 stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 4-10ft, 1-5ft, 1-2
JOINING METHOD flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION hinged locking cover w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~[illegible]~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.8			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 1.0	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 138.0	BOTTOM 157.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 143.0	BOTTOM 153.0	TOP	BOTTOM
PIEZOMETER TIP	157.0			
BOTTOM OF BOREHOLE	157.0 ft			
GWL AFTER INSTALLATION	78.8 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS 4/30 sand installed from 157.0 Ft to 143.0 Ft, then 10/20 sand installed from 143.0 Ft to 138.0 Ft.

158

48 20

Monitoring Well 4426

Location #4

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase	DATE 10-29-92
BORING NUMBER 4426	COORDINATES	DATE STARTED 10-29-92
ELEVATION	GWL. Depth 78.95 Date/Time 10-29-92/1720	DATE COMPLETED 10-29-92
ENGINEER/GEOLOGIST K Morgan, K Sedlak	Depth Date/Time	PAGE 1 OF 21
DRILLING METHODS Cable Tool		

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0.0	103300 10-29-92 0830	3 5 5	4	Loose light olive brown (2.5Y, 5/4) silt, some organic matter (grass), slightly moist	ML	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
1.5	103301 10-29-92 0835	2 5 8	8	Medium stiff light olive brown (2.5Y, 5/4) silty clay with sand and trace very fine gravel, trace root fragments, medium plasticity, moist	CL	.75	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
3.0	10-29-92 0848	8 9 14	0	No Recovery	N/A	N/A	Hnu = N/A Br = N/A α = N/A
4.5	103302 10-29-92 0850	10 12 15	6	Stiff light olive brown (2.5Y, 5/4) silty clay with sand and trace gravel, medium plasticity, moist	CL	2.0	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
6.0	103303 10-29-92 0900	19 18 27	18	Very stiff light olive brown (2.5Y, 5/4) silty clay with sand and gravel, medium plasticity, moist	CL	3.0	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
7.5							

NOTES
Drilling Company: Pennsylvania Drilling
Driller: Jim Saccani

Colors Identified using Munsell color chart
Samples collected per ASTM standard - Penetration Test

Background Levels
Hnu = 0 ppm
Br = 20 cpm
α = 0 cpm

PRELIMINARY

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602 04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES	DATE 10-29-92	
ELEVATION	GWL: Depth 78.95 ft. Date/Time 11-9-92 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sedlak	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 2 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	103304 10-29-92 0905	20 25 31	18	Very stiff light olive brown (2.5Y, 5/4) silty clay with sand and gravel, high plasticity, moist	CL	2.5	Hau = 0 ppm Bγ = 20 cpm α = 0 cpm
9.0	103305 10-29-92 0915	20 22 32	18	Very stiff light olive brown (2.5Y, 5/4) silty clay with sand and gravel, low plasticity, slightly moist	CL	3.75	Hau = 0 ppm Bγ = 20 cpm α = 0 cpm
10.5	103306 10-29-92 1010	6 10 15	12	Hard yellowish brown (10YR, 5/6) silty clay with sand and gravel, low plasticity, slightly moist	CL	4.0	Hau = 0 ppm Bγ = 20 cpm α = 0 cpm
12.0	10-29-92 10:17	9 11 14	0	NO Recovery	NA	NA	Hau = NA ppm Bγ = NA cpm α = NA cpm
13.5	10-29-92 13:27	7 16 23	0	NO Recovery	NA	NA	Hau NA ppm Bγ NA cpm α NA cpm
15.0							

NOTES

See Page 1

PRELIMINARY

FERNALD RI/FS

E-48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 10-29-92	
ELEVATION	GWL: Depth 18.95 ft Date/Time 10-9-92	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Martin, K. Sellak	Depth Date/Time	DATE COMPLETED 10-9-92	
DRILLING METHODS Cable Tool		PAGE 3 OF 21	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	10-29-92 1340	6 12 17	0	No Recovery	N/A	N/A	Hnu = N/A Br = N/A α = N/A
16.5	103307 10-29-92 1405	7 13 18	2	Medium Stiff ~~gray~~ (5Y,5/1) gravelly sandy clay, medium plasticity, wet	CL	.75	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
18.0	103308 10-29-92 1530	6 8 9	6	Stiff gray (5Y,5/1) silty clay with sand and very fine gravel, medium plasticity, moist	CL	1.75	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
19.5	103309 10-29-92 1550	3 7 9	4	Stiff dark gray (5Y,4/1) silty clay with sand and very fine gravel, medium plasticity, moist	CL	1.5	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
21.0	033.0 10-29-92 1603	5 11 11	10	Stiff dark gray (5Y,4/1) silty clay with sand and very fine gravel, medium plasticity, moist	CL	1.75	Hnu = ppm Br = cpm α = cpm
22.5							

NOTES

See Page 1

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES	DATE 10-29-92	
ELEVATION	GWL: Depth 78.95 ft. Date/Time 12-9-92 / 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sedlak	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 4 OF 21	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
22.5	10-29-92 1611	6 10 11	0	No Recovery	N/A	N/A	Hnu = N/A Bq = N/A α = N/A
24.0	103311 10-29-92 1634	9 10 11	12	Stiff dark gray (5Y, 4/1) silty clay with sand and very fine gravel, medium plasticity,	CL	2.0	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
25.5	103312 10-29-92 1642	5 7 8	6	Same As Above	CL	2.0	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
27.0	103313 10-30-92 0800	6 8 10	10	Stiff gray (5Y, 5/1) silty clay with sand and fine gravel, medium plasticity, moist	CL	1.5	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
28.5	103315 10-30-92 0825	8 9 10	9	Same As Above	CL	2.0	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
30.0							

NOTES

See Page 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 60.04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES		DATE 10-30-92
ELEVATION	GWL: Depth 78.95 ft Date/Time 10-9-92 / 1722		DATE STARTED 10-29-92
ENGINEER/GEOLOGIST K. Murray, K. Sullek	Depth	Date/Time	DATE COMPLETED 10-29-92
DRILLING METHODS Cable Tool			PAGE 5 OF 21

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	103316 10-30-92 0840	5 8 10	11	Stiff gray (5Y, 5/1) silty clay with sand and fine gravel, medium plasticity, moist	CL	2.0	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
31.5	103317 10-30-92 LM 10-30-92 0855	3 ~~Tbl~~ 11 10	2	Same As Above	CL	1.5	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
33.0	103318 10-30-92 0910	11 10 11	14	Same As Above	CL	1.5	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
34.5	103319 10-30-92 0926	12 9 13	18	Stiff gray (5Y, 5/1) silty clay, medium plasticity, moist	CL	1.5	Hnu = N/A Br = 20 cpm α = 0 cpm
36.0	103320 10-30-92 0945	10 11 22	18	Dense gray (5Y, 5/1) silt, moist	ML	N/A	Hnu = N/A Br = 20 cpm α = 0 cpm
37.5							

NOTES

See Page 1

Note: due to the high humidity the Hnu wasn't reliable today

PRELIMINARY

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 10-30-92	
ELEVATION	GWL: Depth 78.95 ft Date/Time 12-9-92/1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sedlak	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 6 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
37.5	103321 10-30-92 1000	9 9 14	14 38.5	Medium dense strong brown (7.5YR, 5/8) banded silt, moist	ML	N/A	Hnu = N/A BT = 20 cpm α = 0 cpm
				Medium dense yellowish brown (10YR 5/8) poorly graded medium sand, wet	SP	N/A	Top of sand and gravel aquifer material
39.0				Beginning with the 45 ft. split spoon sample, samples will be collected at 5 ft. intervals			
45.0							

NOTES

See Page 1

Note: due to the high humidity the Hnu wasn't reliable today

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 10-30-92	
ELEVATION:	GWL: Depth 78.95 ft Date/Time 10-29-92 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sedlak	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 7 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45.0	103322 1415 10-30-92	56 50/2	8	Very Dense yellowish brown (10YR, 5/6) well graded sand with trace gravel, moist	SW	N/A	Hnu = N/A ppm BT: 20 cpm α: 0 cpm
46.5							
50.0	103323 1430 10-30-92	25 18 50	14	Very dense light brownish gray (10YR, 6/2) well graded gravelly sand, dry	SW	N/A	Hnu = N/A ppm BT: 20 cpm α: 0 cpm
51.5							
55.0	103325 1125 11-3-92	25 41 57	18	Very Dense very pale brown (10YR, 7/4) poorly graded medium sand with gravel, dry	KM. 11-3-92 ~~SW~~ SP	N/A	Hnu: 0 ppm BT: 20 cpm α: 0 cpm
56.5							
60.0							

NOTES

Note: Due to the high humidity the Hnu wasn't reliable on 10-30-92

166

PRELIMINARY

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES.	DATE 11-3-92	
ELEVATION	GWL: Depth 78.95 ft. Date/Time 10-29-92 / 1220	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sedlak	Depth Date/Time	DATE COMPLETED 10-9-92	
DRILLING METHODS Cable Tool		PAGE 8 OF 21	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	103326 1345 11-3-92	12 21 43	18	Very Dense yellowish brown (10 YR, 5/6) poorly graded medium Sand, trace gravel, dry	SP	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
61.5							
65.0	103327 1442 11-3-92	50/.4	5	Very dense yellowish brown (10 YR, 5/6) poorly graded medium Sand, trace gravel, dry	SP	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
66.5							
70.0	103328 1515 11-3-92	18 31 49	8	Very dense pale yellow (2.5Y 7/3) well graded Sand with gravel, dry	SW	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
71.5							
75.0							

Preliminary

NOTES

See Page 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I	
BORING NUMBER 4426	COORDINATES	DATE 11-4-92
ELEVATION:	GWL: Depth 78.95 ft. Date/Time 11-9-92 / 1722	DATE STARTED 10-29-92
ENGINEER/GEOLOGIST K. Marian K. Sedlak	Depth Date/Time	DATE COMPLETED 12-9-92
DRILLING METHODS Cable Tool		PAGE 9 OF 21

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0	103329 1130 11-4-92	109/.5	6	Very dense yellowish brown (10YR, 5/6) poorly graded sandy gravel, dry	GP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
76.5							
80.0	103330 1455 11-4-92	8 11 10	12	Medium dense dark grayish brown (2.5Y, 4/2) poorly graded gravelly coarse sand, wet	SP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
81.5							Water Level = 78.95 below ground surface
85.0	103331 1520 11-4-92	6 6 7	9	Medium dense dark grayish brown (2.5Y, 4/2) poorly graded coarse sand with a little fine gravel, wet	SP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
86.5							
90.0							

NOTES

See Page 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602.04 27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 11-5-92	
ELEVATION	GWL: Depth 78.95 Date/Time 10-9-92/1222	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marino, K. Sedlak	Depth Date/Time	DATE COMPLETED 10-9-92	
DRILLING METHODS Cable Tool		PAGE 10 OF 2	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90.0							
91.5	103333 0950 11-5-92	7 7 11	18	Medium dense dark grayish brown (2.5Y, 4/2) poorly graded medium sand with trace gravel, wet	SP ~~SW~~ K.M. 11-5-92	N/A	Hnu = 0 ppm Bf = 20 cpm α = 0 cpm
95.0							
96.5	103334 1115 11-5-92	11 11 14	18	Medium dense dark grayish brown (2.5Y, 4/2) well graded sandy gravel, wet	GW	N/A	Hnu = 0 ppm Bf = 20 cpm α = 0 cpm
100.0							
101.5	103335 1315 11-5-92	9 13 25	18	Dense dark grayish brown (2.5Y, 4/2) well graded sand with gravel, wet	SW	N/A	Hnu = ppm Bf = cpm α = cpm
105.0							

NOTES

See Page 1

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 11-5-92	
ELEVATION:	GWL: Depth 78.95 Date/Time 10-9-92 / 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marlow, K. Sedlak	Depth Date/Time	DATE COMPLETED 10-9-92	
DRILLING METHODS Cable Tool		PAGE 11 OF 21	

DEPTH (ft.) 105.0	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106.5	103336 1710 11-5-92	10 17 30	18	Dense dark grayish brown (2.5Y 4/2) well graded sand with gravel, wet	SW	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
110.0							
111.5	103337 1006 11-6-92	5 8 9	18.	Medium dense dark grayish brown (2.5Y 4/2) well graded sand with gravel, wet	SW	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
115.0							
116.5	N/A	N/A	N/A	N/A	N/A	N/A	Hnu = N/A Bq = N/A α = N/A The sample interval was accidentally drilled past
120							

NOTES

See Page 1

FERNALD RI/FS

48

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 11-6-92	
ELEVATION:	GWL: Depth 78.95 ft. Date/Time 11-9-92 / 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marciony, K. Sedlak	Depth Date/Time	DATE COMPLETED 10-9-92	
DRILLING METHODS Cable Tool		PAGE 12 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120.0	103339 1450 11-6-92	3 9 12	18	Medium dense dark grayish brown (2.5Y, 4/2) well graded sand with gravel, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
125.0	~~103342~~ ~~Rejected~~ 103340 1725 11-6-92	6 50/2	8	Very dense dark grayish brown (2.5Y, 4/2) well graded sand with gravel, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
130.0	103341 1010 11-9-92	25 28 31	18	Very dense dark grayish brown (2.5Y, 4/2) well graded sand with trace gravel, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
135.0							

PRELIMINARY

NOTES

See Page 1

171

FERNALD RI/FS

48 2U

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 11-9-92	
ELEVATION:	GWL: Depth 19.95 ft. Date/Time 11-9-92/1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Seibert	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 13 OF 21	

DEPTH ft.	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135.0				very dense,			
136.5	103342 1355 11-9-92	18 29 31	18	Very dark grayish brown (2.5Y, 3/2) poorly graded fine sand with trace gravel, wet	SP	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
140.0	K.M. 11-10-92						
141.5	~~103343~~ 103344 1600 11-9-92	19 23 29	18	Very dense ~~dark~~ grayish brown (2.5Y, 4/2) poorly graded coarse sand, wet	SP	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
145.0	K.M. 11-10-92						
146.5	~~103345~~ 103345 1700 11-9-92	47 19 32	18	Very dense very dark grayish brown (2.5Y, 3/2) well graded sand and gravel, wet	GW & SW	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
150.0							

NOTES

See Page 1

PRELIMINARY

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME CRA Phase 1		
BORING NUMBER 4426	COORDINATES.	DATE 11-9-92	
ELEVATION:	GWL: Depth 78.95 ft Date/Time 11-9-92 / 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sellak	Depth Date/Time	DATE COMPLETED 11-9-92	
DRILLING METHODS Cable Tool		PAGE 14 OF 21	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150.0	103346 1745 11-9-92	12 21 42	16	Very dense dark grayish brown (2.5Y, ~~5/2~~ 4/2) Coarse sand with trace fine gravel, wet	SP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
155							
155.0	K.M. 11-16-92			Light olive brown K.M. 11-13-92			
	103346 103347 1100 11-13-92	50/5	4	Very dense ~~gray~~ (2.5Y, 5/4) Gravel (poorly graded), wet	GP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
156.5							
160.0	103348 1400 11-13-92	18 11 8	2	Medium dense Light olive brown (2.5Y, 5/4) Poorly graded gravel with a little sand, wet	GP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
161.5							
165.0							

NOTES

See Page 1

PRELIMINARY

173

402

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1		
BORING NUMBER 4426	COORDINATES	DATE 11-13-92	
ELEVATION	GWL: Depth 7.95 ft. Date/Time 12-9-92 / 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion, K. Sellak	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable 1001		PAGE 15 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
165.0	AM 114674						
166.5	~~103349~~ 103350 1715 11-13-92	11 50/5	6	Very dense very dark gray (5Y 3/1) well graded gravel with some sand and trace clay, wet	GW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
170.0	103351 1800 11-16-92	3 9 11	12	Medium dense dark gray (5Y, 4/1) well graded gravelly sand, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
175.0	103352 1455 11-16-92	27 38 45	18	Very dense gray (5Y, 5/1) well graded sand with trace gravel, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
180.0							

NOTES

See Page 1

PRELIMINARY

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 4426	COORDINATES	DATE 11-16-92
ELEVATION	GWL: Depth 78.95 ft Date/Time 12-9-92 / 1722	DATE STARTED 10-29-92
ENGINEER/GEOLOGIST K. Marion / K. Sedlak	Depth Date/Time	DATE COMPLETED
DRILLING METHODS Cable Tool		PAGE 16 OF 21

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
180.0							
181.5	103353 1530 11-16-92	36 22 17	18	Dense dark gray (5Y, 4/1) well graded sand with a little gravel, wet	SW	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
185.0							
186.5	103354 1000 11-17-92	8 11 47	18	Very dense olive gray (5Y, 4/2) well graded sand with trace gravel, wet	SW	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
190.0							
191.5	103356 1145 11-17-92	27 38 41	18	Same as above	SW	N/A	Hnu = 0 ppm Bg = 20 cpm α = 0 cpm
195.0							

PRELIMINARY

NOTES

See Page 1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04.27	PROJECT NAME RCRA Phase 2	
BORING NUMBER 4426	COORDINATES	DATE 11-17-92
ELEVATION	GWL: Depth 78.95 ft Date/Time 12-9-92 1722	DATE STARTED 10-29-92
ENGINEER/GEOLOGIST K. Marion, K. Sellek	Depth Date/Time	DATE COMPLETED 12-9-92
DRILLING METHODS Cable Tool		PAGE 17 OF 21

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
195.0							
196.5	103357 1450 11-17-92	50/4	4	Very dense olive gray (5Y, 4/2) Well graded sand with trace gravel, wet	SW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
200.0							
201.5	103358 1510 11-17-92	29 50/3	8	Very dense light olive brown (2.5Y, 5/3) coarse sand with trace gravel, wet	SP	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
205.0							
206.5	103359 1620 11-17-92	18 31 34	12	Very dense olive (5Y, 4/3) coarse sand with trace gravel, wet	SP K.M. 11-17-92	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
210.0							

NOTES

See Page 1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04. 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES	DATE 11-17-92	
ELEVATION:	GWL: Depth 18.95 ft Date/Time 12-9-92 1722	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 18 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
210.0	103360 1700 11-17-92	5 5 17	18	Medium dense olive gray (5Y, 4/2) very coarse sand with trace gravel, wet	SP	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
211.5							
215.0	103362 1020 11-18-92	18 47 32	18	Very dense light olive brown (2.5Y, 5/3) coarse sand with trace gravel, wet	SP	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
216.5							
220.0	103363 1130 11-18-92	8 11 32	18	Dense grayish brown (2.5Y, 5/2) coarse sand with a little gravel, wet	SP	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
221.5	103364 1440 11-18-92	27 18 34	18	Very dense grayish brown (2.5Y 5/2) well graded sand with a little gravel, wet	SW	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
223.0	103365 1505 11-18-92	47 43 50/5	16	Very dense grayish brown (2.5Y, 5/2) well graded gravel including coal, granite, and limestone with a little sand, wet	GW	N/A	Hnu = 0 ppm Bq = 20 cpm α = 0 cpm
224.5				Continued on next Page			

NOTES

See Page 1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I		
BORING NUMBER 4426	COORDINATES	DATE 11-18-92	
ELEVATION:	GWL: Depth 78.95ft Date/Time 2-4-92 / 1222	DATE STARTED 10-29-92	
ENGINEER/GEOLOGIST K. Marion	Depth Date/Time	DATE COMPLETED 12-9-92	
DRILLING METHODS Cable Tool		PAGE 19 OF 21	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
224.5	103366 1600 11-18-92	31 91/5	11	Very dense grayish brown (2.5Y, 5/2) well graded coarse limestone gravel with a little sand, wet	GW	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
226.0	103367 1630 11-19-92	150/2	2	Gray (5Y, 6/1) weathered limey shale	N/A	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
227.0	103369 1855 11-19-92	150/3	2	Same As Above	N/A	N/A	Hnu = 0 ppm Br = 20 cpm α = 0 cpm
227.3				Bottom of Bore Hole			

NOTES

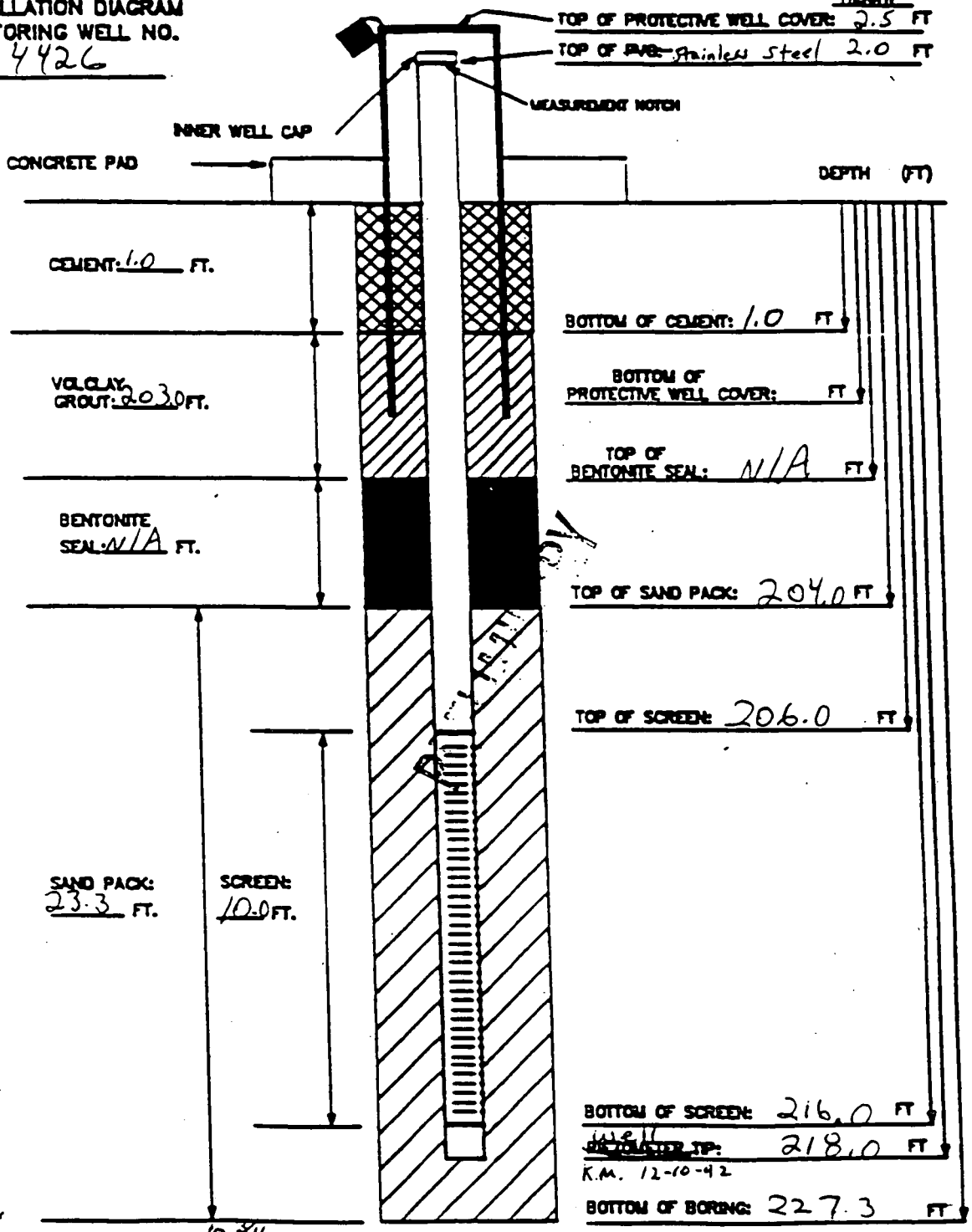
See Page 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 4426

Stickups

INSTALLATION DATE: 12-9-92 48 20



BOREHOLE DIAMETER: 10 3/4 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 20 50 lb. bags of 430 SAND 12-9-92 K.M.
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 79 50 lb bags
AMOUNT OF CEMENT: 1 50 lb. bag
AMOUNT OF WATER USED: 1630 gallons
OTHER: 2 ft. Sump, 10 ft. Screen, 20 – 10 ft. Sections, 1 – 8 ft. Section
42 soil drums
2 decon water drums

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS. 4 inch I.D. Stainless Steel
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS. 4 inch I.D. Stai
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE: 78.95 ft. / 12-9-92

TASK: 602.04.27 GEOLOGIST/ENGINEER: Ken Marion

FERNALD RI/FS

48 20

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase 1 FIELD ENG./GEO. Ken Marien DATE 12-9-92
PROJECT NO. 602. 04. 27 CHECKED BY DATE
BORING NO. 4426
PIEZOMETER NO. N/A DATE OF INSTALLATION 12-9-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 TO 80.0 ft
FLUID N/A FROM — TO —

TYPE OF BIT 10" Churn Bit
CASING SIZE (S) USED:
SIZE 10 FROM 0.0 TO 227.3 ft
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Stainless Steel
DIAMETER OF PERFORATED SECTION 4.0 in.
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS ~~.020 in.~~ .020 in.
TOTAL PERFORATED AREA 10 ft. KM. 12-10-92

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 1-2 ft. sump, 20-10 ft. risers, 1-10 ft. screen, 1-8 ft. riser
JOINING METHOD Threaded Flush Jointed

OTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.
OTHER PROTECTION Steel Well Cover with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (ft.)	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 1.0	BOTTOM 204.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
SAND	TOP 204.0	BOTTOM 227.3	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 106.0	BOTTOM 116.0	TOP	BOTTOM
PIEZOMETER TIP	118.0			
BOTTOM OF BOREHOLE	227.3			
GWL AFTER INSTALLATION	78.95			

THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

MARKS The temporary steel casing was removed upon the installation of the well

48 20

Monitoring Well 2417

Location #5

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 602 3.23	PROJECT NAME: FEMP RI / FS		
BORING NUMBER: 2417	COORDINATES:	DATE: 2-28-92	
ELEVATION: 593.0	GWL: Depth 76.90 Date/Time 3-9-92/1605	DATE STARTED: 2-28-92	
ENGINEER/GEOLOGIST: Ken Marion	Depth . Date/Time	DATE COMPLETED: 3-9-92	
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 1	OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	38081 1045 2-28-92	3 5 3	10	Loose olive brown (2.5Y, 4/4) CLAYEY SILT with organic matter, slightly moist	ML	N/A	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
1.5	38082 1050 2-28-92	3 5 7	11	Stiff light olive brown (2.5Y, 5/4) SILTY CLAY with trace organic matter, high plasticity, slightly moist	CL	1.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
3.0	38083 1055 2-28-92	7 9 10	15	Stiff light olive brown (2.5Y, 5/4) SILTY CLAY with sand and gravel, low plasticity, slightly moist	CL	2.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
4.5	38084 1100 2-28-92	10 11 11	18	Very stiff light olive brown (2.5Y, 5/4) SILTY CLAY with some light brownish gray (2.5Y, 6/2) mottling and some sand and gravel, low plasticity, slightly moist	CL	3.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
6.0	38085 1105 2-28-92	11 13 13	9	Very stiff light olive brown (2.5Y, 5/4) SILTY CLAY with sand and gravel, ~~and~~ E.A. 2-28-92 trace light brownish gray (2.5Y, 6/2) mottling and very dark grayish brown (10YR, 3/2) staining, low plasticity, moist	CL	2.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
7.5							

NOTES

Drilling Company: Pennsylvania Drilling
Driller: Dave Newman
Assistant Driller: Bob Johnson

Samples Collected per ASTM Standard Penetration Test
Colors Identified using Munsell Color Chart

Hnu S/N: 1185	0 ppm	Background Levels
Bγ S/N: 50760	40 cpm	
α S/N: 50768	0 cpm	

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

OJECT NUMBER 602.3.23	PROJECT NAME. FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE. 2-28-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92/1615	DATE STARTED 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 2 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
7.5	38086 1110 2-28-92	13 15 16	14	Stiff olive brown (2.5Y, 5/4) SILTY CLAY with sand and gravel, low plasticity, moist	CL	2.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
9.0	38087 1120 2-28-92	15 17 21	18	Stiff olive brown (2.5Y, 5/4) SILTY CLAY with sand and gravel, low plasticity, slightly moist	CL	3.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
10.5	38088 1625 3-2-92	3 10 21	15	Very stiff light olive brown (2.5Y, 5/4) SILTY CLAY with sand and gravel, some light gray (5Y, 6/1) and yellowish brown (10YR, 5/6) mottling, low plasticity, slightly moist	CL	3.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
12.0	38089 1634 3-2-92	6 13 25	15	Same as above	CL	3.25	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
13.5	38090 1653 3-2-92	1 5 7	10	Stiff gray (2.5Y, 5/0) SILTY CLAY with sand and gravel, medium plasticity, moist	CL	1.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
15.0							

NOTES

See p. 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 607.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE: 3-2-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92 1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Morian	Depth Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 3 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	38091 1701 3-2-92	5 5 11	16	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, trace dark olive brown (2.5Y, 3/3) staining, low plasticity, slightly moist	CL	3.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
16.5	38092 1715 3-2-92	5 8 12	16	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, low plasticity, slightly moist	CL	2.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
18.0	38093 1724 3-2-92	7 13 15	18	Same as above	CL	2.25	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
19.5	38094 0844 3-3-92	17 18 21	15	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, low plasticity, ~~moist~~ K.M. 3-3-92 slightly moist	CL	3.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
21.0	38095 0854 3-3-92	10 13 17	12	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, medium plasticity, moist	CL	2.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
22.5							

NOTES

See p. 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

S 20

PROJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS		
BORING NUMBER: 2417	COORDINATES:	DATE 3-3-92	
ELEVATION:	GWL: Depth 7.90 Date/Time 3-9-92/1615	DATE STARTED: 2-28-92	
ENGINEER/GEOLOGIST: Ken Marion	Depth Date/Time	DATE COMPLETED: 3-9-92	
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 4 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
22.5	38096 0910 3-3-92	6 9 15	12	Stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, medium plasticity, moist	CL	1.75	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
24.0	38097 0955 3-3-92	9 13 20	14	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, low plasticity, moist	CL	3.0	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
25.5	38098 1005 3-3-92	13 16 22	14	Same as above	CL	3.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
27.0	38099 1027 3-3-92	16 25 27	14	Same as above	CL	3.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
28.5	38100 1315 3-3-92	5 7 13	13	Very stiff gray (5Y, 5/1) SILTY CLAY with sand and gravel, medium plasticity, moist	CL	3.5	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
30.0							

NOTES

see p. 1

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE: 3-3-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92 / 1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 5 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	38101 1335 3-3-92	7 11 16	14	Hard gray (5Y,5/1) SILTY CLAY with sand and gravel, low plasticity, moist	CL	4.0	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
31.5	38102 1347 3-3-92	10 10 13	16	Stiff gray (5Y,5/1) SILTY CLAY with sand and gravel, medium plasticity, moist	CL	2.0	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
33.0	38103 1410 3-3-92	7 13 21	16	Dense ~~very fine~~ K.M. 3-3-92 gray (5Y,5/1) ~~SILTY CLAY~~ K.M. 3-3-92 poorly graded very fine sand, slightly moist	SC	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm Aquifer met Base of till at 34.5 ft
34.5	38104 1430 3-3-92	12 22 25	16	Dense yellowish brown (10YR,5/6) ~~met~~ poorly graded medium sand, trace gravel, dry	SP	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
36.0				No sample collected Samples will be collected at 5.0 ft intervals.			Hnu = 0 ppm Br = 40 cpm α = 0 cpm
37.5							

NOTES

See p. 1

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

POJECT NUMBER 602.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE 3-3-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92/1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 6 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
37.5							
				No Samples collected			
40.0							
	38105 1500 3-3-92	18 36 48	14	Very dense light yellowish brown (2.5Y, 6/4) poorly graded medium sand, trace gravel, dry	SP	N/A	Hnu = 0 ppm BT = 40 cpm α = 0 cpm
41.5							
				Samples will be collected at 5 ft. intervals			
45.0							
	38106 1637 3-3-92	23 50	13	Very dense light yellowish brown (2.5Y, 6/4) SANDY GRAVEL, dry	GW	N/A	Hnu = 0 ppm BT = 40 cpm α = 0 cpm
46.5							
50.0							
	38107 1733 3-3-92	5 11 26	17	Dense light yellowish brown (2.5Y, 6/4) well graded SAND with a little gravel, dry	SW	N/A	Hnu = 0 ppm BT = 40 cpm α = 0 cpm
51.5							
52.5							

NOTES

See p. 1

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.3.23	PROJECT NAME. FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE 3-4-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92 1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth · Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 7 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
52.5							
55.0	38108 0920 3-4-92	20 50/4	14	Very dense light yellowish brown (2.5Y, 6/4) poorly graded medium SAND, dry	SP	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
56.5							
60	38109 0940 3-4-92	12 25 48	18	Very dense light yellowish brown (2.5Y, 6/4) GRAVELLY SAND, dry	SW	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
61.5							
65.0	38110 1110 3-4-92	33 50/4	17	Very dense light yellowish brown (2.5Y, 6/4) GRAVELLY SAND, dry	SW	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
66.5							
67.5							

NOTES

see p. i

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

POJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS	4820
BORING NUMBER: 2417	COORDINATES:	DATE: 3-4-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-4-92 / 1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth · Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 8 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
67.5							
70.0							
	38111 1445 3-4-92	45 50/4	10	Very dense light yellowish brown (2.5Y, 6/4) SANDY GRAVEL, dry	GW	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
71.5							
75.0							
	38112 1545 3-4-92	3 5 12	12	Medium dense light brownish gray (10YR, 6/2) well graded SAND with trace gravel	SW	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
76.5				▽ W.L. = 76.90 Ft.			The water level was measured 3-4-92 at 1615.
80.0							
	38113 1647 3-4-92	16 23 23	15	Dense grayish brown (2.5Y, 5/2) well graded sand with a little fine gravel, wet	SW	N/A	Hnu = 0 ppm Br = 40 cpm α = 0 cpm
81.5							
82.5							

NOTES

W.L. = water level

See p. 1

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2417	COORDINATES:	DATE: 3-5-92
ELEVATION:	GWL: Depth 76.90 Date/Time 3-9-92 1615	DATE STARTED: 2-28-92
ENGINEER/GEOLOGIST: Ken Marion	Depth . Date/Time	DATE COMPLETED: 3-9-92
DRILLING METHODS: Cable Tool 10" drill bit		PAGE 9 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
82.5							
85.0	38114 0840 3-5-92	3 5 5	13	Loose grayish brown (2.5Y, 5/2) GRAVELLY SAND, wet	SW	N/A	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
86.5							
90.0	38115 0930 3-5-92	3 3 5	13	Loose grayish brown (2.5Y, 5/2) Coarse SAND, wet	SW	N/A	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
91.5				Bottom of Bore Hole Drilled to a depth of 90.0 ft. Split spoon sampled to a depth of 91.5 ft.			

NOTES

See p. 1

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. 2417

Stickups

INSTALLATION DATE: 3-4-92

HEIGHT

TOP OF PROTECTIVE WELL COVER: 2.5 FT

TOP OF PVC: 2.0 ft. FT

(4) 3/4" Stainless Steel

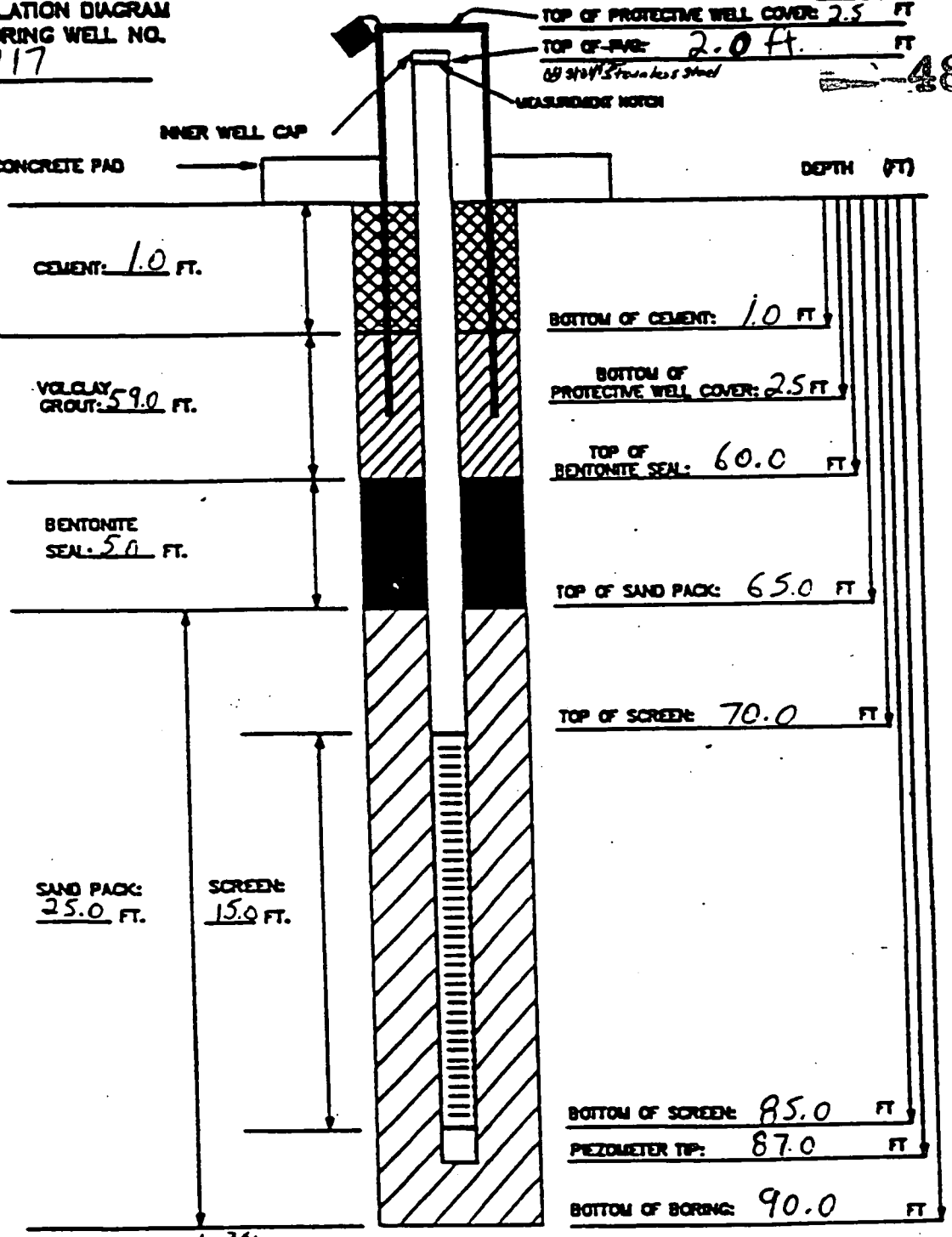
48 20

MEASUREMENT NOTCH

INNER WELL CAP

CONCRETE PAD

DEPTH (FT)



BOREHOLE DIAMETER: 10 3/4 INCHES

MATERIALS USED:

SAND TYPE AND QUANTITY: 430 Sand, 16 bags
BENTONITE PELLETS (5-GALLON BUCKETS): 6
BAGS OF VOLCLAY GROUT: 11
AMOUNT OF CEMENT: 1/2 bag
AMOUNT OF WATER USED: 800 gallons
OTHER:

K.M.
3-11-92

NOTES:
1) RISER PIPE IS ~~6-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS~~ 4 in. Stainless Steel
2) SCREEN IS ~~6-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS~~ 4 in. I.D. .010 in. Slots
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP
4) WATER DEPTH/DATE: 76.90 / 3-9-92

TASK: 602.3.23

GEOLOGIST/ENGINEER: Ken Marsh

PIEZOMETER INSTALLATION SHEET

OJECT NAME FEMP RI/FS FIELD ENG./GEO. Ken Marion DATE 3-10-92
ROJECT NO. 602.3.23 CHECKED BY DATE
BORING NO. 2417
PIEZOMETER NO. N/A DATE OF INSTALLATION 3-9-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 TO 90.0
FLUID N/A FROM N/A TO N/A

TYPE OF BIT 10 inch drill bit (chrum bit)
CASING SIZE (S) USED:
SIZE 10 3/4 in. FROM 0.0 TO 90.0
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Cable Tool
DIAMETER OF PERFORATED SECTION 4.0 in. I.D
PERFORATION TYPE:
SLOTS ☑ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .010 in.
TOTAL PERFORATED AREA 15.0 ft.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 67 ft.
JOINING METHOD flush-Joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Steel well cover with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (ft.)	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT / SLURRY	TOP 0.0	BOTTOM 60.0	TOP	BOTTOM
BENTONITE	TOP 60.0	BOTTOM 65.0	TOP	BOTTOM
SAND	TOP 65.0	BOTTOM ~~87.0~~ 90.0 K.A. 3-26-92	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP N/A	BOTTOM N/A
PERFORATED SECTION	TOP 70.0	BOTTOM 85.0	TOP	BOTTOM
PIEZOMETER TIP	87.0			
BOTTOM OF BOREHOLE	90.0			
GWL AFTER INSTALLATION	76.90			

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
AS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
RKS The temporary casing was removed during the installation of the well

48 20

Monitoring Well 3417

Location #5

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES	DATE 11/3/92
ELEVATION:	GWL: Depth 7.66 ft Date/Time 11/11/92 1250	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geiger	Depth 73.70 ft Date/Time 12/4/92 8:15	DATE COMPLETED 12/4/92
DRILLING METHODS Cable Tool		PAGE 1 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
.0	105000	3	13	med ~~Stiff~~ Dense Olive Brown (2.5Y 4/4) Clayey Silt with some organic material, moist	ML	N/A	HNU = 0 ppm Bγ = 40 cpm α = 0 cpm
	1030	5					
	11/3/92	7					
1.5	105001	7	14	Very stiff Light Olive Brown (2.5Y, 5/4) Silty Clay with some organic matter, med plasticity moist	CL	2.5	HNU = 0 ppm Bγ = 40 cpm α = 0 cpm
	1040	9					
	11/3/92	11					
3.0	105002	6	7	med stiff, Light Olive Brown (2.5Y 5/4) Silty Clay with Trace of Gravel, low plasticity slightly moist	CL	1.0	HNU = 0 ppm Bγ = 40-60 cpm α = 0 cpm
	1045	8					
	11/3/92	12					
4.5	105003	6	16	Stiff Light Olive Brown (2.5Y 5/4) Silt Clay with some Light Brownish gray (2.5Y, 6/2) mottling with some Gravel low plasticity, slightly moist	CL	1.5	HNU = 0 ppm Bγ = 40-60 cpm α = 0 cpm
	1050	8					
	11/3/92	12					
6.0	105004	9	18	Very Stiff Light Olive Brown (2.5Y, 5/4) Silty Clay with Trace of Sand + Gravel Some light Brownish Gray (2.5Y, 6/2) mottling low plasticity, slightly moist	CL	2.0	HNU = 0 ppm Bγ = 40 cpm α = 0 cpm
	1105	10					
	11/3/92	12					
7.5							

NOTES

Drilling company: Pennsylvania Drilling
Driller: Dave Newmen
Assistant Driller: Jeff Bentley

Samples collected per ASTM standard Penetration Test. Colors Identified using Munsell Color Chart

Background Levels
HNU = 0 ppm
Bγ = 40 cpm
α = 0 cpm

FMPC QA 015
2/19/93

2/19/93

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 102 04 27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES.	DATE 11/3/92
ELEVATION:	GWL: Depth see 0 / Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Gaiper	Depth see / Date/Time	DATE COMPLETED 12/4/92
DRILLING METHODS Cable Tool		PAGE 2 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
2.5	105005 1350 11/3/92	12 13 12	18	Very Stiff Light Olive Brown (2.5Y 5/4) Silty Clay with Some Light Brownish gray (2.5Y, 6/2) mottling Low Plasticity slightly moist	CL	2.5	Hnu = 0 ppm BY = 40 cpm α = 0 cpm
9.0	105006 1400 11/3/92	14 18 21	18	Very Stiff Olive Brown (2.5Y 4/4) Silty Clay with Some Sand and gravel Low Plasticity, slightly moist	CL	3.0	Hnu = 0 ppm BY = 40 cpm α = 0 cpm
10.5	105007 1405 11/3/92	21 24 28	18	Very Stiff Olive Brown (2.5Y 4/4) Silty Clay with Some Sand and Gravel Low Plasticity, slightly moist	CL	3.0	Hnu = 0 ppm BY = 40-60 cpm α = 0 cpm
12.0	105008 1900 11/6/92	6 21 35	12	Very Stiff Gray (2.5Y 5/1) Silty Clay with Some Sand + Gravel, medium Plasticity slightly moist	CL	3.0	Hnu = .2 ppm BY = 40 cpm α = 0 cpm
13.5 15.0	105009 1920 11/6/92	10 8 21	9	Very Stiff Gray (2.5Y 5/1) Silty Clay with Some Sand + Gravel Mid Plasticity slightly moist	CL	3.0	Hnu = .2 ppm BY = 40 cpm α = 0 cpm

NOTES

See Page 1

Background Levels 11/3/92
Hnu = 0 ppm
BY = 40 cpm
α = 0 cpm

Background Levels 11/6/92
Hnu = .2 ppm
BY = 40 cpm
α = 0 cpm

FMPC QA DIS

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME. KCAA Phase 1	
BORING NUMBER 3417	COORDINATES.	DATE 11/6/92
ELEVATION:	GWL: Depth Seep. / Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Grieser	Depth Seep. / Date/Time	DATE COMPLETED 12/4/92
DRILLING METHODS Cable Tool		PAGE 3 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	105010 0950 11/6/92	6 8 12	12	Stiff Gray (2.5Y 5/1) ~~[illegible]~~ KG 11/6/92 Silty Clay Some Sand + Gravel medium plasticity slightly moist	CL	1.0	Hnu = .2ppm Bγ = 40cpm α = 0cpm
16.5	105011 1005 11/6/92	7 9 12	13	Stiff Gray (2.5Y, 5/1) Silty Clay with some sand + Gravel med plasticity, slightly moist	CL	1.5	Hnu = .2 ppm Bγ = 40 cpm α = 0 cpm
18.0	105012 1025 11/6/92	12 14 15	11	Stiff Gray (2.5Y, 5/1) Silty Clay with some sand + Gravel medium plasticity, slightly moist	CL	1.5	Hnu = .2ppm Bγ = 40cpm α = 0 cpm
19.5	105013 1400 11/6/92	8 12 15	12	Very Stiff Gray (2.5Y, 5/1) Silty Clay ~~[illegible]~~ KG 11/6/92 with some sand and Gravel medium plasticity, slightly moist	CL	2.0	Hnu = .2ppm Bγ = 40 cpm α = 0 cpm
21.0 22.5	105014 1415 11/6/92	8 8 12	1	Same As Above	CL	2.0	Hnu = .2ppm Bγ = 40cpm α = 0cpm

NOTES

See Page 1

Background Levels
Hnu = .2ppm
Bγ = 40cpm
α = 0 cpm

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES	DATE 11/6/92
ELEVATION	GWL: Depth see p. 1 / Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Kim Geiger	Depth see p. 1 / Date/Time	DATE COMPLETED 12/4/92
DRILLING METHODS Cable Tool		PAGE 4 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
22.5	105015 1430 11/6/92	8 10 11	9	Medium Stiff Gray (2.5Y, 5/1) Silty Clay with Sand + Gravel medium plasticity, moist	CL	0.5	Hnu = .2ppm Bγ = 40 cpm α = 0 cpm
24.0	105016 1440 11/6/92	8 11 12	11	Stiff Gray (2.5Y, 5/1) Silty clay with Sand + Gravel medium plasticity, moist	CL	1.0	Hnu = .2ppm Bγ = 40cpm α = 0 cpm
25.5	105017 1545 11/6/92	6 8 12	12	Very Stiff Gray (2.5Y, 5/1) Silty Clay with Sand + Gravel medium plasticity, moist	CL	2.5	Hnu = .2ppm Bγ = 40cpm α = 0 cpm
27.0	105018 1605 11/6/92	8 10 12	14	Stiff Gray (2.5Y, 5/1) Silty clay with Sand + Gravel medium Plasticity slightly moist	CL	2.0	Hnu = .2ppm Bγ = 40cpm α = 0 cpm
28.5	105019 1700 11/6/92	10 12 9	15	Very Stiff Gray (2.5Y, 5/1) Silty Clay with Sand and Gravel medium plasticity slightly moist	CL	2.5	Hnu = .2ppm Bγ = 40 cpm α = 0 cpm
30.0							

NOTES

See Page 1

Background Levels
Hnu = .2ppm
Bγ = 40cpm
α = 0 cpm

Date: 3/18/93

Ind.

FMPC CA 015

197

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER. 3417	COORDINATES.	DATE 11/9/92
ELEVATION:	GWL: Depth Sep. / Date/Time	DATE STARTED: 11/3/92
ENGINEER/GEOLOGIST. Ken Geiger	Depth Sep. / Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS: Cable Tool		PAGE 5 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	105020	8		~~Very~~ Very Stiff Gray (2.5Y, 5/1) Silty Clay with Sand and Gravel Low Plasticity / Slightly Moist	CL	2.25	HNU = .2 ppm BG = 40 cpm α = 0 cpm
	0940	10	17				
	11/9/92	13					
31.5	105021	12		Medium Stiff Gray (2.5Y, 5/1) Silty Clay with Sand and Gravel medium plasticity Slightly Moist	CL	1.0	HNU = .2 ppm BG = 40-60 cpm α = 0 cpm
	0955	17	13				
	11/9/92	19					
33.0	105022	19		Very Dense Dark Yellow Brown (10YR 4/4) Poorly Graded Very fine Sand with " Traces of Gravel, Dry	SP ~~SC~~	N/A	HNU = .2 ppm BG = 40 cpm α = 0 cpm
	1025	28	12				
	11/9/92	42					
34.5	105023	19		Very Dense Yellowish Brown (10YR 5/6) Poorly Graded medium Sand with Traces of Gravel, Dry	SP	N/A	HNU = .2 ppm BG = 40-60 cpm α = 0 cpm
	1045	25	13				
	11/9/92	45					
36.0				No Sample Collected. Samples To Be Collected At 5.0 ft intervals.			
37.5							

NOTES

See Page 2

Background Levels
HNU = .2 ppm
BG = 40-60 cpm
α = 0 cpm

Date 12/10/92

198

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602 04 27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 3417	COORDINATES:	DATE 11/9/92
ELEVATION:	GWL: Depth Sep. / Date/Time	DATE STARTED: 11/3/92
ENGINEER/GEOLOGIST: Ken Geiser	Depth Sep. / Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS: Cable Tool		PAGE 6 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
37.5				No Sample Collected			
40.0	105024 1105 11/9/92	35 38 49	12	Very Dense Yellowish Brown (10YR 5/4) Poorly Graded medium Sand with Some Gravel, Dry	SP	N/A	HNU = .2ppm Bγ = 40 cpm α = 0 cpm
41.5							
45.0	105025 1510 11/9/92	32 50/2	6	Very Dense Yellowish Brown (10YR, 5/4) Poorly Graded medium Sand with Some Gravel, Dry	SP	N/A	HNU = .2ppm Bγ = 40-60 cpm α = 0 cpm
46.5							
50.0	105026 1600 11/9/92	17 25 32	14	Very Dense Yellowish Brown (10YR, 5/4) Well Graded medium Sand with Some Gravel, Dry	SW	N/A	HNU = .2ppm Bγ = 40-60 cpm α = 0 cpm
51.5							
52.5							

NOTES: See page 1

Background Levels
HNU = .2 ppm
Bγ = 40-60 cpm
α = 0 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602.04.27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER 3417	COORDINATES:	DATE 11/9/92
ELEVATION:	GWL: Depth see p. 1 Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Gogol	Depth see p. 1 Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS Cable Tool		PAGE 7 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
52.5							
55.0	105027 1700 11/9/92	Hole 11/9/92 30 28 41	13	Very Dense yellowish Brown (10YR, 5/4) well Graded Gravelly Sand Dry	SW	N/A	Hnu = .2ppm Bγ = 40cpm α = 0cpm
56.5							
60.0	105028 0900 11/10/92	10 17 32	7	Dense Yellowish Brown (10YR, 5/4) well Graded Sand with some Gravel, Dry	SW	N/A	Hnu = .2ppm Bγ = 60cpm α = 0 cpm
61.5							
65.0	105030 1400 11/10/92	29 32 50	10	Very Dense Yellowish Brown (10YR, 5/4) well Graded Sand with Some Gravel, Dry	SW	N/A	Hnu = .2ppm Bγ = 40-60cpm α = 0 cpm
66.5							
67.5							

NOTES

See Page 1

Back Ground Levels 11/9/92
Hnu = .2ppm
Bγ = 40-60cpm
α = 0cpm

Background Levels 11/10/92
Hnu = .2ppm
Bγ = 60cpm
α = 0cpm

200

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER 602 04.27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES:	DATE 11/10/92
ELEVATION:	GWL: Depth See p.1 Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geiger	Depth See p.1 Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS Cable Tool		PAGE 8 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
69.0							
70.0	105031 1500 11/10/92	32 39 50	16	Very Dense Yellowish Brown (10YR 5/4) well Graded Gravelly sand, Dry	SW	N/A	HNU = .2 ppm Bγ = 40-60 cpm α = 0 cpm
71.5							
95.0	105032 1645 11/10/92	10 17 42	16	Very Dense Light Brownish Gray (10YR, 6/2) Poorly Graded Sand with some Gravel, wet	SP	N/A	HNU = .2 ppm Bγ = 40 cpm α = 0 cpm
76.5				▽ WATER LEVEL 76.6 ft			
80.0	105033 0935 11/11/92	17 25 32	6	Very Dense Grayish Brown (2.5Y 5/2) well Graded medium sand with some Gravel, wet	SW	N/A	HNU = .1 ppm Bγ = 40 cpm α = 0 cpm
81.5							
82.5							

NOTES

See Page 1

Background Levels 11/10/92
HNU = .2 ppm
Bγ = 60 cpm
α = 0 cpm

Background Levels 11/11/92
HNU = .1 ppm
Bγ = 40-60 cpm
α = 0 cpm

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS — 48 20

PROJECT NUMBER 602.04.27	PROJECT NAME. RCRA Phase 2	
BORING NUMBER. 3417	COORDINATES:	DATE 11/11/92
ELEVATION:	GWL: Depth see p. 1 Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geiger	Depth see p. 1 Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS Cable Tool		PAGE 9 OF 14

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
82.5							
85.0	105034 1340 11/11/92	17 24 33	13	Very Dense Dark Grayish Brown (2.5Y, 4/2) Poorly Graded Gravelly Sand, wet	SP	N/A	HNu = .1 ppm Bg = 40 cpm α = 0 cpm
86.5							
90.0	105036 0930 11/12/92	5 17 32	18	Dense Gray (2.5Y 5/1) Poorly Graded coarse sand with some Gravel, wet	SP	N/A	HNu = .2 ppm Bg = 40 cpm α = 0 cpm
91.5							
95.0	105037 1445 11/13/92	12 17 32	12	Dense Gray (2.5Y, 5/1) Poorly Graded Gravelly Sand wet	SP	N/A	HNu = .2 ppm Bg = 40 cpm α = 0 cpm
96.5							
97.5							

NOTES

See Page 1

Background Levels 11/11/92
HNu = .1 ppm
Bg = 40-60 cpm
α = 0 cpm

Background Levels 11/12/92
HNu = .2 ppm
Bg = 40-60 cpm
α = 0 cpm

3/4/93

202

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 102.04 27	PROJECT NAME: RCRA Phase 2	
BORING NUMBER: 3417	COORDINATES:	DATE 11/13/92
ELEVATION:	GWL: Depth See p. 1 Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST: Ken Geiger	Depth See p. 1 Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS: Cable Tool		PAGE 10 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
92.5							
100.0	105038 1345 11/13/92	16 24 35	18	Very Dense Gray (2.5Y 5/1) Poorly Graded Gravelly Sand WET	SP	N/A	HNU = .2ppm Bγ = 40 cpm α = 0 cpm
101.5							
105.0	105039 1365 11/13/92	32 42 45	13	Very Dense Gray (2.5Y 5/1) Poorly Graded Coarse Gravelly Sand WET	SP	N/A	HNU = .2ppm Bγ = 40 cpm α = 0 cpm
106.5							
110.0	105041 1415 11/16/92	12 15 17	12	Dense Grayish Brown (2.5Y 5/2) well ~~graded~~ Medium sand with some Gravel, WET	SW	N/A	HNU = 0ppm Bγ = 40cpm α = 0cpm
111.5							
112.5							

NOTES

See Page 1

Background Levels
HNU = .2ppm
Bγ = 40-60cpm
α = 0cpm

Background Levels
HNU = 0ppm
Bγ = 40cpm
α = 0cpm

12/10/92

MPC QA 015

203

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS 48 20

PROJECT NUMBER 102 04 27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES	DATE 11/16/92
ELEVATION:	GWL: Depth sep. / Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geyer	Depth sep. / Date/Time	DATE COMPLETED 12/4/92
DRILLING METHODS Cable Tool		PAGE 11 OF 16

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
112.5	105642 11/16/92						
115.0	105642 1545 11/16/92	25 37 45	18	Very Dense Gray (2.5Y 5/1) Poorly Graded Sand with Some Gravel, WET	SP	N/A	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
116.5							
120.0	105643 1540 11/16/92	9 12 14	18	Medium-Dense Gray (2.5Y 5/1) well Graded Sand with Some Gravel WET	SW	N/A	Hnu = 0 ppm Bγ = 40-60 cpm α = 0 cpm
121.5							
125.0	105644 1410 11/19/92	12 15 19	18	Dense Dark Grayish Brown (2.5Y 4/2) well Graded medium Sand with Some Gravel WET	SW	N/A	Hnu = 0 ppm Bγ = 40 cpm α = 0 cpm
126.5							
127.5							

NOTES

See Page 1

Background Levels
Hnu = 0 ppm
Bγ = 40 cpm
α = 0 cpm

Background Levels
Hnu = 0 ppm 11/16/92
Bγ = 40 cpm
α = 0 cpm

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase 1	
BORING NUMBER 3417	COORDINATES:	DATE 11/17/92
ELEVATION:	GWL: Depth see p. 1 Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geiger	Depth see p. 1 Date/Time	DATE COMPLETED: 12/4/92
DRILLING METHODS Cable Tool		PAGE 12 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
123.5							
130.0	105045 1435 11/17/92	9 14 18	15	Dense Dark Grayish Brown (2.5Y 4/2) well Graded medium Sand with Trace of Gravel, wet	SW	N/A	HNu = 0 ppm BY = 40 cpm α = 0 cpm
131.5							
135.0	105046 1600 11/17/92	12 16 21	16	Dense Dark Grayish Brown (2.5Y 4/2) Poorly Graded medium Sand with some Gravel, wet	SP	N/A	HNu = 0 ppm BY = 40 cpm α = 0 cpm
136.5							
138.0	105049 1645 11/18/92	9 13 16	16	Medium Dense Dark Grayish Brown (2.5Y 4/2) well Graded medium Sand with Some Gravel, wet	SW	N/A	HNu = 0 ppm BY = 40 cpm α = 0 cpm
139.5	105049 1705 11/18/92	6 9 12	12	Medium Dense Grayish Brown (2.5Y 5/2) well Graded medium Sand with a Trace of Gravel wet	SW	N/A	HNu = 0 ppm BY = 40 cpm α = 0 cpm
141.0	105050 915 11/19/92	32 50 50/5"	18	Very Dense Grayish Brown (2.5Y 5/2) well Graded medium Sand with a Trace of Gravel wet	SW	N/A	HNu = 0 ppm BY = 40 cpm α = 0 cpm
142.5							

NOTES

See Page 1

Background Levels 11/17/92
HNu = 0 ppm
BY = 40 cpm
α = 0 cpm

Background Levels 11/18/92
HNu = 0 ppm
BY = 40 cpm
α = 0 cpm

Background Levels 11/19/92
HNu = 0 ppm
BY = 40 cpm
α = 0 cpm

FERNALD RI/FS

-020

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME. LCKA Phase 2	
BORING NUMBER 3417	COORDINATES:	DATE 11/19/92
ELEVATION:	GWL: Depth Seep. Date/Time	DATE STARTED 11/3/92
ENGINEER/GEOLOGIST Ken Geiger	Depth Seep. Date/Time	DATE COMPLETED 12/4/92
DRILLING METHODS		PAGE 13 OF 16

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
142.5	105051 0940 11/19/92	9 13 17	18	Medium Dense Grayish Brown (2.5Y, 5/2) Well Graded Medium Sand with a Trace of Gravel, wet	SW	N/A	HNU = 0ppm Br = 40cpm α = 0cpm
144.0	105052 1010 11/19/92	13 21 32	18	Very Dense Grayish Brown (2.5Y, 5/2) Poorly Graded Medium Sand with Sand Gravel, wet	SP	N/A	HNU = 0ppm Br = 40cpm α = 0cpm
145.5	105053 1110 11/19/92	10 17	9	Very Soft Dark Greenish Gray (5GY, 4/1) Silty Clay with Sand and Gravel Medium Plasticity, moist	CL	.25	HNU = 0ppm Br = 40cpm α = 0cpm
146.5				Pushed Shelby Tube - NO Recovery			
147.5	105055 1110 11/20/92	Shelby Tube	16	Very Soft Dark Greenish Gray (5GY, 4/1) Silty Clay with Sand and Gravel Medium Plasticity, moist	CL	.25	HNU = 0ppm Br = 40cpm α = 0cpm
148.8				Bottom of Sampling at 148.8ft Bottom of Boring at 149.0ft			

NOTES

See Page 2

Background Levels 11/19/92
HNU = 0ppm
Br = 40-60 cpm
α = 0cpm

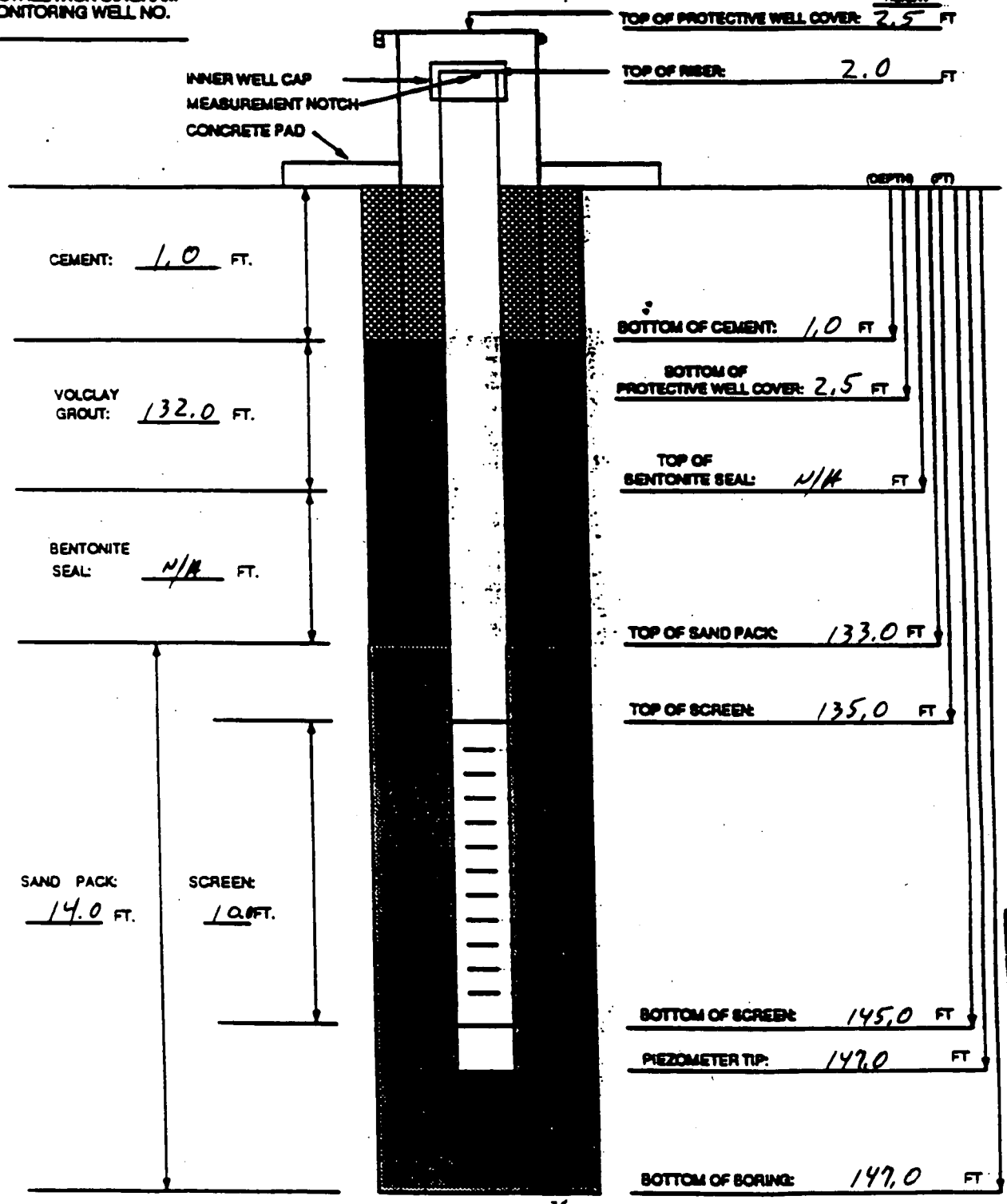
Background Levels 11/20/92
HNU = 0 ppm
Br = 40 cpm
α = 0 cpm

* Sieve analysis sample # 105054 collected from 135.5 to 145.5 ft

48 20

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO.

INSTALLATION DATE: 12/4/92



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 40 Sand / 17-50lb Bags
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
[illegible]S OF VOLCLAY GROUT: 32 -50lb Bags
[illegible]NT OF CEMENT: 1.5 Bags
[illegible]UNT OF WATER USED: 889 Gallons
OTHER: 24 Drums Soil ; 2 Drums Decon water
TASK: 602 04 27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE. FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.020 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.

GEOLOGIST/ENGINEER: KEN GEIGER

4) WATER DEPTH AND DATE 76.60 FT/[illegible]
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BEL[illegible] GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

207

Length of Pipe Sections
[illegible] 13-10 Ft

FERNALD RI/FS

48 20

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase 1 FIELD ENG./GEO. Ken Geiger DATE 12/4/
PROJECT NO. 602.04.27 CHECKED BY C. Brown DATE 12/30/
BORING NO. 3417
~~PIEZOMETER~~ MONITORING WELL NO. 3417 DATE OF INSTALLATION 12/4/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer Percussion Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID water FROM 0.0 ft TO 76.60 ft	SIZE 10.0 in ID FROM 0.0 ft TO 147.0
FLUID N/A FROM N/A TO N/A	SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4.0 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in ~~NS~~ I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS ~~13-10ft to 1-36ft~~, 1-5ft, 1-2ft 1-10ft screen with 2' sump
AVERAGE SIZE OF PERFORATIONS .020 in	JOINING METHOD Screw Type - flush joint
TOTAL PERFORATED AREA 10.0 ft	Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft	OTHER PROTECTION Hinged well cover
PROTECTIVE PIPE O.D. 10 3/4 in	with lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
CEMENT GROUT/SLURRY	TOP 1.0	BOTTOM 133.0	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP 133.0	BOTTOM 147.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 135.0	BOTTOM 195.0	TOP	BOTTOM
PIEZOMETER TIP	147.0			
BOTTOM OF BOREHOLE	147.0			
GWL AFTER INSTALLATION	73.90			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

Field Check
Log Key In
Data Key In
Mark

Sieve Analysis 11/23/92 Page 1

Well # 3417

4820

Retained Values

90% = .006

50% = .019

40% = .025

$\frac{.025}{.006} = 4.1$ 4.1 > 3 use a factor of 4

4 X .019 = .076

.076 most closely fits the coarse grain sand and

.020 screen size

4820

Monitoring Well 2429

Location #6

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 0427	PROJECT NAME: RCRA Ph[illegible] I, 23 Well		
BORING NUMBER: 2429	COORDINATES.	DATE: 7-28-93	
ELEVATION:	GWL: Depth 79.2 Date/Time 7-28-93	DATE STARTED: 7-24-93	
ENGINEER/GEOLOGIST B. Yeardley	Depth 79.6 Date/Time 8-7-93	DATE COMPLETED: 8-6-93	
DRILLING METHODS: Cable Tool		PAGE 1	OF

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
0.0				See MW 3429 for description			
74.4							

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sykes
Helper : Mark Riebodt

SAA = Same As Above
N/A = Not Applicable
Background = NA

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: RCRA Phase I 23 [illegible]		
BORING NUMBER: MW [illegible]	COORDINATES:	DATE: 7-27-93 [illegible]	
ELEVATION:	GWL: Depth 79.2 Date/Time 7-28-93	DATE STARTED:	
ENGINEER/GEOLOGIST: B. Yeaculen	Depth 79.6 Date/Time 8-7-93	DATE COMPLETED:	
DRILLING METHODS: Cable Tool		PAGE 2 OF	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY	* REMARKS
75	1535 1053.0 7-27-93	88 134	11	Vn Dense 10YR(6/6) brown yellow fine to coarse sand w/ gravel some coarse (2") [illegible]	SW	NA	BG: 70-80 cpm MTip= 0 ppm
76	1545 1053.1 7-27-93	81 46	9	SAA	SW	↑	BG: 40-50 cpm MTip= 0 ppm
77	1010 1053.2 7-27-93	12 34 0	11	SAA moist to wet	SW		BG: 40-50 cpm MTip: 0 ppm
78	0840 [illegible] 7-28-93	6 [illegible] 24	5 All to [illegible]	Loose 2.5Y(5/4) [illegible] brown fine to coarse sand w/ gravel some coarse [illegible] WET	SW		BG: 40-50 cpm MTip: 0 ppm
	0850 1053.4 7-28-93	4 24 20	5	Vn Dense 2.5Y(5/4) [illegible] olive brown fine to coarse gravel w/ sand well graded wet	GW		BG: 40-50 cpm MTip: 0 ppm
80	0935 1057.5 7-28-93	24 [illegible] [illegible]	14	Vn Dense 2.5Y(5/4) [illegible] olive brown medium sand w/ gravel some coarse well graded wet some silt	SW		BG: 40-50 cpm MTip= 0 ppm
85	1000 [illegible] 7-28-93	5 [illegible] [illegible]	5	Vn Dense 2.5Y(5/4) [illegible] olive brown medium to coarse sand w/ gravel some [illegible]	SW		BG: 40-50 cpm MTip= 0 ppm
90	[illegible] [illegible] 7-28-93	[illegible] [illegible] [illegible]	5 All [illegible]	SAA	SW		BG: 40-50 cpm MTip= 0 ppm
95	[illegible] 1057.6 7-28-93	5 [illegible] [illegible]	0	SAA	SW	↓	BG: 40-50 cpm MTip= 0 ppm
[illegible]	[illegible] [illegible]	[illegible]		SAA	[illegible]	N/A	BG: [illegible] MTip= [illegible]

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: [illegible]
Driller: [illegible]
Helper: [illegible]

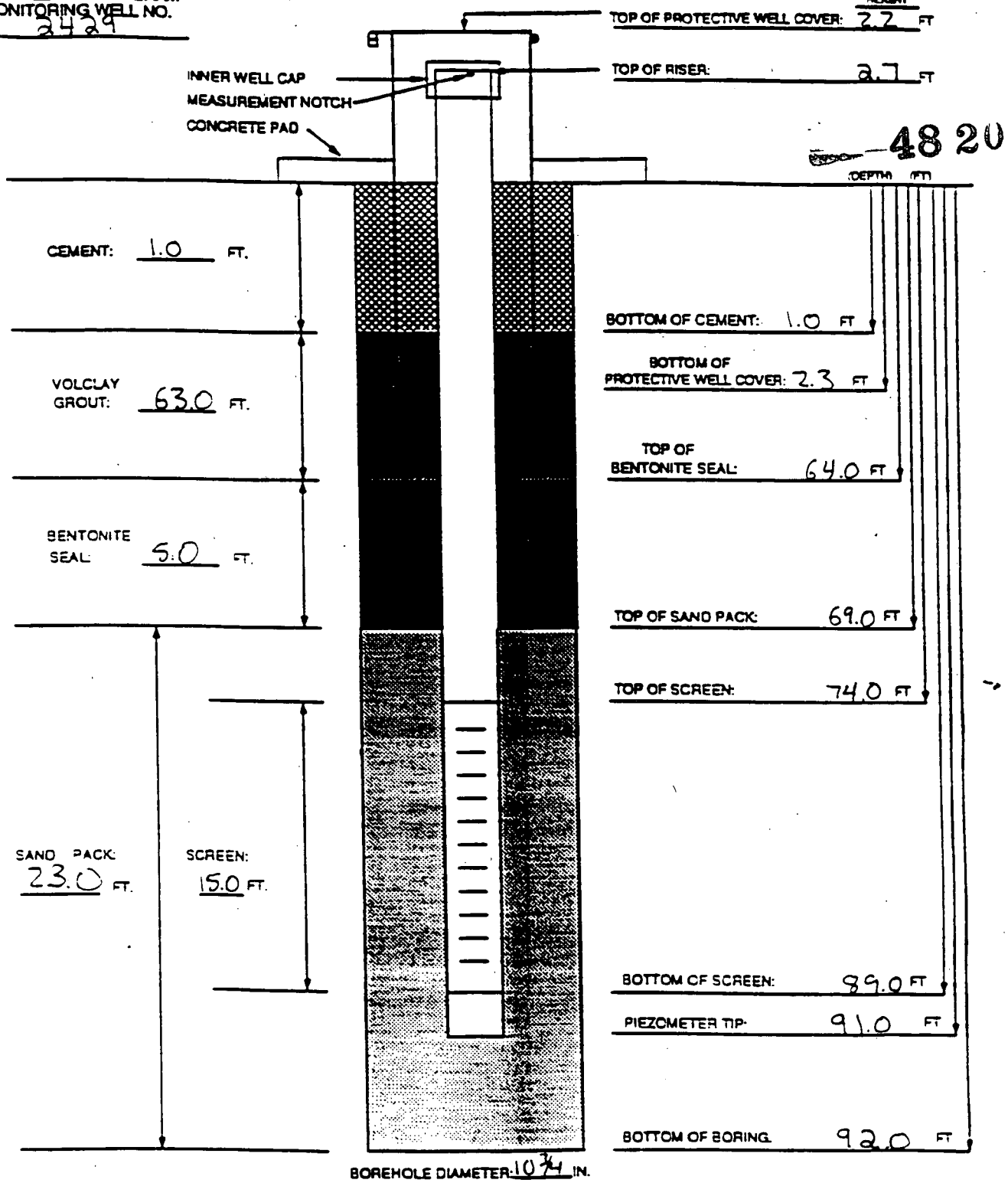
SAA = Same As Above
N/A = Not Applicable
Background = [illegible]

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

212

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2429

INSTALLATION DATE: 7-29-93 to 8-6-93



MATERIALS USED

SAND TYPE AND QUANTITY: 27 bags coarse
BENTONITE PELLETS (5-GALLON BUCKETS): 8
BAGS OF VOLCLAY GROUT: 15 bags (50 lb)
AMOUNT OF CEMENT: 7 bags
QUANTITY OF WATER USED: 900 gal
12 Drums Soil, 1 Drum H_2O
DATE: 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.02 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP
4) WATER DEPTH AND DATE 79.6 FT/ 9-
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK

GEOLOGIST/ENGINEER: B. Yeardley

FERNALD
RI/FS

48 20

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I, 23 Well FIELD ENG./GEO. B. Yeardley DATE 8-6-93
PROJECT NO. 0427 CHECKED BY _____ DATE _____
BORING NO. 2429
PIEZOMETER NO. 2429 DATE OF INSTALLATION 7-24-93 to 8-6-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Percussion Hammer Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID H_2O FROM 0.0 ft TO 79.0 ft	SIZE 10 in ID FROM 0.0 TO 55 in
FLUID — FROM — TO —	SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitor Well	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION 4.0 in ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 I.D. 4.0 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 7-0 ft, 14 ft, 1-2 ft
AVERAGE SIZE OF PERFORATIONS 0.02 in	JOINING METHOD ~~Hinged locking~~ By 8-6-93
TOTAL PERFORATED AREA 15.0 ft	Screen type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION Hinged locking
PROTECTIVE PIPE O.D. 10 3/4 in	cover w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION	
TOP OF RISER PIPE	2.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.3			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
CEMENT GROUT / ~~SLURRY~~ By 8-6-93	TOP 1.0	BOTTOM 64.0	TOP	BOTTOM
BENTONITE	TOP 64.0	BOTTOM 69.0	TOP	BOTTOM
SAND	TOP 69.0	BOTTOM 92.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 74.0	BOTTOM 89.0	TOP	BOTTOM
PIEZOMETER TIP	92.0 ft			
BOTTOM OF BOREHOLE	92.0 ft			
GWL AFTER INSTALLATION	79.6 ft			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS _____

MW2429

Methodology for sand pack and sieve determinatio
(from R Scheper paper)

① WEMCO grain size
40% = .060 in
50% = .041 in
90% = .006 in

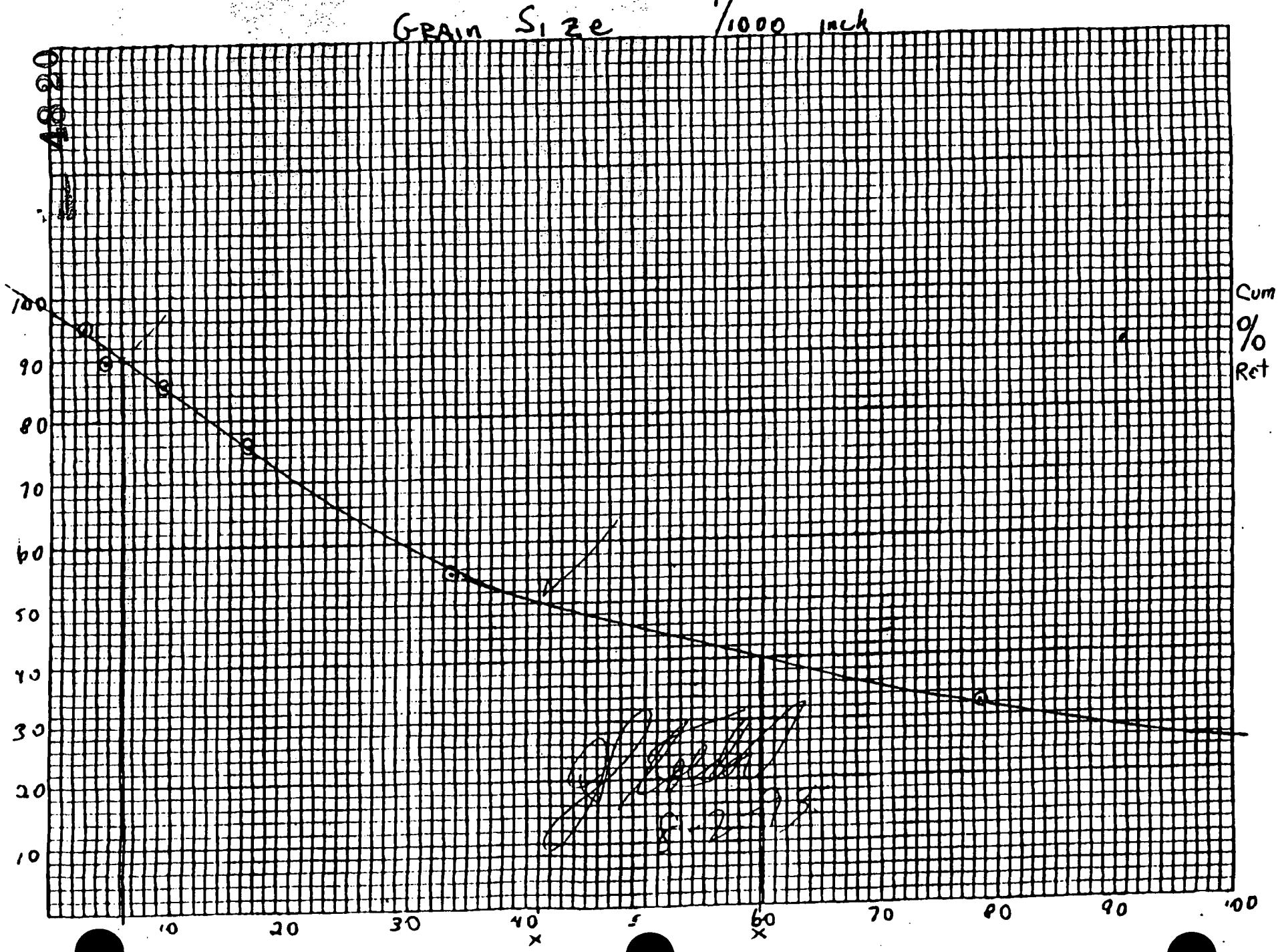
② 40% 90% Ratio (uniformity coefficient)
= 10 > 3 ∴ use 4 factor

③ 50% value × 4
.041 × 4 = 0.164

④ Look at distribution curves 0.164 falls beyond the medium and coarse grain curves. Therefore because this grain size falls closer to the 50% grain size for coarse grain curve we will use coarse grain sand pack with the 20 slot (.0020 in) screen. This will allow for maximum flow of water into well and also retain formation infiltration.

Geologist: Brian [illegible]

NO. 340/ -10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH
EUGENE DIETZGEN CO
MADE IN U. S. A.



4820

Monitoring Well 3429

Location #6

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: [illegible]	PROJECT NAME: [illegible]		
BORING NUMBER: MW 3429	COORDINATES:		DATE: [illegible]
ELEVATION:	GWL: Depth 7.59	Date/Time 6-23-93	DATE STARTED: [illegible]
ENGINEER/GEOLOGIST: B. Yeardley	Depth 7.94	Date/Time 7-26-93	DATE COMPLETED: 7-23-93
DRILLING METHODS: Cable Tool			PAGE 1 OF 14

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	* REMARKS
	1600 105351 6-10-93	3 3 5	5	St.ff, 10YR(3/3) Dk brown, organic silty clay, low plasticity, moist V. St.ff, 10YR(5/6) yellowish brown, silty clay, med. plasticity, moist	CL CL	1.0 2.5	βγ: 50-100 cpm Micro = 0 ppm
30	1603 105352 6-10-93	3 5 10	14	V. St.ff, 10YR(3/2) Vy Dk grayish brown, organic wood chips, silty clay, low plasticity, moist	CL	2.5	βγ: 50-100 cpm MTip = 0 ppm
40	1605 105353 6-10-93	7 7 8	8	Vy St.ff, 10YR(5/6) yellowish brown, silty clay, med. plasticity, moist	CL	2.5	βγ: 50-100 cpm MTip: 0 ppm
50	1607 105354 6-10-93	7 9 9	8	SAA	CL	2.5	βγ: 50-100 cpm MTip: 0 ppm
60	1610 105355 6-10-93	6 8 11	8	SAA w/ minor gravel	CL	2.0	βγ: 50-70 cpm MTip: 0 ppm
70	1625 105356 6-10-93	6 7 17	6	St.ff, mottled 7.5YR(5/6) & 10YR(5/6) lt. olive brown and yellowish brown, silty clay w/ minor gravel, med. plast., moist	CL	1.7	βγ: 50-70 cpm MTip = 0 ppm
80	1630 105357 6-10-93	7 11 13	17	V. St.ff, 10YR(5/6) yellowish brown, silty clay, w/ some gravel, med. plasticity, moist	CL	3.5 ↓ 2.0	βγ: 50-70 cpm MTip = 0 ppm
90	1645 105358 6-10-93	6 15 19	5	Hard, mottled 7.5YR(5/6) and 10YR(5/6) strong brown and yellowish brown silty clay w/ gravel med. plasticity moist	CL	>4.0	βγ: 50-70 cpm MTip: 0 ppm
100	1650 105359 6-10-93	17 17 23	12	V. St.ff, 10YR(5/6), yellowish brown silty clay w/ gravel (med. to crse) med. plasticity moist	CL	3.5	βγ: 50-70 cpm MTip = 0 ppm
110	1045 105360 6-10-93	14 14 15	13	V. St.ff, mottled browns, silty clay, moist V. St.ff, 5Y(4/1) Dk Gray w/ 7.5YR(5/8) strong brown, silty clay w/ gravel moist	CL CL	3.5 3.5	βγ: 50-70 cpm MTip: 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Craig Coulter
Helper: Jeff Cherch, Bill Siebert

SAA = Same As Above
N/A = Not Applicable

Background = 60-80 cpm
50-70 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS — 48 20

PROJECT NUMBER: WBS 04.27	PROJECT NAME: RCRA Phase I 23 Well		
BORING NUMBER: MW 3429	COORDINATES:	DATE:	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED: 6-16-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED: 7-27-93	
DRILLING METHODS: Cable Tool		PAGE 2 OF 4	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
10	1050 105362 6-11-93	12 13 16	17	Vy St.ff, 2.5Y(4/1) Dk Gray w/ 7.5(5/6) Strong Brown fracture coatings, silty clay, moist Vy St.ff. 2.5Y 4/1 Dk Gray silty clay w/ gravel, med plasticity, moist	CL CL	3.5 3.5	βγ: 50-70 cpm HNU: 0 ppm
15	1450 105363 6-11-93	3 6	2	St.ff, 2.5Y 4/1 Dk Gray gravelly clay, med plasticity, moist	CL	2.0	βγ: 50-70 cpm HNU: 0 ppm
14	1455 105364 6-11-93	3 11 10	14	Very St.ff, 2.5Y 4/1 Dk Gray, silty clay w/ gravel, moist, med plasticity	CL	3.0	βγ: 50-70 cpm HNU: 0 ppm
20	1430 105365 6-11-93	4 7 11	8	Vy St.ff, 2.5Y 4/1 Dk Gray, gravelly clay, medium plasticity, moist	CL	2.25	βγ: 50-70 cpm HNU: 0 ppm
22	1440	4 7 13	0	No Sample	—	—	βγ: – HNU: –
23	1010 105368 6-15-93	5 6 7	18	St.ff, 5Y(4/1) Dk. gray, silty clay w/ gravel, moist, medium plasticity 6-15-93	CL	1.75	βγ: 60-80 cpm HNU: 0 ppm
25	1020 105377 6-15-93	3 7 10	10	SAA	CL	1.5	βγ: 60-80 cpm HNU: 0 ppm
30 37	105369 1025 6-15-93	4 4 5	8	St.ff, 5Y(4/1) Dk Gray, silty clay w/ some gravel, medium plasticity, moist	CL	1.0	βγ: 40-60 cpm HNU: 0 ppm
35	105370 1350 6-15-93	4 6 8	3	Vy. soft, 5Y(4/1) Dk Gray, silty clay w/ some gravel, medium plasticity wet	CL	0.5	βγ: 40-60 cpm HNU: 0 ppm
39 30	105371 1405 6-15-93	15 48 60	8.5	Vy. St.ff, 5Y(4/1) Dk Gray, silty clay w/ some gravel and rock fragments, medium plast. moist	CL	3.0	βγ: 40-60 cpm HNU: 0 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Jim Saccan
Helper: Jeff Chechan

SAA = Same As Above
N/A = Not Applicable

Background = 50-70 cpm 6-15
40-60 cpm 6-16

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

FINAL
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER WBS 09.27	PROJECT NAME RCRA PHASE I, 23		
BORING NUMBER MW # 3429	COORDINATES	DATE 6-16-93	
ELEVATION	GWL. Depth 75.9 Date/Time 6-23-93	DATE STARTED	
ENGINEER/GEOLOGIST RILEY, Yearkey	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED 7-26-93	
DRILLING METHODS CABLE TOOL		PAGE 3 OF 12	

DEPTH (FEET)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCH	RECOVERY (INCH)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	105372 1419 6-16-93	4 5 9	12	VERY STIFF, GRAY (10YR 5/1) SILTY CLAY, WITH SOME GRAVEL, MEDIUM PLASTICITY, MOIST	CL	2.5	BY = 40-60 cpm MicroTIP = 0 ppm
31.5	C430 105373 6-17-93	12 14 19	16	Very St. ff, SY(4/1) DK Gray, silty clay w/ gravel, med plasticity, moist	CL	2.0 3.5	BY = 40-60 cpm MT.p = 0 ppm
33.0	C455 105374 6-17-93	8 9 10	17	Vy. St. ff, SY(4/1) DK Gray, silty clay w/ gravel, med plasticity, moist	CL	2.25	BY = 40-60 cpm MT.p = 0 ppm
34.6	1015 6-17-93	8 8 10	0	No Recovery	—	—	BY = NA MT.p = NA
36.0	C420 105375 6-15-93	3 4 3	8	Stiff, SY(4/1) DK Gray, silty clay w/ some gravel, med plasticity, moist	CL	1.5	BY = 40-60 cpm MT.p = 0 ppm
37.5	C445 105376 6-15-93	5 18 31	17	Stiff, SY(4/1) DK Gray, silty clay, med plasticity, moist Dense, 10YR(5/8) yellowish brown, fine sand, dry Dense, " fine sand "well sorted" dry	CL ML SP	0.5 NA	BY = 40-60 cpm MT.p = 0 ppm
39.0				Begin 5 ft sampling			BY = MT.p =
40.5							BY = MT.p =
42.0							BY = MT.p =
43.5							BY = MT.p =
45.0							BY = MT.p =

DRILLING CONTRACTOR: PENNSYLVANIA DRILLING
EQUIPMENT: CABLE TOOL
DRILLER: JIM SACCANI
HELPER: ALEX BAKER

BACKGROUND LEVELS
6-16-93
BY = 40 cpm (6-16-93)
MT = 0 ppm
BY = 40-60 cpm (6-17-93)
BY = 40-60 cpm (6-18-93)

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME. RCRA Phase I 23 well		
BORING NUMBER 3429	COORDINATES.	DATE: 6-15-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED. 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED. 7-23-93	
DRILLING METHODS Cable Tool		PAGE 4 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISI)	REMARKS
45.0	101S 105370 [illegible]	27 32 39	11	Vy dense, 2.5Y(6/4) lt. yel. brown, med to crse med w/ gravel, well graded, dry	SW	NA	Bg = 40-60 cpm MT.p = 0 ppm
50.0	102S 105371 [illegible]	63 50 56	16	Vy dense, 2.5Y(6/4) lt yellow brown, fine sand w/ gravel, poorly graded, dry minor clay	SP	NA	Bg = 40-60 cpm MT.p = 0 ppm
55.0	103S 105380 [illegible]	40 32 45	12	Vy Dense, 10.YR, yellowish brown fine to medium sand w/ gravel, well graded, dry	SW	NA	Bg = 40-60 cpm MT.p = 0 ppm

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sciascia
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable
Background = 40-60 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME: RCRA Phase I 23 well		
BORING NUMBER 3429	COORDINATES:		DATE: 6-21-93, 6-22-93
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93		DATE STARTED: 6-10-93
ENGINEER/GEOLOGIST B Yearling	Depth 79.4 Date/Time 7-26-93		DATE COMPLETED: 7-26-93
DRILLING METHODS Cable Tool			PAGE 5 OF 19

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
50	3410 105351 6-2243	32 24 34	14	V. Dense, 10YR (5/4) yellowish brown, fine sand, poorly graded, dry	SP	NA	Bg = 50-70 cpm MT.p = 0 ppm
55	3410 105352 6-2243	45 96	13	V. Dense, 10YR (5/4) yellowish brown, fine to medium sand, well graded, dry / V. Dense 10YR (5/4) yellowish brown, fine sand w/ trace gravel, poorly graded	SW / SP	NA	Bg = 50-70 cpm MT.p = 0 ppm
70	3410 105353 6-2243	40 45 37	16	V. Dense, 10YR (5/4) yellowish brown, fine to coarse sand w/ gravel some large limestone gravel, well graded, dry	SW	NA	Bg = 50-70 cpm MT.p 0 ppm
75							

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Jim Scessani
Helper: Alex Batten

SAA = Same As Above
N/A = Not Applicable
Background = 50-70cpm

* Samples collected per ASTM Standard Penetration Test.
• All colors identified by the Munsell Color Chart.

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME: RCRA Phase I 23 well		
BORING NUMBER 3424	COORDINATES.	DATE: 6-23-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED. 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED. 7-23-93	
DRILLING METHODS. Cable Tool		PAGE 6 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
75.0	0850 105384 6-22-93	32 119	13	v. Dense 10YR(5/4) yellowish brown, fine to coarse sand w/ gravel, well graded, dry	SW	NA	Bq = 50-70 cpm MT.p = 0 ppm
80.0	0915 105385 6-22-93	15 13 11	17	Med Dense 2.5Y(5/4) lt. olive brown medium to crse sand and gravel, well graded, wet	SW	NA	Bq = 50-70 cpm MT.p = 0 ppm
85.0	1440 105387 6-22-93	7 15 19	13	Dense, 2.5Y(5/4) lt. Olive Brown med to crse sand w/ gravel, well graded, wet	SW	NA	Bq = 50-70 cpm MT.p = 0 ppm
90.0							

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sugerni
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable
Background = 40-60 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

FERNALD RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME RCRA Phase I, 23 well		
BORING NUMBER 3429	COORDINATES	DATE 6-23-93 6-24-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED 7-23-93	
DRILLING METHODS Cable Tool		PAGE 7 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
40.0	1516 105388 6-23-93	10 12 18	14	Dense 2.5Y(5/4) lt olive brown, fine grading to a coarse sand then gravel, well graded to a poorly graded gravel wet	SW ↓ GP	NA	Bq = 50-70 cpm MT.p = 0 ppm
45.0	0855 105389 6-24-93	27 35 32	18	V Dense, 2.5Y(5/4) lt. olive brown, med. to coarse sand w/ fine to medium gravel, well graded, wet	SW	NA	Bq = 60-80 cpm MT.p = 0 ppm
50.0	0935 105390 6-24-93	7 7 6	9	M. Dense, 2.5Y(5/4) lt. olive brown, fine to medium sand w/ gravel, well graded, wet	SW	NA	Bq = 60-80 cpm MT.p = 0 ppm

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sgrecchi
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable

Background (6-23-93) 60-70 cpm
(6-24-93) 60-80 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

224

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME RCRA Phase I 23 well		
BORING NUMBER 3429	COORDINATES	DATE 6-24-93 7-25-93	
ELEVATION	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-28-93	DATE COMPLETED 7-23-93	
DRILLING METHODS Cable Tool		PAGE 8 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISF)	REMARKS
[illegible]	1535 105341 [illegible]2493	H 19 35	13	Dense, 2.5Y(5/4) lt. olive gray, fine to coarse sand w/ some gravel, well graded, wet	SW	NA	Bq = 00-80 cpm MT.p = 0 ppm
				hydropunch @ 1110 ft. 0910			
1100	2445 105393 [illegible]2543	11 13 10	12	M. Dense, 2.5Y(5/4) lt. olive brown, fine to coarse sand w/ some gravel, well graded, wet	SW	M	Bq = 40-60 cpm MT.p: 0 ppm
1150	1400 105344 [illegible]2548	45 35 30	10	v. Dense, 2.5Y(5/4) lt. olive brown, fine to coarse sand w/ fine to medium gravel, well sorted, wet	SW	M	Bq = 40-60 cpm MT.p: 0 ppm

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sacconi
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable

Background = 60-80 cpm
40-60 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

407-11-86

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER C427	PROJECT NAME RCRA Phase I 23 well		
BORING NUMBER 3429	COORDINATES	DATE 6-25-93, 6-28-93	
ELEVATION	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED 6-10-93	
ENGINEER/GEOLOGIST B Yearsley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED 7-23-93	
DRILLING METHODS Cable Tool		PAGE 9 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120.0	1435	10	18	Medium dense, 2.5Y(5/4) lt. olive brown, fine to medium sand, well graded, wet	SW	NA	Bg = 40-60 cpm
	105395	9					MT.p = 0 ppm
121.5	6-25-93	10		to a fine to coarse gravel, well, wet	GW		
125.0	1015	28	16	Vry Dense, 2.5Y(5/4) lt. olive brown, fine to med. grain sand w gravel, well graded, wet	SW	NA	Bg = 40-60 cpm
	105396	60					MT.p = 0 ppm
126.5	6-28-93	59					
130.0	1055	7	15	M Dense, 2.5Y(5/4) lt. olive brown, fine to med. gr sand w/ gravel well graded, wet	SW	NA	Bg = 60 cpm
	105397	11					MT.p = 0 ppm
131.5	6-28-93	14					

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sugrani
Helper : Alex Baken

SAA = Same As Above
N/A = Not Applicable

Background = 40-60 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME. RCRA Phase I 23 Well		
BORING NUMBER 3429	COORDINATES.	DATE: 6-30-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED. 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED. 7-22-93	
DRILLING METHODS. Cable Tool		PAGE 10 OF 9	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (ISS)	REMARKS
136.0	1420	33		V. Dense, 2.5Y(5/4) lt. olive brown			Bq = 70 cpm
	105399	51	14	fine - crse sand and gravel,	SW	NA	MT.p = 0 ppm
136.5	6-30-93	59		well graded, wet			
140.0				Continuous sampling begins			
	~~105400~~ B7 7-1-93						Bq = cpm MT.p = ppm
145.5							
145.5	~~105301~~ B7 7-1-93						Bq = cpm MT.p ppm

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sessoni
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable

Background = 40-60cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

FERNALD
RI/FS

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 0427	PROJECT NAME: RCRA Phase I, 23 Well		
BORING NUMBER: MW 3429	COORDINATES:	DATE: 7-1-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED: 6-16-93	
ENGINEER/GEOLOGIST: B. Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED: 7-23-93	
DRILLING METHODS: Cable Tool		PAGE 11 OF 19	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
140.0	0720	13		M. Dense, 2.5Y(5/4) lt. olive brown,			βγ: 40-60 cpm
141	105400	14	16	fine to coarse sand w/ minor gravel,	SW	NA	MT.p: 0.7 ppm
	7-1-93	17		well graded, wet			(background) = fog
142	0750	6		M. dense, 2.5Y(5/4) lt. olive brown,			βγ: 40-60 cpm
	105301	8	3	fine to coarse sand w/ minor gravel,	SW	NA	MT.p: 0.3 ppm
143	7-1-93	12		well graded, wet			(background)
	1035	20		V. Dense, 2.5Y(5/4) lt. olive brown,			βγ: 40-60 cpm
144	105302	40	16	fine to coarse sand w/ gravel.	SW	NA	MT.p: 0.0 ppm
	7-1-93	52		well graded, wet			
145	1100	15		SAA			βγ: 40-60 cpm
	105303	27	14		SW	NA	MT.p: 0.0 ppm
146	7-1-93	82					
	1415	13		SAA			βγ: 40-60 cpm
147	105304	18	10		SW	NA	MT.p: 0.4 ppm
	7-1-93	28					Background: 0.4
148	1445	43		SAA			βγ: 40-60 cpm
	105305	63	11		SW	NA	MT.p: 0.0 ppm
149	7-1-93	40					
	1510	20		SAA			βγ: 40-60 cpm
150	105306	22	10		SW	NA	MT.p: 0.0 ppm
	7-1-93	26					
				Go back to 5.0 ft Sampling			βγ: MT.p:
							βγ: MT.p:
							βγ: MT.p:

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: Cable Tool
Driller: Jim Saccani
Helper: Alex Baker

SAA = Same As Above
N/A = Not Applicable
Background = 40-60 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 0427	PROJECT NAME. RCRA Phase I 23 well		
BORING NUMBER 3429	COORDINATES.	DATE: 7-8-93	
ELEVATION:	GWL: Depth 75.9 Date/Time 6-23-93	DATE STARTED. 6-10-93	
ENGINEER/GEOLOGIST B Yeardley	Depth 79.4 Date/Time 7-26-93	DATE COMPLETED. 7-23-93	
DRILLING METHODS. Cable Tool		PAGE 12 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
155.0	1010 105300 7-8-93	56 71 50/0	14	Vy. Dense, 2.5Y (5/4) lt olive brown, fine to coarse gravel w/ sand, well graded, wet	GW	NA	Bg = 60-80 cpm MT.p = 0.0 ppm
160.5							
160	1020 105309 7-8-93	30 61 65	8	Hard, 5G (4/1) DK greenish gray, Silty clay, high plasticity, moist w/ some gravel 7-8-93	CL		Bg = 60-50 cpm MT.p = 0.0 ppm
165.5				-Shelby Tube taken @ 161.5. No Sample -Hole drilled to 164.0 ft.			
							Bg = — cpm MT.p — ppm

NOTES

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment : Cable Tool
Driller : Jim Sgarlini
Helper : Alex Baker

SAA = Same As Above
N/A = Not Applicable

Background = 60-80 cpm

* Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

402-11-86

MW 3429 1

Methodology for sand pack and sieve determination
(from R Scheper paper)

① WEMCO grain size
40% = .066 in
50% = .043 in
90% = .007 in

② 40% 90% Ratio (uniformity coefficient)
.066/.007 = 9.4 > 3 ∴ use 4 factor

③ 50% value × 4
.043 × 4 = 0.172

④ Look at distribution curves. 0.172 falls beyond the medium and coarse grain curves. Therefore, because this grain size falls closer to the 50% grain size for coarse grain curve we will use coarse grain sand pack with the 20 slot (0.020 in) screen. This will allow for maximum flow of water into well and also retain formation infiltration.

Geologist: BRIAN YEARDLEY

FERNALD RI/FS

18 of 19

PIEZOMETER INSTALLATION SHEET 48 20

PROJECT NAME _____ FIELD ENG./GEO. _____ DATE _____
PROJECT NO _____ CHECKED BY _____ DATE _____
BORING NO _____
PIEZOMETER NO _____ DATE OF INSTALLATION 7-23-93

BOREHOLE DRILLING

DRILLING METHOD _____	TYPE OF BIT _____
DRILLING FLUID(S) USED:	CASING SIZE (S) USED:
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____
FLUID _____ FROM _____ TO _____	SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE _____	RISER PIPE MATERIAL 316 Stainless Steel
DIAMETER OF PERFORATED SECTION _____	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. _____ I.D. _____
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS _____
AVERAGE SIZE OF PERFORATIONS _____	JOINING METHOD Screw type - flush joint
TOTAL PERFORATED AREA _____	_____

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH _____	OTHER PROTECTION hinged locking
PROTECTIVE PIPE O.D. 10 3/4 in	cover

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	3.			
BOREHOLE FILL MATERIALS:				
GROUT / ~~SLURRY~~	TOP	BOTTOM	TOP	BOTTOM
BENTONITE NA	TOP	BOTTOM	TOP	BOTTOM
SAND fine sand	TOP	BOTTOM	TOP	BOTTOM
~~GRAVEL~~ course sand BA 7-26-93	TOP	BOTTOM	TOP BA 7-26-93	BOTTOM
PERFORATED SECTION	TOP	BOTTOM	TOP	BOTTOM
PIEZOMETER TIP				
BOTTOM OF BOREHOLE				
GWL AFTER INSTALLATION	79.4 ft			

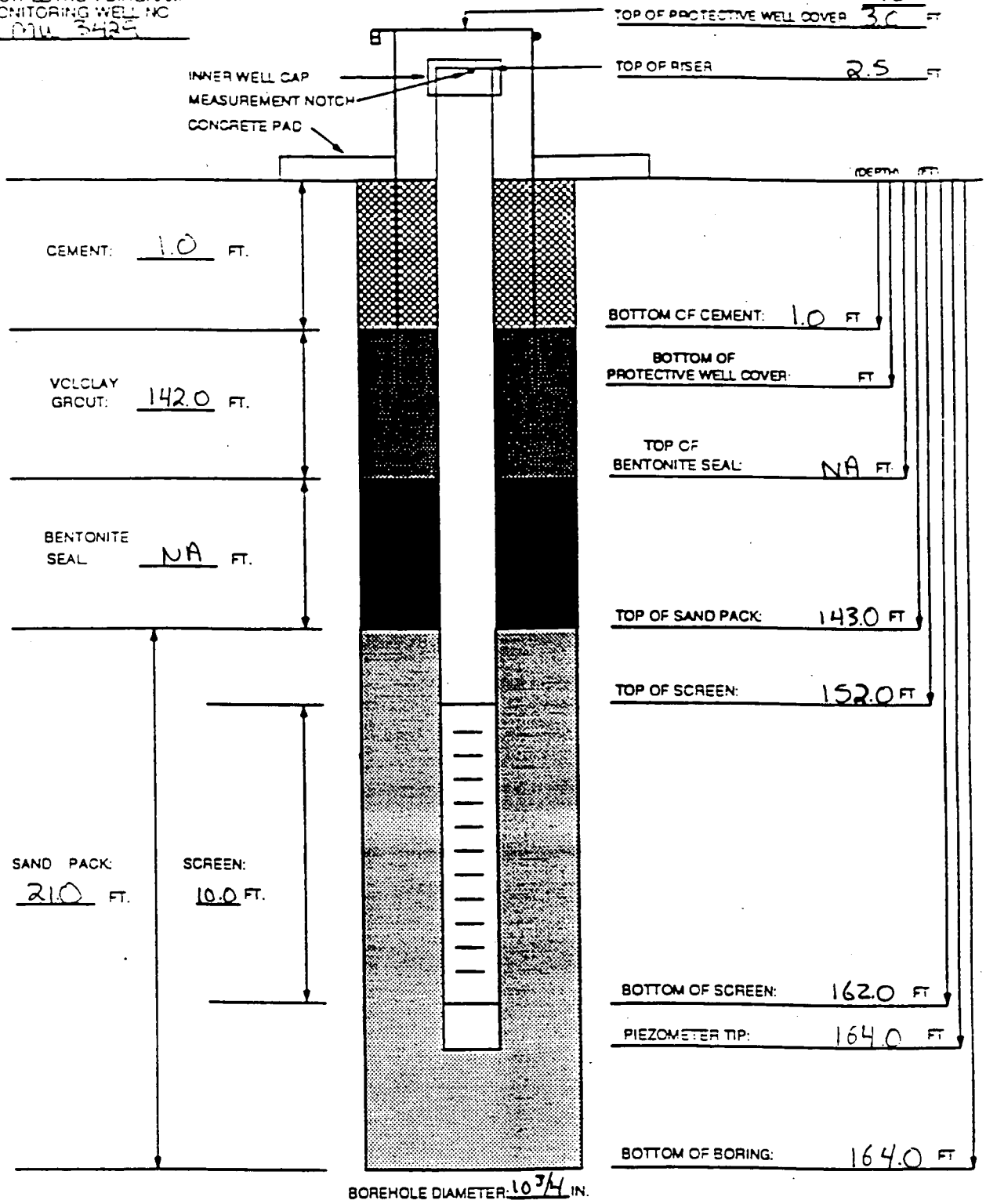
WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS _____

19 of 19

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO
OU 3425

INSTALLATION DATE: 6-10-93 → 7-23-93



BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

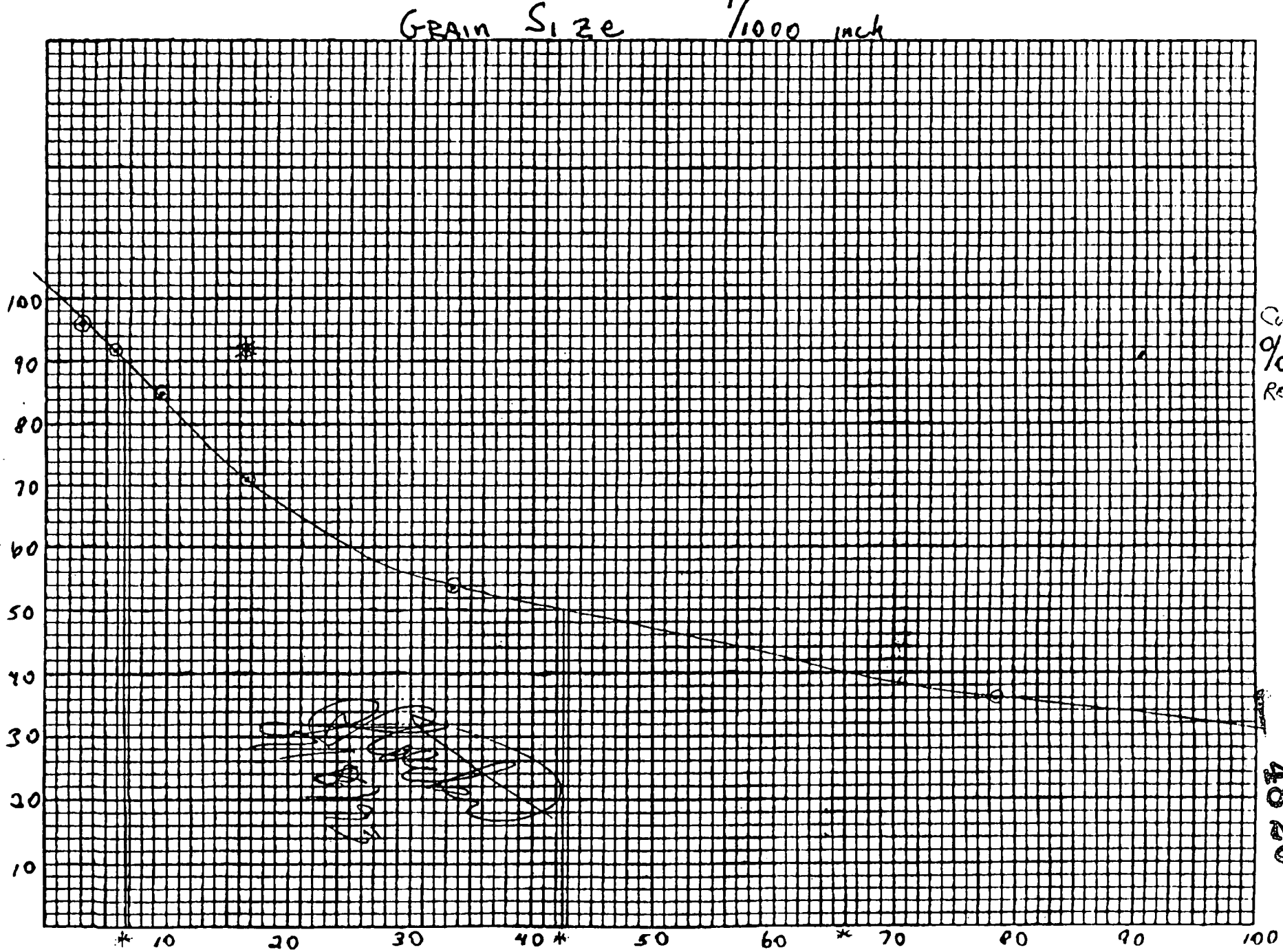
SAND TYPE AND QUANTITY: 6 bags fine, 13 bags coarse
BENTONITE PELLETS (5-GALLON BUCKETS): NA
AMOUNT OF VOLCLAY GROUT: 40 bags
AMOUNT OF CEMENT: 7.5 bags
AMOUNT OF WATER USED: 1240 gal
OTHER: 22 drums soil, 2 drums H_2O
TASK: 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.02 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 79.5 FT/7/26/93
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: B. Yeardley

NO. 340/ 10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH
EUGENE DIETZGEN CO.
MADE IN U. S. A.



48 20

233

4820

Monitoring Well 2430

Location #7

234

VISUAL CLASSIFICATION OF SOILS — 48 20

PROJECT NUMBER. 602.0427	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 2430	COORDINATES:	DATE 10/30/92	
ELEVATION:	GWL: Depth 75.0 ft Date/Time 11/10/92	DATE STARTED: 10/30/92	
ENGINEER/GEOLOGIST. B Yeardley	Depth Date/Time	DATE COMPLETED: 11/10/92	
DRILLING METHODS: Cable Tool		PAGE 1 OF 11	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0910 104655 10/30/92	27 31 40	18	V. Hard brownish yellow 10YR (6/6) mottled gray 10YR(5/1) silty clay w/ some gravel, med plast, dry Rock Slag	CL NA	>4 NA	HNU = 0 ppm αβ = 40 cpm HNU = 0ppm αβ = 60-80 cpm
2 3	0917 104656 10/30/92	24 17 26	18	Hard yellowish brown 10YR(5/6) silty clay w/ some gravel, med plast, ~~dry~~ moist - BJY 12/1/92	CL	2.5	HNU = 0ppm αβ = 60-80 cpm
4	0921 104657 10/30/92	15 20 24	6	Hard yellowish brown 10YR(5/6) silty clay w/ some gravel, med plast, ~~dry~~ moist BJY 12/1/92	CL	2.75	HNU = 0ppm αβ = 50-80 cpm
5 6	0925 104658 10/30/92	14 20 23	17	Hard yellowish brown 10YR(5/6) silty clay w/ some gravel, med plasticity, ~~dry~~ moist - BJY 12/1/92	CL	3.5	HNU = 0ppm αβ = 40-60 cpm
7	0933 104659 10/30/92	21 27 29	6	Hard yellowish brown 10YR(5/6) silty gravelly clay, med. plasticity, ~~dry~~ moist - BJY 12/1/92	CL	2.25	HNU = 0ppm αβ = 40-60 cpm
8 9	0945 104660 10/30/92	31 50 50/5	18	Hard yellowish brown 10YR(5/6 silty gravelly clay, med. plasticity, ~~dry~~ moist - BJY 12/1/92	CL	3.0	HNU = 0ppm αβ = 60 cpm
10	1000 104661 10/30/92	50 50 50	18	Hard yellowish brown 10YR(5/6) silty clay, med. plasticity, ~~dry~~ moist BJY 12/1/92 V. Hard gray 10YR(5/1) silty, gravelly clay, med. plasticity, ~~dry~~ moist BJY 12/1/92	CL CL	~~>4~~ 3.5 BJY 11/11/92 >4	HNU = 0 ppm αβ = 60 cpm
11 12	1520 104662 10/30/92	25 30 45	18	V. Hard yellowish brown 10YR(5/6) silty, gravelly clay, med. plasticity, ~~dry~~ moist BJY 12/1/92	CL	>4	HNU = 0ppm αβ = 60 cpm
13	1525 104663 10/30/92	11 15 50/4	16	Hard yel. brown 10YR (5/6) mottled (6/8) silty, gravelly clay, med. plasticity, ~~dry~~ moist BJY 12/1/92	CL	3.0	HNU = 0 ppm αβ = 60 cpm
14 15	1535 104664 10/30/92	11 17 20	12	Hard yell brown 10YR (5/6) silty gravelly clay, med plasticity, ~~dry~~ moist BJY 12/1/92 Hard 10YR (5/1) gray silty, gravelly clay, med plasticity, ~~dry~~ moist 12/1/92	CL CL	2.5 2.5	HNU = 0 ppm αβ = 40 cpm

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA = Not Applicable

Samples collected per ASTM standard procedures

Colors identified using Munsell Color

FMPC QA 015

235

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.0427	PROJECT NAME. RCRA Phase I		
BORING NUMBER: ~~3933~~ 2430 By 11/2/92	COORDINATES:		DATE 10/30/92
VATION:	GWL: Depth	Date/Time	DATE STARTED: 10/30/92
INEER/GEOLOGIST. B. Yeardley	Depth	Date/Time	DATE COMPLETED: 11/10/92
DRILLING METHODS: Cable Tool			PAGE 7 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1550 104665 10/29/92	10 10 7	8	Firm 10YR (5/1) gray silty, gravelly clay, med plasticity, ~~dry~~ moist By 12/1/92	CL	1.75	HNU = 0ppm αβ = 60 cpm
17 18	1615 104666 10/30/92	11 13 17	18	Hard 10YR (5/1) → gray silty, gravelly clay minor sand, med plasticity ~~dry~~ moist 12/1/92	CL	2.5	HNU = 0 αβ = 60cpm
19	1620 104667 10/30/92	3 7 19	8	Firm 10YR (5/1) → gray silty, gravelly clay, med. plasticity, ~~dry~~ moist 12/1/92	CL	1.75	HNU = 0 αβ = 60
20 21	1630 104668 10/30/92	3 7 13	18	Firm 10YR (5/1) → gray silty, gravelly, med plasticity, ~~dry~~ moist By 12/1/92	CL	1.5	HNU = 0 ppm αβ = 60
22	1645 104669 10/30/92	3 4 16	10	Firm 10YR (5/1) → gray silty, gravelly med. plasticity, ~~dry~~ moist By 12/1/92	CL	1.5	HNU = 0ppm αβ = 40cpm
23 24	1345 104670 11/2/92	10 11 24	12	Firm, SAA, moist	CL	1.5	HNU = 0 αβ = 40cpm
25	1445 NA ~~104671~~ By 11/2/92	9 6 9	0	No Recovery	NA	NA	HNU = ~~0 ppm~~ αβ = ~~40~~ By 11/5/92 } NA
26 27	1505 NA 11/2/92	24 12 3	0	SAA	NA	NA	HNU = ~~0ppm~~ By 11/5/92 αβ = NA NA
28	1515 NA 11/2/92	2 2 2	0	SAA	NA	NA	HNU = NA αβ = NA
29 30	1525 NA 11/2/92	10 12 16	0	SAA	NA	NA	HNU } αβ } NA Rods hydraulic this interval

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

403-11-46

236

2/10/93

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.0427	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2430	COORDINATES:		DATE 11/2/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/30/92
ENGINEER/GEOLOGIST: B Yeralan	Depth	Date/Time	DATE COMPLETED: 11/10/92
DRILLING METHODS: Cable Tool			PAGE 3 OF 1

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	1535	27					
31	NA	34	0	No Recovery	NA	NA	NA
	11/2/92	26					
32	1545	12		From 10 YR (5/1) silty gravelly clay, moist plastic, [illegible] moist 12/1/92	CL	1.5	HNU = 0 ppm
	10471	27	16	V. soft yellowish brown (5/8) clayey silt, low plasticity, [illegible] moist 12/1/92	ML	0	αβ = 40 cpm
33	11/2/92	32		V. dense 2.5Y (6/6) olive yellow, med. sand w/ some gravel, poorly graded, [illegible] moist	SP	NA	
				penetrate aquiter begin 5 ft. sampling at 35.0 ft (see next page)			

NOTES

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell [illegible]

237

FERNALD RI/FS

48 2U

VISUAL CLASSIFICATION OF SOILS

OJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
RING NUMBER ~~2733~~ 2430 By 11/2/92	COORDINATES	DATE 11/2/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 10/30/92	
ENGINEER/GEOLOGIST B. Yeardley	Depth Date/Time	DATE COMPLETED: 11/10/92	
DRILLING METHODS Cable Tool		PAGE 4 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
36.5	1600 1046723 11/2/92	24 34 48	18	V. Dense 2.5Y(6/6) olive yellow med. sand w/ some gravel, poorly graded, ~~sorted~~, ~~dry~~ moist By 12/1/92	SP	NA	HNU = 0ppm αβ = 40cpm
41.5	1655 1046733 11/2/92	43 50/5	10	V. Dense 2.5Y(6/8) olive yellow, med. sand w/ gravel, poorly graded, ~~dry~~ moist → limestone By 12/1/92	SP	NA	HNU = 0 ppm αβ = 40cpm
46.5	0832 1046724 11/3/92	50/5	5	V. Dense 2.5Y (5/4) lt. olive Brown, gravelly sand, poorly graded, ~~dry~~ moist By 12/1/92	SP	NA	HNU = 0 ppm αβ = 40cpm

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 38 Cyclone

Driller Chris Coulter

David Holmes

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration te:

Colors identified using Munsell Color Chart

602-

238

10/93

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: ~~3723~~ 2430	COORDINATES:		DATE 11/3/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/26/92
ENGINEER/GEOLOGIST: Brian Yearsley	Depth	Date/Time	DATE COMPLETED: 11/10/92
DRILLING METHODS: Cable Tool			PAGE 5 OF 11

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
51.5	0900 1046 75 11/3/92	42 50/5	9	V. Dense 2.5Y (5/4) lt. olive brown med sand w/ some gravel, poorly ~~sorted~~ graded, ~~dry~~ moist Brx 12/1/92 By 11/3/92	SP	NA	HNU: 0ppm αβ: 60cpm
55							
55.5	1010 1046 76 11/3/92	41 50/5	8	V. Dense 2.5Y (5/4) lt olive brown med. sand w/ minor gravel, poorly graded, ~~dry~~ By 12/1/92	SP	NA	HNU = 0ppm αβ = 60cpm
60							
61.5	1020 1046 77 11/3/92	26 40 40	14	V. Dense 2.5 (5/4) lt. olive brown, med. sand w/ minor gravel, poorly graded, ~~dry~~ moist 12/1/92	SP	NA	HNU = 0ppm αβ = 60cpm
65							

Pennsylvania Drilling

42 Cyclone

Chris Coulter

David Holmes

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell Color Chart

211093

VISUAL CLASSIFICATION OF SOILS

48 20

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2430	COORDINATES:	DATE 11/3/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/30/92	
GINEER/GEOLOGIS Brian Yeardley	Depth Date/Time	DATE COMPLETED: 11/10/92	
DRILLING METHODS: Cable Tool		PAGE 6 OF 11	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
65	1350 104879 11/3/92	100/5	4	v. dense gravelly sand, poorly graded, dry moist 2.5Y (5/4) H. olive brown By 11/3/92	SP	NA	HNU-0ppm αβ-60cpm
66.5				↓ Begin continuous sample for sieve analysis (next page)			
70							
71.5							
CA							
75							
76.5							

Pennsylvania Drilling

38 Cyclone

Chris Coulter

David Holmes

SAA - Same as above

NA Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell Color Chart

Date 11/3/92

240 21 of 83

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.0427	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 2430	COORDINATES:	DATE 11/3/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/30/92	
ENGINEER/GEOLOGIST. B Yeardley	Depth Date/Time	DATE COMPLETED: 11/10/92	
DRILLING METHODS: Cable Tool		PAGE By 11/18/92 7 OF 11	

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
66.5	1420 104680 11/3/92	17 29 50/5	5	V. Dense 2.5Y (5/4) lt. olive brown, gravelly sand, well graded, wet	SW	NA	HNU = 0 ppm αβ = 60 cpm
68.0	1445 104681 11/3/92	10 37 50/5	14	Dense 2.5Y (5/4) lt. olive brown, gravel and sand, well graded, wet	SW	NA	HNU = 0 ppm αβ = 60 cpm
69				V. Dense 2.5Y (5/4) lt. olive brown, med. sand, poorly graded ~~day~~ mast By 11/11/92	SP	NA	
70	1520 104682 11/3/92	12 23 50/5	16	m. Dense 2.5Y (5/4) lt. olive brown, gravel & sand, well graded wet	SW	NA	HNU = 0 ppm αβ = 40 cpm
71				V. Dense 2.5Y (5/4) lt. olive brown, med sand w/ minor gravel, poorly graded ~~day~~ mast By 11/11/92	SP	NA	
72	1625 104683 11/3/92	38 50/5	12	V. Dense 2.5Y (5/4) light olive brown sand and gravel, well graded, wet.	SW	NA	HNU = 0 ppm αβ = 40 cpm
73	1640 104684 ~~104687~~ ~~104688~~ ~~cancel~~ 11/3/92	50 50/5	12	V Dense 2.5Y (5/4) lt. olive brown, sand w/ gravel, well graded, wet.	SW	NA	HNU = 0 ppm αβ = 60 cpm
74							
75	1715 ~~cancel~~ ~~104689~~ 104685 11/3/92	31 50/5	16	V. Dense 2.5Y (5/4) lt. olive brown, gravel w/ some sand to coarse sand w/ some gravel, well graded, wet	SW	NA	HNU = 0 ppm αβ = 60 cpm
76	1730 ~~cancel~~ ~~104690~~ 104686 11/3/92	13 15 16	18	SAA, Dense	SW	NA	HNU = 0 ppm αβ = 60 cpm
77							
78	1000 104687 ~~104688~~ ~~cancel~~ 11/4/92	28 31 50/2	14	SAA, very Dense	SW	NA	HNU = 0 ppm αβ = 60 cpm
79				End of Sampling			
80							
81				~~End of Hole~~ By 11/10/92			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter, David Holmes

SAA = Same as above

NA - Not Applicable

* sample # for sieve analysis is 104688 (Depth 65.0-78.5ft)

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

Date 11/9/92

Initial KB

2.41

2/10/93

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.0427	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2430	COORDINATES:		DATE 11/4/92
...VATION:	GWL: Depth	Date/Time	DATE STARTED: 10/30/92
...GINEER/GEOLOGIST: B Yeardley	Depth	Date/Time	DATE COMPLETED: 11/10/92
DRILLING METHODS: Cable Tool			PAGE 8 OF 11

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
82	NA	NA	NA	no sample taken	NA	NA	NA
83	NA	NA	NA		NA	NA	NA
84	NA	NA	NA		NA	NA	NA
85	NA	NA	NA		NA	NA	NA
86				End of Hole 86.0 ft			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration ...

Colors identified using Munsell Color ...

Date 8/3/92

Initial CS

242

FMPC QA 015 2/5/93

FERNALD RI/FS

4820

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 602 04.27
BORING NO. 2430
PIEZOMETER NO. 2430

FIELD ENG./GEO. B. Yeardley DATE 11/13/92
CHECKED BY C. Bruen DATE 12/01/92
DATE OF INSTALLATION 10/30/92 - 11/10/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 ft TO 75.0 ft
FLUID NA FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 ft TO 86.0 ft
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 15.0 ft

RISER PIPE MATERIAL 316 Stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 1, 2 and 100 ft
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinged locking cover with padlock

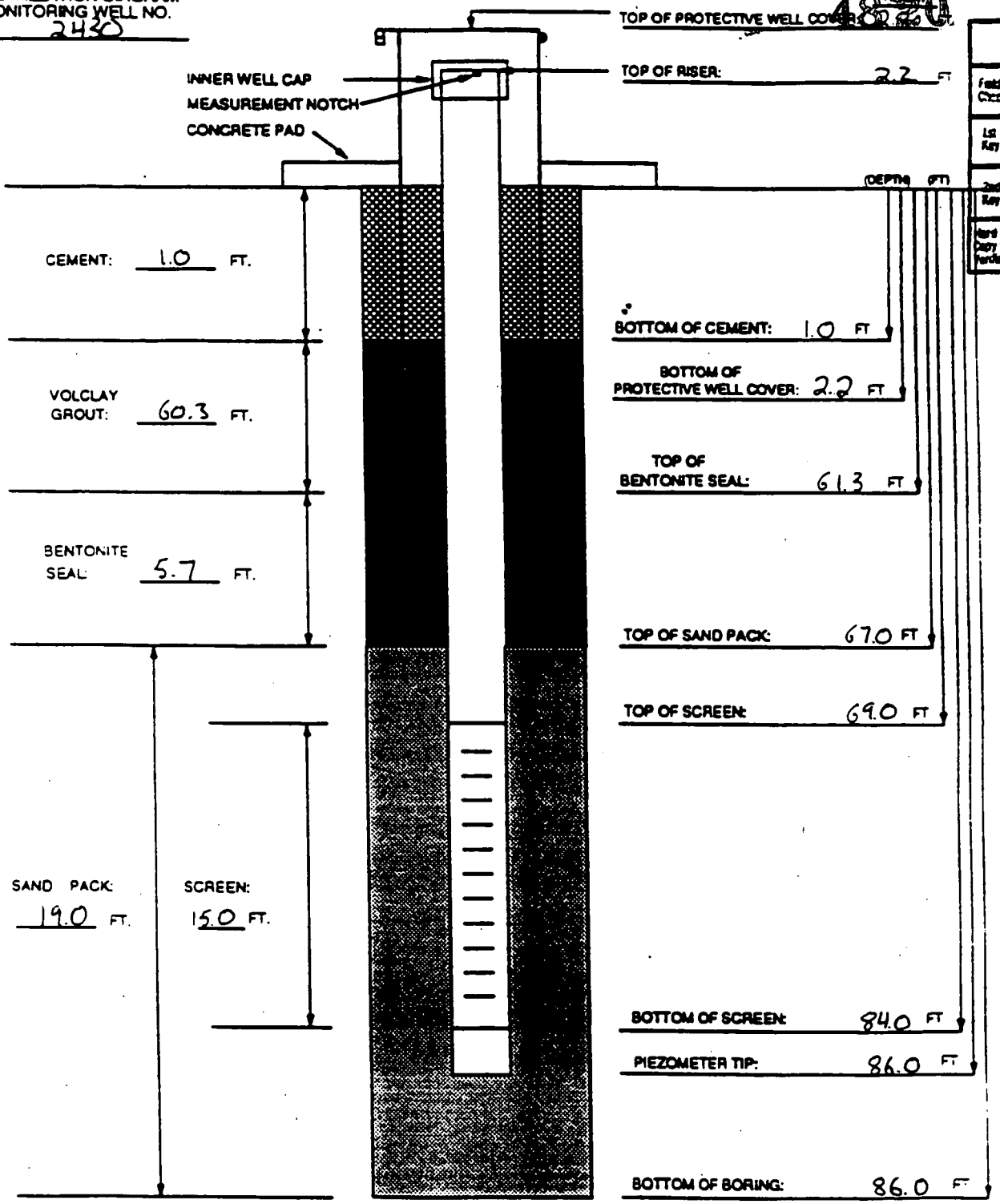
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.2			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.2			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
Volclay CEMENT GROUT / ~~SLURRY~~ By 11/12/92	TOP 1.0	BOTTOM 61.3	TOP	BOTTOM
BENTONITE	TOP 61.3	BOTTOM 67.0	TOP	BOTTOM
SAND	TOP 67.0	BOTTOM 86.0	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 69.0	BOTTOM 84.0	TOP	BOTTOM
PIEZOMETER TIP	86.0			
BOTTOM OF BOREHOLE	86.0			
GWL AFTER INSTALLATION	75.0 (11/10/92 from ground surface)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2430

INSTALLATION DATE: 10/30/92 - 11/10/92



MATERIALS USED

SAND TYPE AND QUANTITY: 20 bags 4/30 coarse sand
BENTONITE PELLETS (5-GALLON BUCKETS): 6
BAGS OF VOLCLAY GROUT: 13
AMOUNT OF CEMENT: 1/2 bag
AMOUNT OF WATER USED: 625 gallons
OTHER: 11 drums Soil, 1 drum water
TASK: 602 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.020 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 75 11/K
5) TOP OF CASING IS SECURED W/ STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Brian Yeardley

4820

Monitor Well #2430 Brian Yeandley

Methodology for sand pack and sieve determination

I. Wemco values for grain size

40% = .072 in

50% = .045 in

90% = .007 in

II 40% / 90% Ratio or Uniformity Coefficient

.072 in / .007 = 10.3

10.3 > 3 ∴ use factor of 4

III 50% value × 4

.045 in × 4 = 0.18

IV 0.18 falls far to the left of the medium and coarse grain curves. However, since this v is closer to the coarse grain curve (50% val we will use the coarse grain sand pack with the 20 slot (0.02 in) screen. This will allow f maximum flow of water into well and also retain formation.

CB 1/31/93

2/10/93

245

4820

Monitoring Well 3067

Location #7

FERNALD RI/FS

QC/DH/2.4.89

48 20PA
32

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 607.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B36T~~ B3067 88	COORDINATES: 479760.13 E 1382988.18		DATE: Nov 21, 1987
ELEVATION: 595.15 top 1-5-89	GWL: Depth —	Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Willo	Depth —	Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool			PAGE 1 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	11-20 1330 7427	8 14 18	13	Soft black 7½YR 3/0 sandy clay some silt, organic plant matter - moist ½	OH	NA	HNU = 0 ppm
				rock = slag 1	NA	NA	γB = 60 cpm
						>5	α = 2 cpm
2	11-20 1335 7428	16 10 10	12	Fill: (hard yellowish brown silty clay, trace sand and gravel slag-dry 1½	NA		HNU = 0 ppm
				Fill: (hard yellowish brown 10YR 5/4 silty clay some sand and gravel slag-dry	NA	>5	γB = 60 cpm
3							α = 2 cpm
4	11-20 1340 7429	9 10 11	10	Fill: (hard yellowish brown 10YR 5/4 mottled gray 10YR 5/1 and brownish yellow 10YR 5/8 silty clay some sand and gravel slag-dry 4.6	NA NA	>5	HNU = 0 ppm γB = 80 cpm α = 20 cpm
5	11-20 1345 7430	10 10 12	11	hard yellowish brown 10YR 5/6 mottled gray 10YR 5/1 and red(?) silty clay some sand and gravel - dry	CL	>5	HNU = 0 ppm γB = 70 cpm α = 20 cpm
7	11-20 1350 7431	8 10 12	10	hard yellowish brown 10YR 5/6 mottled dark gray 10YR 4/1 silty clay some sand trace gravel and pebbles - dry	CL	>5	HNU = 0 ppm γB = 60 cpm α = 20 cpm
8	11-20 1645 7432	4 9 20	11	hard yellowish brown 10YR 5/6 mottled gray 10YR 5/1 silty clay some sand trace gravel - dry 8½	CL	>5	HNU = 0 ppm γB = 70 cpm α = 20 cpm
9				hard yellowish brown 10YR 5/6 gravelly clay some silt and sand - dry 9	CL		
10	11-20 1700 7433	6 15 21	11	hard yellowish brown 10YR 5/4 gravelly clay, some silt and sand, trace pebbles-dry	CL	>5	HNU = 0 ppm γB = 60 cpm α = 20 cpm
11	NS	NA	NA	11.5		NA	0935 pushed Shelby tube - No return 1.2 ft
12							
13	11-21 1015 7434	8 10 16	12	hard gray 10YR 5/1 gravelly clay some silt and sand, trace pebbles-dry	CL	>5	HNU = 0 ppm γB = 60 cpm α = 2 cpm
14	11-21 1040 7435	8 13 22	12	hard gray 10YR 5/1 gravelly clay some silt and sand - dry	CL	>5	HNU = 0 ppm γB = 70 cpm α = 2 cpm

NOTES:
Pennsylvania Drilling Co
Bucyrus Erie 24-W drilling rig
Driller Dave Neiman
Helper Bob Johnson
Blows on sampler follow ASTM standard for 2 in by 18 in split spoon sampler
Soil color description follow Munsell color chart

Background Nov 20, 1987
HNU = 0 ppm
γB = 60 cpm
α = 2 cpm

247

QC/DA/24.89

	Initials	Date
1st Entry		
2nd Entry		
Hard Copy Verification		

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B36T~~ B3067 BB 1-5-89	COORDINATES: see p1	DATE: Nov 21, 1987	
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987	
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/6/87	
DRILLING METHODS: Cable Tool		PAGE 2 OF 10	

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (density and consistency based on relative soil terms)
16	11-21 1160 7436	2 10 13	3	hard gray 10YR 6/1 gravelly clay, some silt, sand, trace pebbles - dry	cl	UNKNOWN NA	No return first try, second try got 3 inches HNU = 0 ppm γβ = 60 cpm α = 2 cpm
17	11-21 1120 7437	4 9 13	10	hard gray 10YR 6/1 silty clay, trace sand and gravel, dry	cl	4.5	HNU = 0 ppm γβ = 70 cpm α = 2 cpm
18	11-21 1140 7438	6 9 13	18	very stiff gray 10YR 6/1 silty clay, some sand, trace gravel, dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
19	NS	NA	NA			NA	HNU = 0 ppm γβ = 70 cpm α = 1 cpm Pushed shelby tube 1.3 feet got 0.2 return did not keep sample
21	11-21 1430 7439	3 6 10	11	very stiff gray 10YR 6/1 silty clay, some sand, trace gravel - dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 2 cpm
22	11-21 1450 7440	8 6 10	14	very stiff gray 10YR 6/1 gravelly clay some silt and sand - dry	cl	3.5	HNU = 0 ppm γβ = 80 cpm α = 3 cpm
23	11-21 1500 7441	3 5 7	14	very stiff gray 10YR 5/1 gravelly clay some silt, trace sand - dry	cl	3.2	HNU = 0 ppm γβ = 70 cpm α = 2 cpm
24	11-21 1515 7442	8 34	2	rock, very stiff gray 10YR 6/1 gravelly clay some silt and sand - dry	NA	NA	HNU = 0 ppm γβ = 80 cpm α = 2 cpm
25	11-21 1530 7443	13 13 17	12	hard gray 10YR 6/1 gravelly clay some sand, silt and pebbles, trace pebbles - dry	cl	<5	HNU = 0 ppm γβ = 60 cpm α = 1 cpm
26	11-21 1600 7444	7 10 28	12	very stiff gray 10YR 6/1 gravelly clay, some sand, silt and pebbles dry	cl	3.5	HNU = 0 ppm γβ = 60 cpm α = 0 cpm

TES:

QC/DH/2.4.89

PAC

	Initial	Date
1st Key In		
2nd Key In		8/14/88
Hard Copy Verification		

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 60232	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067 BB 1-5-88	COORDINATES: see p1	DATE: Nov 22, 1987
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 3 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	11-22 730 7445	8 10 15	10	very stiff gray 10YR 5/1 gravelly clay some silt and sand, trace pebbles dry 31½	cl	3.5	HNU=0ppm ΣB=70cpm α=2cpm
32	11-22 810 7446	3 16 27	8	dense yellowish brown 10YR5/8 sand, some silt and clay, trace gravel - dry	sp	NA	HNU=0ppm ΣB=60cpm α=0cpm
33 34	11-22 900 7447	8 12 13	12	dense brownish yellow 10YR 5/6 sand some silt and clay, trace gravel dry	sp	NA	HNU=0ppm ΣB=60cpm α=0cpm
36	11-22 920 7448	8 18 19	12	dense brownish yellow 10YR 5/6 sand and fine gravel - some silt, trace clay and pebbles - dry	sp	NA	HNU=0ppm ΣB=60cpm α=0cpm
37 38 39 40							
41	12-1 945 7449	32 38 50	18	dense yellowish brown 10YR6/8 sand and gravel, some silt and clay, dry	SM	NA	HNU=0ppm ΣB=800cpm α=2cpm
42 43 44							

NOTES:

249

QC/DH/24.89

PAC

FERNALD RI/FS

— 4820

	Initials	Date
1st Entry		
2nd Entry	DC	8/16/90
Final Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 7602.32	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B3167	COORDINATES: see p1	DATE: 12/1/87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: Nov 20, 1987
ENGINEER/GEOLOGIST: Lowell Wille	Depth — Date/Time —	DATE COMPLETED: 12/2/87
DRILLING METHODS: Cable tool		PAGE 4 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ ft	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	12-1 1340 7450	26 36 37	12	dense yellowish brown 10YR 6/8 sand and fine gravel, some silt, clay and med to coarse gravel, dry.	SM	NA	HNU = 0ppm ⅄B = 80cpm α = 2cpm
47							
48							
49							
51	12-1 1550 7451	20 23 30	8	med. dense, yellow brown 10YR 4/8 sand and gravel, some silt, clay and med. to coarse gravel, brown silty fine sand lens @ 50.5 ft., dry.	SM	NA	HNU = 0ppm ⅄B = 60cpm α = 2cpm
52							
53							
54							
55	12-1 1630 7452	16 30 42	11	dense brown 10YR 6/4 sand and gravel, some silt, dry. 56.0	SM	NA	HNU = 0ppm ⅄B = 90cpm α = 2cpm
56				brown-gray 10YR 6/3 med. sand, some silt, clay, gravel, dry.	SM		
57							
58							
59							

NOTES:

QC/DH/24.89

FERNALD RI/FS

4820

	Initial	Date
1st Key In		
2nd Key In		5/16/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.37	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B3067	COORDINATES: See p1	DATE: 12/2/87
ELEVATION: See p1	GWL: Depth – Date/Time –	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille/T. Sullivan	Depth – Date/Time –	DATE COMPLETED: 12/6/87
DRILLING METHODS:		PAGE 5 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60	07453 12-2 0820	11 33 42	12	dense brown gray 10YR 5/4 sand with some gravel and pebbles, some silt and clay, dry.	SM	NA	HNU = 0ppm βB = 80cpm α = 2cpm
61							
62							
63							
64							
66	07454 12-2 1130	75 for 6in-	6	very dense brown 10YR5/3 sand and gravel, some silt and clay, trace pebbles, dry.	SM	NA	HNU = 0ppm βB = 60cpm α = 2cpm
67							
68							
69							
70	07700 12-2 1420	16 33 29	9	med. dense, brown-gray 10YR 5/3 sand and gravel, some pebbles, silt and clay, dry.	SM	NA	HNU = 0ppm βB = 60cpm α = 2cpm
71							
72							
73							
74							
75							

TIS:

251

QC/DN/24489

PRC

FERNALD RI/FS

4820

	Initial	Date
1st Key In		
2nd Key In		8/16/89
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B3067~~ B3069 SB 1469	COORDINATES: see p1	DATE: 12/2/87
ELEVATION: see p1	GWL: Depth — Date/Time —	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Willett, Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS:		PAGE 6 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ft)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75							
76	07701 12-2 1520	16 13 18	6	med. dense, dark brown gray 10YR 4/1 Sand with trace gravel, some silt, clay, moist.	SM	NA	HNU = 0ppm ⊮B = 60cpm α = 2cpm
77							
78							
79							
81	07702 12-2 1710	11 15 11	10	med dense, gray 10YR 4/1, sand and gravel, with some silt, pebbles, and clay, wet.	SM	NA	HNU = 0ppm ⊮B = 60cpm α = 2cpm
82							
83							
84				84.0 very dense gray 10YR 4/1 fine sand, some silt and clay - wet	SW		
85	7703 12-3 1140	48 72	10	85.5 very dense gray 10YR 4/1 sand and gravel some silt and clay - wet	SM	NA	HNU = 0ppm ⊮B = 80cpm α = 2cpm
86							
87							
88							
89							
90							

NOTES:

QC/DA/5-4-89

4820

	Initials	Date
1st Key In		
2nd Key In		8/16/88
Hard Copy Verification		

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B306 BB 12-09	COORDINATES: See p1	DATE: 12-3-87
ELEVATION: See p1	GWL: Depth — Date/Time —	DATE STARTED: 11-20-87
ENGINEER/GEOLOGIST: L. Wille / T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable Tool		PAGE 7 OF 10

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (½ ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	7707 12-3 1400	7 7 14	15	medium dense gray 10YR 4/1 sand with some gravel, silt and clay, some gravel (as) with some silt, pebbles. sand and clay @ 91 ft - wet	SM	NA	HNU = 0 ppm γB = 80 cpm α = 2 cpm
92							
93							
94							
96	7705 12-3 1620	32 63	18	very dense gray 10YR 4/1 sand with some ~~some~~ silt, gravel and clay - wet	SM	NA	HNU = 0 ppm γB = 100 cpm α = 2 cpm
97							
98							
99							
100	7706 12-4 0900	5 5 11	10	medium dense, gray 10YR 4/1 sand with some gravel, silt and clay - wet	SM	NA	HNU = 0 ppm γB = 80 cpm α = 2 cpm
101				101 medium dense gray 10YR 4/1 sandy gravel, some silt and clay, trace pebbles	GM		
102							
103							
104							

T.S.:

QC/DM/24-89

PAC

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B367 B3167 BB	COORDINATES: see p1	DATE: 12-4-87	
ELEVATION: see p1	GWL: Depth 77.3 Date/Time 12/4 0800	DATE STARTED: 11-20-87	
ENGINEER/GEOLOGIST: L. Wille / T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87	
DRILLING METHODS: Cable Tool		PAGE 8 OF 10	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	7707 12-4 1315	20 50 35	13	very dense gray 10YR 4/1 sandy gravel with some silt and clay - wet	gm	NA	HNU = 0 ppm; RB = 80 cpm; α = 2 cpm
107							
108							
109				109½			
111	7708 12-4 1415	4 5 16	11	loose gray 10YR 4/1 sand with some gravel and pebbles, some silt and clay, wet	SM	NA	HNU = 0 ppm; RB = 80 cpm; α = 2 cpm; NO RETURN 1st Try, 11 in second try blowcounts 1st try
112							
113							
114							
115				115			
116	7709 12-4 1600	33 50 57	12	very dense gray 10YR 4/1 gravelly sand with some silt and clay wet; 115½ very dense gray 10YR 4/1 sand with some gravel, silt and clay - wet	gm; gm	NA	HNU = 0 ppm; RB = 80 cpm; α = 2 cpm
117							
118							
119							

NOTES:

FERNALD RI/FS

00/004/24489

4820

	Initial	Date
1st Entry by		
2nd Entry by		8/19/88
Hand Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B367~~ B3067	COORDINATES: see p1	DATE: 12-5-87
ELEVATION: see p1	GWL: Depth 77.0 Date/Time 12/5 0740	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille/T. Sullivan	Depth — Date/Time —	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 9 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1½ ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	7710 12-5 0845	7 13 21	18	med dense gray 10YR 4/1 sand with some silt, clay, gravel and pebbles, wet.	gm	NA	HNU=0ppm βB = 100 cpm α = 2 cpm
121							
122							
123							
124							
125	7711 12-5 1500	17 56 66	7	very dense gray 10YR 4/1 sand and gravel, some silt, clay, and pebbles, wet.	gm	NA	HNU=0ppm βB = 80 cpm α = 2 cpm
126							
127							
128							
129							
130	7712 12-5 1555	4 7 12	6	med. dense gray 10YR 4/1 sand and gravel, some pebbles, silt, and clay, wet.	gm	NA	HNU=0ppm βB = 80 cpm α = 2 cpm
131							
132							
133							
134							
135							

NOTES:

FERNALD RI/FS

02/04/24/89
4820

	Initials	Date
1st Key In		
2nd Key In		8/14/88
Hard Copy Verification		

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B367 B306 7BB 1-5-90	COORDINATES: see pg	DATE: 12/5/87 - 12/6/87
ELEVATION: see pg	GWL: Depth 76.0 Date/Time 12/6 0755	DATE STARTED: 11/20/87
ENGINEER/GEOLOGIST: L. Wille / T. Sullivan	Depth 76.0 Date/Time 12/6 1010	DATE COMPLETED: 12/6/87
DRILLING METHODS: Cable tool		PAGE 10 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	7713 12-5 1710	7 6 9	2	loose, gray 10YR 4/1 sand and gravel, some pebbles, silt, and clay, wet.	gm	NA	HNU=0 ppm γB=100 cpm α=2 cpm
136							
137							
138							
139							
140	7714 12-6 0930	11 9 10	3	loose gray 10YR 4/1 sand with some gravel, silt, and clay, some pebbles present, wet.	gm	NA	HNU=0 ppm γB=100 cpm α=2 cpm
141							
142				E.O.B. 141.5 ft.			

NOTES:

256

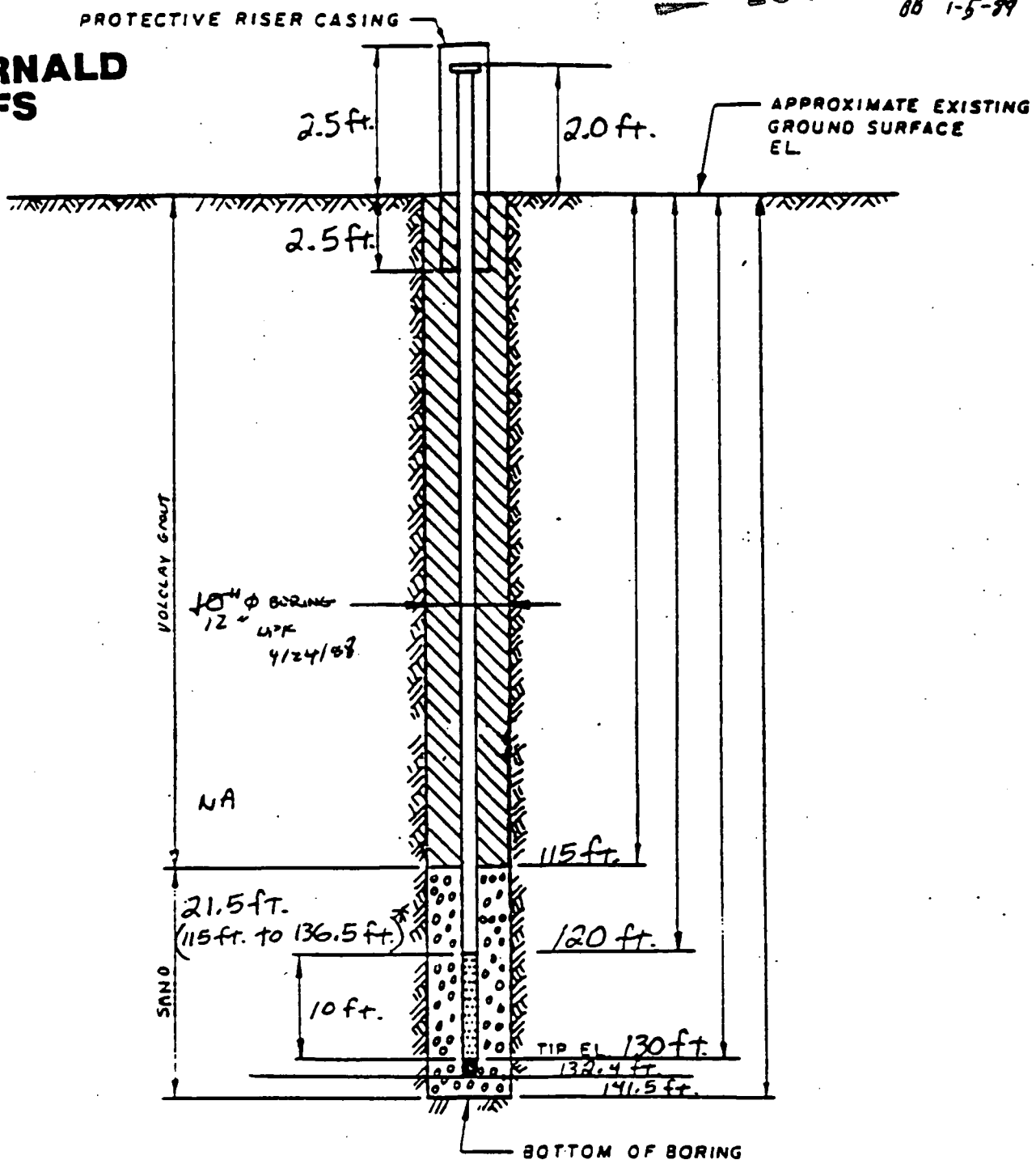
This form did not represent the installed monitoring well, therefore, it has been modified with white out by L. Willis. WPK 4/24/88

QC/DH/2-4-89

~~48 20~~ # ~~367~~ 3067

BB 1-5-89

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DP

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 75.75 ft. below ground surface
5. WATER LEVEL READING ON 12/10/87 0725 (77.75 ft. below T.O.C.)

INSTALLATION DETAILS
MONITORING WELL 367

PREPARED FOR 3067

BB 1-5-89

*Bottom 5 ft. of hole caved in, sand is placed above 136.5 ft.

256 A

DC/DH/2.4.89

FERNALD RI/FS

4820

	Initial	Date
1st Key In		
2nd Key In		
Hard Copy Verification		

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. L. Wille/ T. Sullivan DATE 12/10/87
PROJECT NO. 602.3.2 CHECKED BY R Galbraith DATE 2/7/87
BORING NO. ~~B367~~ B3067 BB 1-5-89
PIEZOMETER NO. ~~367~~ 3067 DATE OF INSTALLATION 12/7-9/87

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID WATER FROM ____ TO ____
FLUID ____ FROM ____ TO ____

TYPE OF BIT FLATHEAD HAMMER
CASING SIZE (S) USED:
SIZE 10 FROM 0 TO 141.5'
SIZE ____ FROM ____ TO ____

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4 in.
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 3 in²/ft.

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4 in.
LENGTH OF PIPE SECTIONS 10 ft.
JOINING METHOD Screw thread flush
Joint RHB 2/2/89

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.
PROTECTIVE PIPE Ø.D. 10" (nom)

OTHER PROTECTION LOCKING CAP WITH LOCK.

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION (Ft) MSL	
TOP OF RISER PIPE	2.0		595.15	
GROUND SURFACE	0.0		593.15	
BOTTOM OF PROTECTIVE PIPE	2.5		590.6	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 115	TOP	BOTTOM
BENTONITE	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 115	BOTTOM 136 1/2	TOP	BOTTOM
GRAVEL	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 120	BOTTOM 130	TOP	BOTTOM
PIEZOMETER TIP	132.4			
BOTTOM OF BOREHOLE	141.5			
GWL AFTER INSTALLATION	75.9 0750 12/8/87	75.75 0730 12/10/87		

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cave in from 136.5 to 141.5 RB 4-2-91

257

4820

Monitoring Well 4067

Location #7

258

FERNALD
RI/FS

4820

RECEIVED 6/23/84

REVIEWED BY QA DATE AUG 2 7 1991

VISUAL CLASSIFICATION OF SOILS

	Initial	Date
Field Check	JAW	2-9-89
1st Key In	JMT	5-23-89
2nd Key In	JAW	6-15-89
Hard Copy Verification		

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 4067	COORDINATES: See pl	DATE: 1-5 Through 1-19-
ELEVATION: 593.0 GL estimate	GWL: Depth Date/Time	DATE STARTED: 1-5-89
ENGINEER/GEOLOGIST: See Notes	Depth Date/Time	DATE COMPLETED: 1-19-8
DRILLING METHODS: Cable Tools		PAGE 1 OF 1

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS WAW 3-3-
50				See Visual Classification of Soils Log For Boring 4967 for sample description to 221.5 Ft.			
100							
150							
200							
250				Bottom of Boring 4067 is 220.7 Ft.			

NOTES: Personnel involved in supervision of this boring: K. Hemlein, L. Adams, M. Slusarski, S. Moore
This page was completed by W.A. Hertel on 2-10-89

FERNALD RI/FS

REVIEWED BY QA ____ DATE ____ AUG 2 RECEIVED 6/23/89

482

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 4067 4967	COORDINATES: N479772.61 E1362994.40	DATE: 11-30-88 (11-30-88)
ELEVATION: 593.0	GWL: Depth Date/Time	DATE STARTED: 11-15-88
ENGINEER/GEOLOGIST: LAURA ADAMS	Depth Date/Time	DATE COMPLETED: 12-5-88
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 6

DEPTH (FT.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				INTERVAL 0.0 FT TO 141.5 FT PREVIOUS SAMPLED IN BORING # 3067. SEE VISUAL CLASSIFICATION OF SOILS FROM BORING # 3067 FOR DETAILED DESCRIPTION OF SEDIMENTS SAMPLED IN BORING #4067 TO CHANGE @ 141.0 FT.			
145	10420	27		VERY DENSE, GRAY (10YR 4/1) POORLY GRADED FINE SAND TRACE FINE GRAVEL WET	SP	N/A	HNU = 0 α = 0 RB = 40.00 CPM
146	0955 11-22	50+	6				
147							
148							
149							
150	10421	66		very dense gray (10yr 4/1) poorly graded fine sand, trace gravel, wet	SP	N/A	HNU = 0 α = 0 RB = 60.00 CPM
151	0900 11-30	36 28	8	yellowish brown poorly graded fine sand, ly gravel (> in.) (10yr 6/4)			
152				very dense gray (10yr 4/1) poorly graded fine sand, trace gravel, wet			
153							
154							

NOTES: CONTRACTOR: PENN DRILL
RIG: BUCYRUS ERIE 24-W
DRILLER: DAVE NEWMAN
ASSISTANTS: JIM LAUX, KEVIN KRAMER

SAMPLES COLLECTED AS PER ASTM STANDARD PENETRATION TEST

SOILS IDENTIFIED USING MODIFIED UCSC SYSTEM

BACKGROUND LEVELS: HNU = 0 LEL = 0 PPM
α = 0.2 CPM 20.6% O2
RB = 40 CPM

WATER ADDED TO HOLE DURING DRILLING ACTIVITIES: NA WAH 2-8-89

402-11

260

FERNALD RI/FS

REVIEWED BY QA [illegible] DATE [illegible]

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022 3.2	PROJECT NAME: Fernald RIFS		
BORING NUMBER: ~~4867~~ 4967	COORDINATES: See Pl	DATE: 11-30-88	
ELEVATION: 593.0	GWL: Depth Date/Time	DATE STARTED: 11-15-88	
ENGINEER/GEOLOGIST: L. Adams	Depth Date/Time	DATE COMPLETED: 12-5-88	
DRILLING METHODS: Cable Tool		PAGE 2 OF 6	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
156	10422 1330 11-30	13 33 28	3	Very dense, medium gray (10yr 5/1) poorly graded fine sands. Trace gravel. Some clays. Wet	SC	N/A	Hnu = 0 ppm α = 0 β = 60-80 ppm
157							
158							
159							
160	10423 1420 11-30	22 28 36	18	Very dense, dark gray (10yr 4/1) poorly graded fine sand moist	SP	N/A	Hnu = 0 ppm α = 0 β = 100 ppm
161				Very dense dark gray (10yr 4/1) poorly graded gravelly fine sand moist	SP		
162							
163							
164							
165	10424 1630 11-30	29 31 46	12	Very dense moist gray very fine sand poorly graded moist	SP	N/A	Hnu = 0 α = 0 β = 60 ppm
166							
167							
168							
169							

NOTES:

FERNALD RI/FS

REVIEWED BY QA ___ DATE ___

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: Fernald RI FS		
BORING NUMBER: 4067 4967	COORDINATES: Scepl	DATE: 12-1-88	
ELEVATION: 593.0	GWL: Depth / Date/Time	DATE STARTED: 11-15-88	
ENGINEER/GEOLOGIST: L. Adams	Depth / Date/Time	DATE COMPLETED: 12-5-88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 6	

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
171	10425 0845 12-1-88	125 29 30	3	Very dense, gray poorly graded sand (10yr 4/1) wet, no gravel 70.25'	SP	N/A	Hnu: 0ppm α: 0cpm β: 80-100 cpm
			4	Very dense, well graded gravel sand mixture gray (10yr 4/1) moist (gravel to .75 in.)	GW		
172							
173							
174							
175	10426 1130 12-1-88	35 80r	20	Very dense, well graded sandy gravel, gray (10yr 4/1) very wet (gravel to 3 in.)	GW	N/A	Hnu: 0ppm α: β: 28 cpm
				Very dense: Poorly graded fine sand, gray (10yr 4/1) wet	SP		
177							
178							
179							
180	10427 1400 12-1-88	22 22 17	10	Dense, gray (10yr-4/1) med to poorly graded sand with some gravel. wet (gravel to .5 in.)	SP	N/A	Hnu = 0ppm α: β: 80 cpm
181							
182							
183							
184							

NOTES: No α readings from 175 ft to 200.75 ft due to meter malfunction.

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 603 3.2	PROJECT NAME: Fernald - RI/FS		
BORING NUMBER: ~~4069~~ 4967	COORDINATES: Seal	DATE: 12-1-88	
ELEVATION: 593.0 Ft.	GWL: Depth / Date/Time	DATE STARTED: 11-15-88	
ENGINEER/GEOLOGIST: L. Adams	Depth / Date/Time	DATE COMPLETED: 12-5-88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 6	

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
182	10428 1030 12-1-88	73 50+	7	Very dense, gray (10 yr 4/1) well sorted sand. (Grain size to .25 in.) wet - only able to push spoon 7 inches	SW	N/A	Hnu = 0 ppm α = β = 80 cpm
187							
188							
189							
190	10429 0900 12-2-88	13 21 37	10	~~Brownish gray~~ Very dense, (10 yr 4/2) poorly sorted sand some gravel, wet. (grain size to .4 in)	SP	N/A	Hnu = 3 ppm α = β = 20 cpm
191							
192							
193							
194							
195	10430 1140 12-3-88	7 18 40	10	Very dense, brownish gray (10 yr 4/2) poorly sorted sand with some gravel wet (grain size to .5 in.)	SP	N/A	Hnu = 0 cpm α = β = 10
196							
197							
198							
199							

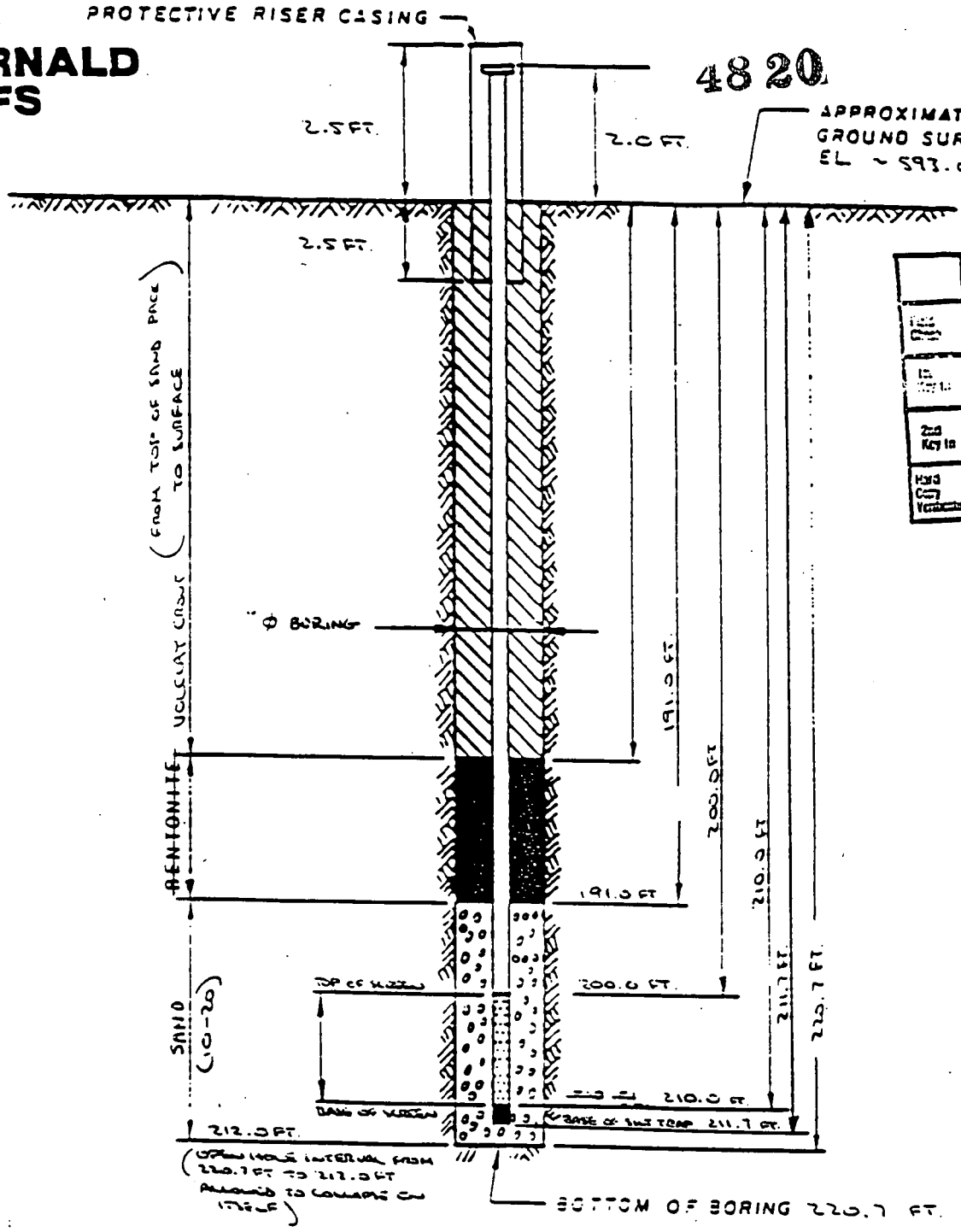
NOTES:

REVIEWED BY CA DATE AUG 2 7 1991

BORING 4067

FERNALD RI/FS

4820



DRAWN BY	HAS 2-1-89	CHECKED BY / APPROVED BY	UAH	2-7-89	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 4.0 IN 10 SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN 1.0 SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED DURING WELL INSTALLATION:

10-20 SAND : 7 - 80 LB SACKS

VOLCLAY GROUT : 66 - 50 LB SACKS

BENTONITE PELLETS : 6 BUCKETS

INSTALLATION DETAILS
MONITORING WELL 02-01

PREPARED FOR
BORING 4067

STAINLESS STEEL RISER PIPE: 1 - 2.0' SECTION
20 - 10.0' SECTIONS

STAINLESS STEEL WELL SCREEN : 1 - 10.0' SECTIONS

STAINLESS STEEL SILT TRAP : 1 - 1.7' SILT TRAP

TOTAL WATER USED DURING DRILLING AND WELL INSTALLATION ACTIVITIES: 1920 GAL.

FERNALD RI/FS

4820

REVIEWED BY QA DATE AUG 27 1991

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FERNALD RI/FS
PROJECT NO. 602 3.2
BORING NO. 4067
PIEZOMETER NO. 4067

FIELD ENG./GEO. M. SLUSARSKI DATE 02-01-
CHECKED BY [illegible] DATE 2-9-89
DATE OF INSTALLATION 01-20-89 TO 01-26-89, 01
INSTALLATION COMPLETED 01

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT. TO 220.7 FT.
FLUID — FROM — TO —

TYPE OF BIT HAMMER
CASING SIZE (S) USED:
SIZE 10.0 IN ID FROM 0.0 FT TO 100.0 FT.
SIZE 8.0 IN ID FROM 0.0 FT. TO 220.0 FT

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL
DIAMETER OF PERFORATED SECTION 4.0 IN ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN ~~[X]~~ WAH 2-9-89
AVERAGE SIZE OF PERFORATIONS .010 IN
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL STAINLESS STEEL
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 1.7 FT / 2.0 FT / 10.0 FT.
JOINING METHOD SCREW TYPE FLUSH JOINT THREADED

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT.
PROTECTIVE PIPE O.D. 10 3/4 IN

OTHER PROTECTION LOCKING CAP & LOCK

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT.)		ELEVATION ( )	
TOP OF RISER PIPE	2.0		591.0	
GROUND SURFACE	0.0		593.0	
BOTTOM OF PROTECTIVE PIPE	2.5		595.5	
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY (Volclay)	TOP 0.0	BOTTOM 191.0	TOP 593.0	BOTTOM 402.
BENTONITE	TOP —	BOTTOM —	TOP —	BOTTOM —
SAND (10-20)	TOP 191.0	BOTTOM 212.0	TOP 402.0	BOTTOM 381.
GRAVEL None Used WAH 2-9-89	TOP —	BOTTOM —	TOP —	BOTTOM —
PERFORATED SECTION	TOP 200.0	BOTTOM 210.0	TOP 393.0	BOTTOM 383
PIEZOMETER TIP	211.7		381.3	
BOTTOM OF BOREHOLE	220.7		372.3	
GWL AFTER INSTALLATION	Not Checked WAH 2-9-89		—	

AS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]

REMARKS OPEN HOLE INTERVAL FROM 212.0 FT TO 212.0 FT WAS ALLOWED TO COLLAPSE ON ITSELF. SIX (6) BUCKETS OF BENTONITE PELLETS WERE POURED AROUND THE PROTECTIVE CASING TO SERVE AS PACKING AND SEALING MATERIAL AT THE SURFACE.

265

4820

Monitoring Well 2431

Location #8

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 2431	COORDINATES:	DATE 12-3-92
ELEVATION:	GWL: Depth 73.3 ft. Date/Time 12-19-92/1600	DATE STARTED: 12-3-92
ENGINEER/GEOLOGIST: Michael Worley	Depth 73.3 ft Date/Time 12-19-92/0800	DATE COMPLETED: 12-17-92
DRILLING METHODS: Cable Tool		PAGE 1 OF 5

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				* For soil characterization of 0.0 to 68.0 Ft. See boring log for well #3431.			
34							
68				* Continuous sampling will begin at 68.0 through 83.0 ft. for sieve screen analysis.			

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Joe Barile

Rick Pierce

SAA - Same as Above

NA - Not Applicable

Background { OVM = 0 ppm; Bγ = 30 cpm; α = 0 cpm

* Samples Collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 2431	COORDINATES:	DATE: 12-7-92
ELEVATION:	GWL: Depth 73.3 ft. Date/Time 12-18-92/1500	DATE STARTED: 12-3-92
ENGINEER/GEOLOGIST: Michael Worley	Depth 73.3 ft. Date/Time 12-17-92/0800	DATE COMPLETED: 12-17-92
DRILLING METHODS: Cable Tool		PAGE 2 OF 5

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
68							
69	1620 105232 12-7-92	21 45 50/.3	12	Very dense (2.5Y, 5/3) light olive brown well graded gravelly sand, dry	SW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
70 71	1640 105232 12-7-92	17 22 24	18	Dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, moist	SW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
72	0810 105232 12-8-92	18 21 23	18	SAA	SW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
73 74	1040 105232 12-8-92	50/.5	2	Very dense (2.5Y, 5/4) light olive brown well graded gravel, trace sand, wet	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
75	1330 105232 12-8-92	28 50/.3	8	SAA	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
76 77	1415 105232 12-8-92	50/.4	3	SAA	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
78	1430 105232 12-8-92	50/.5	3	SAA	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
79 80	1440 105232 12-8-92	50/.5	3	SAA	GW	N/A	βγ = 0 cpm OVM = 30 ppm α = 0 cpm
81	1500 105232 12-8-92	49 34 36	8	SAA	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm
82 83	1510 105232 12-8-92	45 37 40	6	SAA	GW	N/A	OVM = 0 ppm βγ = 30 cpm α = 0 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

: Joe Barile

Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, βγ = 30 cpm, α = 0 cpm

Samples Collected per ASTM Standard Penetration Test

*All colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 2431	COORDINATES:	DATE: 12-8-92
ELEVATION:	GWL: Depth 78.3 ft Date/Time 12-18-92/1500	DATE STARTED: 12-3-92
ENGINEER/GEOLOGIST: Michael Worley	Depth 73.3 ft Date/Time 12-19-92/0800	DATE COMPLETED: 12-17-92
DRILLING METHODS: Cable Tool		PAGE 3 OF 5

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				* Bottom of sampling at 83.0 ft			
84							
85				* Bottom of boring at 85.0 ft.			

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile

Rick Pierce

Samples Collected per ASTM Standard Penetration Test

*All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE

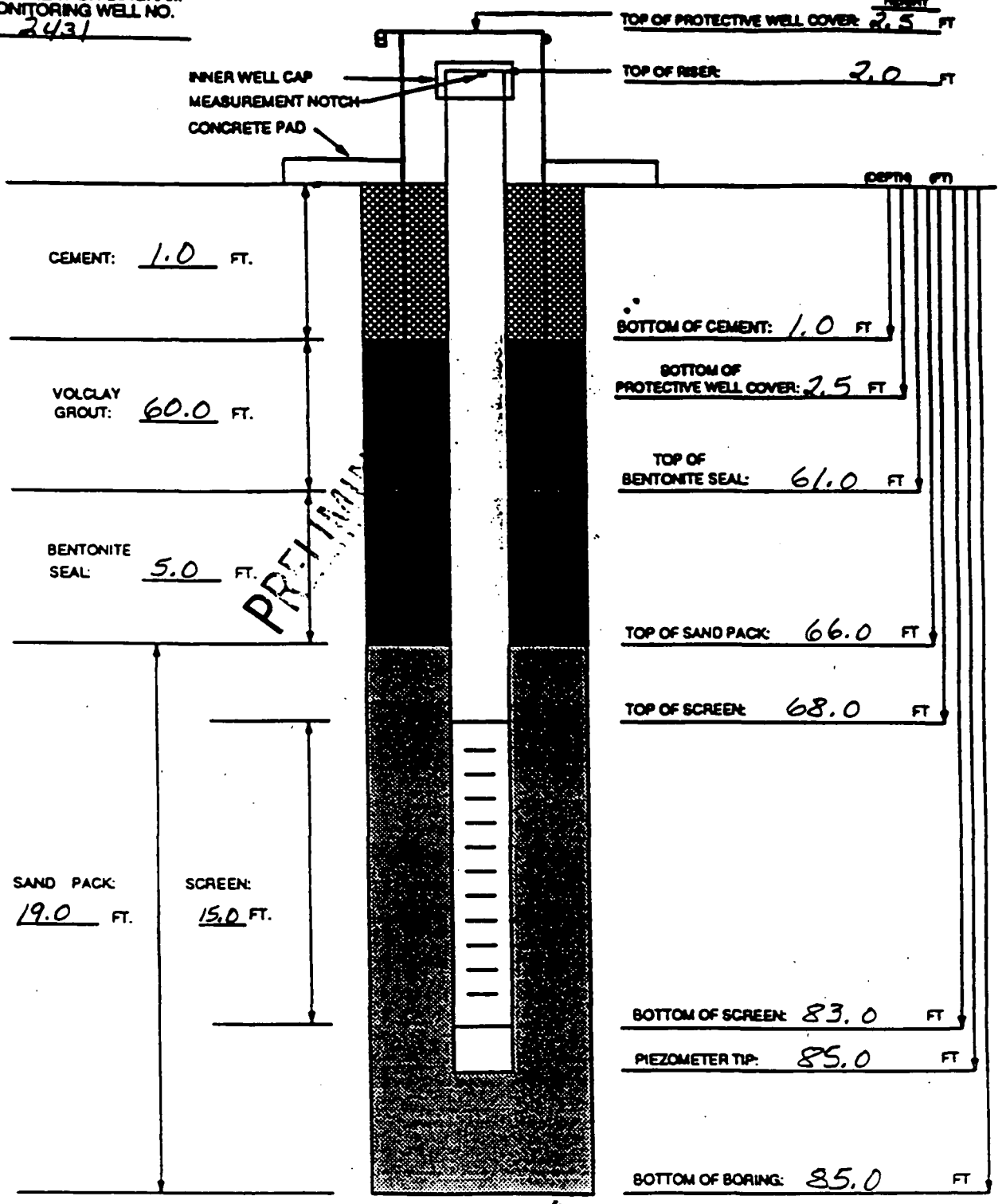
NA - NOT Applicable

Background { OVM = 0 ppm, Bγ = 30 cpm, α = 0 cpm

869

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2431

INSTALLATION DATE: 12-17-92



BOREHOLE DIAMETER: 10¾ IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 4/30, 22-50lb.
BENTONITE PELLETS (5-GALLON BUCKETS): 6
TYPE OF VOLCLAY GROUT: 18-50 lbs.
TYPE OF CEMENT: 1-80lb. bag
AMOUNT OF WATER USED: 1500 gallons
OTHER: 1-water drum, 14 soil drums
TASK: RCRA Phase I, 602.04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.020 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 71.3 FT/12-18-
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Michael Worley

FERNALD RI/FS

4820

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 602.04.27
BORING NO. 2431
PIEZOMETER NO. 2431

FIELD ENG./GEO. Michael Worley DATE 12-20-92
CHECKED BY C. Brun DATE 12/20/92
DATE OF INSTALLATION 12-~~18~~ 17-92 CB 12/20/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 TO 85.0
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in. I.D. FROM 0.0 FT TO 85.0 FT.
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION ~~10.0 in.~~ I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020
TOTAL PERFORATED AREA 15.0 FT.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 1-2.0 FT., 7-10 Ft.
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~3.0~~ 2.5 m.w. 12-18-92			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
VOLCLAY CEMENT GROUT / ~~SLURRY~~ mw 12-18-92	TOP 1.0	BOTTOM ~~60.0~~ 61.0 mw 12-18-92	TOP	BOTTOM
BENTONITE	TOP ~~60.8~~ mw 12-18-92	BOTTOM 66.0	TOP	BOTTOM
SAND	TOP 66.0	BOTTOM 85.0	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 68.0	BOTTOM 83.0	TOP	BOTTOM
PIEZOMETER TIP	85.0			
BOTTOM OF BOREHOLE	85.0			
GWL AFTER INSTALLATION	79.3			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cement placed 0.0 Ft to 1.0 FT. to hold protective cover in place.

4820

Monitoring Well 3431

Location #8

RI/FS

VISUAL CLASSIFICATION OF SOILS

20

PROJECT NUMBER. 6C2.C4.27	PROJECT NAME. RCRA Phase I
BORING NUMBER: 3431	COORDINATES:
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1400
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time
DRILLING METHODS: Cable Tool	

DATE 11-4-92
DATE STARTED: 11-4-92
DATE COMPLETED: 11-24-92
PAGE 1 OF 2

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
1	0920 103215 11-4-92	3 4 7	15	medium stiff (10YR, 4/4) dark yellowish brown silty clay, trace organics, moist, medium plasticity	Cl	1.0	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
2 3	0925 103216 11-4-92	5 14 14	10	SAA (10YR, 5/6) yellowish brown silty clay, medium plasticity, moist	Cl	1.0	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
4	0930 103217 11-4-92	14 26 50/.4	8	stiff (10YR, 5/6) yellowish brown clay, trace gray mottling, low plasticity, trace limestone gravel, slightly moist	Cl	2.0	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
5 6	0935 ~~103~~ 11-4-92 11-4-92	50/0	0.	NO RECOVERY	N/A	N/A	OVM = N/A ppm Bγ = N/A cpm α = N/A cpm
	1300 103218 11-4-92	12 23 36	5	stiff (10YR, 5/6) yellowish brown silty clay, trace gravel, low plasticity, slightly moist	Cl	2.0	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
8 9	1305 103219 11-4-92	50/.3	6	Very stiff, SAA	Cl	2.5	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
10	1330 103220 11-4-92	10 17 25	14	SAA, gray mottling	Cl	3.0	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
11 12	1340 103221 11-4-92	16 26 40	16	Very stiff (10YR, 5/1) gray clay trace gravel, low plasticity, slightly moist	Cl	3.0	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
13	1400 103222 11-4-92	16 21 26	18	SAA (10YR, 4/1) dark gray clay, trace gravel, low plasticity, slightly moist	Cl	3.5	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm
14 15	1410 103223 11-4-92	40 50 36	18	SAA, silty clay, trace gravel, low plasticity, slightly moist	Cl	3.5	OVM = 0 ppm Bγ = 20 cpm α = 0 cpm

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Joe Barile

Rick Pierce

* samples collected per ASTM Standard Penetration Test

* All Colors identified by Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bγ = 20 cpm, α = 0 cpm

VISUAL CLASSIFICATION OF SOILS

482U

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I
BORING NUMBER: 3431	COORDINATES:
ELEVATION:	GWL: Depth 73.5 FT Date/Time 11-24-92/1430
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time
DRILLING METHODS: Cable Tool	

DATE: 11-4-92
DATE STARTED: 11-4-92
DATE COMPLETED: 11-24-92
PAGE 2 OF 13

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1420 103224 11-4-92	13 26 21	12	Very stiff (10YR, 5/1) gray Clay, trace sand and gravel, low plasticity, slightly moist	Cl	2.5	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
17 18	1505 103225 11-4-92	7 12 21	12	SAA, silty clay, trace gravel, SAA	Cl	2.5	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
19	1515 103226 11-4-92	18 28 18	12	Very stiff (10YR 5/1) gray clay trace silt, ~~trace~~ gravel, low plasticity, slightly moist	Cl	2.75	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
20 21	1640 103227 11-4-92	45 10 10	3	Stiff (10YR, 5/1) gray gravely Clay, trace sand, medium plasticity, moist	Cl	1.5	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
22	1650 N/A 11-4-92	2 5 7	0	NO RECOVERY	N/A	N/A	N/A
23 24	1700 103228 11-4-92	2 5 11	4	medium stiff (10YR, 5/1) gray gravely clay, medium plasticity, moist	Cl	1.0	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
25	1720 103229 11-4-92	6 7 9	3	medium dense (10YR, 5/1) gray Clayey gravel, no plasticity, wet	GC	N/A	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
26 27	1400 N/A 11-5-92	3 5 6	0	NO RECOVERY	N/A	N/A	N/A
28	1410 103230 11-5-92	4 7 11	3	Soft (10YR, 5/1) gray gravely clay, medium plasticity, moist.	Cl	0.5	OVM = 0 ppm Bq = 20 cpm α = 0 cpm
29 30	1600 N/A 11-5-92	5 5 9	0	NO RECOVERY	N/A	N/A	OVM = N/A ppm Bq = N/A cpm α = N/A cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling
Drilling Equipment: 72 Speedstar
Driller: Joe Barile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bq = 30 cpm, α = 0 cpm

- Samples collected per ASTM Standard Penetration Test.
* All colors identified by the Munsell Color Chart.

RWPS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 1002.04.07	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-5-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST: Michael Werley	Depth: Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 3 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	1605 103231 11-5-92	14 12 12	12	Stiff (10YR, 5/1) gray clay, trace sand, trace gravel, medium plasticity, moist	CI	1.0	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
32 33	1620 103232 11-5-92	50/.4	8	Very dense (2.5Y, 5/6) light olive brown well graded sand, trace gravel, dry	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
34 35				* Next sample at 35.0 feet. Samples will be collected at 5.0 feet intervals from 35.0 feet.			
36	1645 103233 11-5-92	50/.5	3	Very dense (2.5Y, 5/6) light olive brown well graded sand, trace gravel, dry	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
37 38 39 40							
41	0950 103234 11-6-92	5 50/.4	5	Very dense (2.5Y, 5/6) light olive brown well graded coarse sand, trace gravel, dry	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
42 43 44 45							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Driller: Joe Barile
Rick Pierce

Samples collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bγ = 30 cpm, α = 0 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-6-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 4 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	1320 103235 11-6-92	13 50/.4	6	Very dense (2.5Y, 5/6) light olive brown well graded gravelly sand, slightly moist	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
47							
48							
49							
50							
51	1355 103236 11-6-92	18 45 40	18	SAA	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
52							
53							
54							
55							
56	1500 103237 11-6-92	7 50/.4	6	Very dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, slightly moist	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
57							
58							
59							
60							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm

- Samples collected per ASTM Standard Penetration Test
* Colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 3431	COORDINATES:	DATE 11-6-92
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92
DRILLING METHODS: Cable Tool		PAGE 5 OF 13

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	1530 103238 11-6-92	14 40 40	15	Very dense (2.5Y, 5/3) light olive brown well graded sand, trace gravel, slightly moist	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
62							
63							
64							
65	1630 103239 11-6-92	7 40 50/.0	12	SAA, well graded gravelly sand, slightly moist.	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
66							
67							
68							
69							
70	1720 103240 11-6-92	10 50/.4	10	SAA, moist	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
71							
72							
73							
74							
75				* water table at 75.0 FT			

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile, Rick Pierce

Samples collected per ASTM standard Penetration Test

* Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-18-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 6 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	1425 105201 11-10-92	21 50/.4	8	Very dense (2.5Y, 5/3) light olive brown well graded gravel, trace sand, wet	GW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
77							
78							
79							
80							
81	1615 105202 11-10-92	40 21 20	10	SAA	GW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
82							
83							
84							
85							
86	0950 105203 11-11-92	50/.3	2	Very dense (2.5Y, 5/3) light olive brown clayey gravel, wet.	GC	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
87							
88							
89							
90							

PRELIMINARY

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Driller: Joe Barile
Rick Pierce

Samples collected per ASTM Standard Penetration Test

* Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm }

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 3431	COORDINATES:	DATE 11-11-92
ELEVATION:	GWL: Depth 73.3 ft Date/Time 11-24-92/1430	DATE STARTED: 11-4-92
ENGINEER/GEOLOGIST: Michael Wooley	Depth Date/Time	DATE COMPLETED: 11-24-92
DRILLING METHODS: Cable Tool		PAGE 7 OF 13

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
91	1020 105204 11-11-92	26 31 27	13	Very dense (2.5Y, 5/3) light olive brown, well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
92							
93							
94							
95							
96	1320 105205 11-11-92	50/3	4	SAA	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
97							
98							
99							
100							
101	1345 105206 11-11-92	5 7 21	8	Dense (2.5Y, 5/3) light olive brown well graded gravel, trace coarse sand, wet	GW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
102							
103							
104							
105							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Bagile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm

Samples collected per ASTM Standard Penetration Test

* Colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 3431	COORDINATES:	DATE 11-11-92
ELEVATION:	GWL: Depth 73.3 Ft Date/Time 11-24-92/1430	DATE STARTED: 11-4-92
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92
DRILLING METHODS: Cable Tool		PAGE 8 OF 13

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	15:C 105207 11-11-92	50/.3	4	Very dense (2.5Y, 5/3) light olive brown poorly graded coarse sand, trace gravel, wet	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
107							
108							
109							
110	155C 105208 11-11-92	5 25 25	7	Dense (2.5Y, 5/3) light olive brown gravelly sand, wet well graded	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
111							
112							
113							
114							
115	0900 105211 11-12-92	10 29 36	14	Very dense (2.5Y, 5/3) light olive brown well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
116							
117							
118							
119							
120							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm

*Samples collected per ASTM Standard Penetration Test
*Colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-13-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 9 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	0940 105212 11-13-92	3 7 9	6	Medium dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
122							
123							
124							
125	1315 105213 11-13-92	3 6 11	8	SAA	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
126							
127							
128							
129							
130	1345 105214 11-13-92	13 21 41	12	Very dense, SAA	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
131							
132							
133							
134							
135							

PRELIMINARY

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Driller: Joe Barile
Mark Rebold

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bα = 30 cpm, α = 0 cpm

Samples collected per ASTM Standard Penetration Test
Colors identified by the Munsell Color Chart

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-16-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 10 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	1025 105216 11-16-92	12 15 42	12	Very dense (2.5Y, 5/3) light olive brown well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
137 138	N/A	N/A	N/A	* Continuous sampling will resume at 138.0 - 148.0 FT for screen analysis through screened interval.	N/A	N/A	N/A
139	1100 105217 11-16-92	21 35 42	18	Very dense (2.5Y, 5/3) light olive brown poorly graded sand, wet	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
140 141	1525 105218 11-16-92	25 50/.2	18	SAA, trace gravel	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
142	1615 105219 11-16-92	50/.4	18	SAA	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
143 144	1630 105220 11-16-92	50/.5 50/0	18	SAA	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
145	1645 105221 11-16-92	50/.5 50/.2	18	Very dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
146 147	1715 105222 11-16-92	25 32 45	15	SAA	SW	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
148	1725 105223 11-16-92	50/.4	15	Very dense (2.5Y, 5/4) light olive brown poorly graded sand, trace gravel, wet	SP	N/A	OVM = 0 ppm Bγ = 30 cpm α = 0 cpm
149 150	N/A	N/A	N/A	NO SAMPLE TAKEN. NEXT SAMPLE AT 150.0 - 151.5 FT	N/A	N/A	N/A

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Driller: Joe Barile

Rick Pierce

- Samples collected per ASTM Standard Penetration Test.

* All colors identified by the Munsell Color Chart.

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, Bγ = 30 cpm, α = 0 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3431	COORDINATES:	DATE 11-17-92	
ELEVATION:	GWL: Depth 73.3 FT Date/Time 11-24-92/1430	DATE STARTED: 11-4-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-24-92	
DRILLING METHODS: Cable Tool		PAGE 11 OF 13	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	1500 105225 11-17-92	39 40 31	18	Very dense (2.64, 5/3) light olive brown well graded sand, trace gravel, wet	SW	N/A	OVM = 0 ppm β γ = 30 cpm α = 0 cpm
152				Bottom of sampling at 151.5 FT			
153							
154							
155				Bottom of boring at 155.0 FT			

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile, Rick Pierce

Samples collected per ASTM Standard Penetration Test

* Colors identified by the Munsell Color Chart

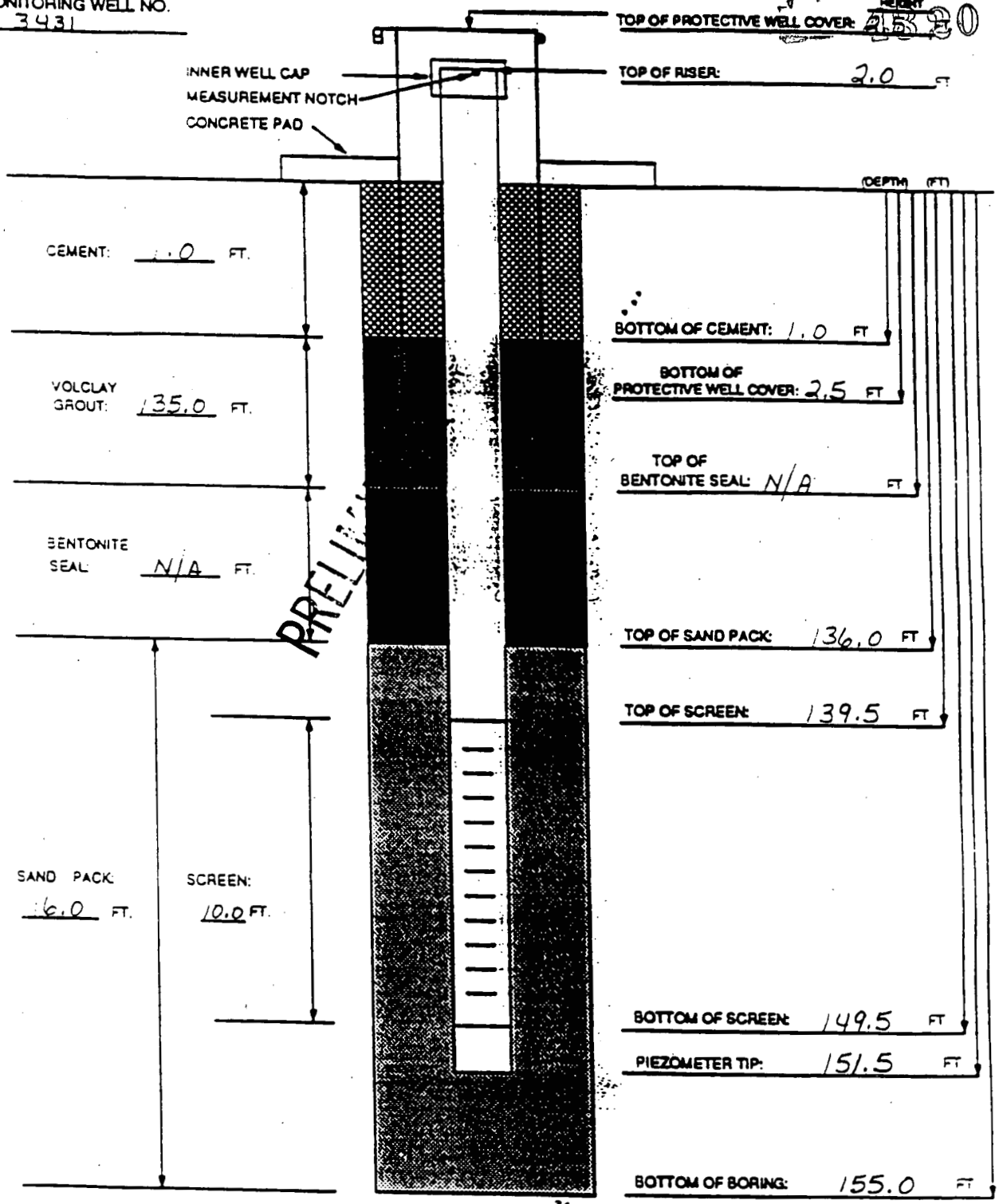
SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { OVM = 0 ppm, β γ = 30 cpm, α = 0 cpm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 3431

INSTALLATION DATE: 11-24-92

TOP OF PROTECTIVE WELL COVER: 2.5 FT (HEIGHT)



TOP OF RISER: 2.0 FT

BOREHOLE DIAMETER: 10 3/4 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20, 10 bags
BENTONITE PELLETS (5-GALLON BUCKETS): NONE USED
BAGS OF VOLCLAY GROUT: 30 - 50 lb.
AMOUNT OF CEMENT: 80 lbs.
AMOUNT OF WATER USED: 1,800 gallons
OTHER: 1 water drum, 26 soil drums
TASK: RCRA Phase I

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 73.3 FT/
5) TOP OF CASING IS SECURED WITH STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BE GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Michael Worley

ASI FORM 0157 REV. (0)

FERNALD
RI/FS

PIEZOMETER INSTALLATION SHEET 4820

PROJECT NAME RCRA Phase I
PROJECT NO. 602.04.27
BORING NO. 3431
PIEZOMETER NO. 3431

FIELD ENG./GEO. Michael Worley DATE
CHECKED BY DATE
DATE OF INSTALLATION 11-24-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID WATER FROM 0.0 FT TO 150.0 FT.
FLUID N/A FROM N/A TO N/A

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 IN I.D. FROM 0.0 FT TO 155.
SIZE N/A FROM N/A TO N/A

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in. I.D.
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 IN.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 Stainless Ste
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 1-1.5 FT, 1-2 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.5			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: VOLCLAY GROUT / ~~SLURRY~~ CEMENT M.W. 11-24-92	TOP 0.0 FT TOP 1.0 FT	BOTTOM 1.0 FT BOTTOM 136.0 FT	TOP	BOTTOM
BENTONITE NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND 10/20	TOP 136.0 FT	BOTTOM 152.0 FT	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 139.5 FT	BOTTOM 149.5 FT	TOP	BOTTOM
PIEZOMETER TIP	151.5 FT			
BOTTOM OF BOREHOLE	155.0 FT			
GWL AFTER INSTALLATION	73.3 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Cement placed 0.0 to 1.0 FT to hold protective cover in place.

4820

Monitoring Well 2432

Location #9

286

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: [illegible] WEH 05	PROJECT NAME: R.R.A. Drilling	
BORING NUMBER: 2432	COORDINATES:	DATE: 1-14-93
LOCATION:	GWL: Depth 15.5 FT(GL) Date/Time: 1-28-93/[illegible]	DATE STARTED: 1-14-93
ENGINEER/GEOLOGIST: K. Payne	Depth 82.6 FT(GL) Date/Time: 1-27-93/1025	DATE COMPLETED: 1-27-93
DRILLING METHODS Cable Tool		PAGE 1 OF 8 [illegible] 1-22-93

DEPTH (Ft.)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				For Soil Classification from 0.0 to 78.0 feet, see Boring Log of monitoring well 4432.			
				Continuous Sampling will begin at 78.0 feet and continue to 93.0 feet for sieve analysis.			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller Bob Johnson

Lonnie McGlaklin

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

287

RIFS

VISUAL CLASSIFICATION OF SOILS

Page of

PROJECT NUMBER: 602.04.27 WEA 05	PROJECT NAME: RCRA Phase I
BORING NUMBER: 2432	COORDINATES:
ELEVATION:	GWL: Depth See p. 1 Date/Time:
ENGINEER/GEOLOGIST: K. Payne	Depth See p. 21 (CB 4/1/93) Date/Time:
DRILLING METHODS Cable Tool	

DATE: 4820 1/19/93
DATE STARTED: 1/14/93
DATE COMPLETED: 1/27/93
PAGE 2 OF 8

DEPTH (ft)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
79	104932 1330 1-20-93	65/.6	5	Very Dense (10YR, 4/6) Yellowish Brown, Well Graded Gravely Sand, Dry	SW ~~GW~~ CB 2/1/93	N/A	HNU = 0 ppm Bγ = 40-60 cpm
80 / 81	104933 1350 1-20-93	10 16 50/.5	6	Very Dense (10YR, 5/4) Yellowish Brown, Well Graded Coarse Gravely Sand, moist	SW ~~GW~~ CB 2/1/93	N/A	HNU = 0 ppm Bγ = 40-60 cpm
82	104934 1450 1-20-93	15 65/.5	6	Very Dense (2.5Y, 5/3) light olive Brown, Well Graded Fine Sand, Moist	SW ~~GW~~ CB 2/1/93	N/A	HNU = 12 ppm Bγ = 60-80 cpm
83	104935 1530 1-20-93	20 65/.6	8	Very Dense (2.5Y, 6/3) light yellowish brown, Well Graded medium Sand, wet	SW	N/A	HNU = 5 ppm Bγ = 60-80 cpm
85	104936 1555 1-20-93	15 27 33	13	Very Dense (2.5Y, 4/3) Olive Brown, Well ~~Graded~~ Graded gravely Sand, wet	SW	N/A	HNU = 2 ppm Bγ = 80-100 cpm
86 / 87	104937 1645 1-20-93	27 45 50/.5	16	Very Dense (2.5Y, 5/3) light Olive Brown, Well Graded gravely Sand, wet	SW	N/A	HNU = 1 ppm Bγ = 60-80 cpm
88	104938 1650 1-20-93	27 45 41	18	Very Dense (2.5Y, 5/4) light olive Brown, poorly graded Sand, wet	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
89 / 90	104939 0945 1-22-93	15 25 20	12	Dense (2.5Y, 4/3) olive Brown Well ~~Sorted~~ graded medium Sand, wet	SW ~~SP~~ 2-1-93	N/A	HNU = 0 ppm Bγ = 60-80 cpm
91	104940 0905 1-22-93	15 15 15	16	~~Very Dense (2.5Y, 4/3) olive~~ Dense (5Y, 4/3) olive, poorly graded medium sand, wet	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
92 / 93	104941 0950 1-22-93	65 85	7	Very Dense (2.5Y, 4/3) olive Brown, well graded sandy Gravel, wet	GW ~~SW~~ KP 1-22-93	N/A	HNU = 0 ppm Bγ = 60-80 cpm

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment Cyclone 42
Driller Bob Johnson
Lonnie McGlothlin
Kevin Cavenaugh

SAA - Same as above
NA - Not Applicable
* Sieve Analysis sample # 104942 collected from 72.0-93.0 Ft
Samples collected per ASTM standard penetration test
Colors identified using Munsell Color Chart

Background Readings
1/19/93 HNU = 0 ppm

CB 2/1/93

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 603.04.27 WEA 05	PROJECT NAME: RCRA - Phase 1	
BORING NUMBER: 2432	COORDINATES:	DATE: 1/22/93
ATION:	GWL: Depth See p. 1 Date/Time:	DATE STARTED: 1/14/93
ENGINEER/GEOLOGIST: K. Payne	Depth See p. 1 Date/Time:	DATE COMPLETED: 1-27-93
DRILLING METHODS Cable Tool		PAGE 2 OF 8

DEPTH (Ft.)	SAMPLE TYPE AND No.	BLOWS ON SAMPLER PER (6in)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
93							
94				For Visual Description of soils from 93.0 to 97.0 ft, see Visual Classification of soils for MW-4432			
95							
96							
97				Bottom of Boring 97 ft			

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

:r Bob Johnson

Lonnie McGlothlin

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

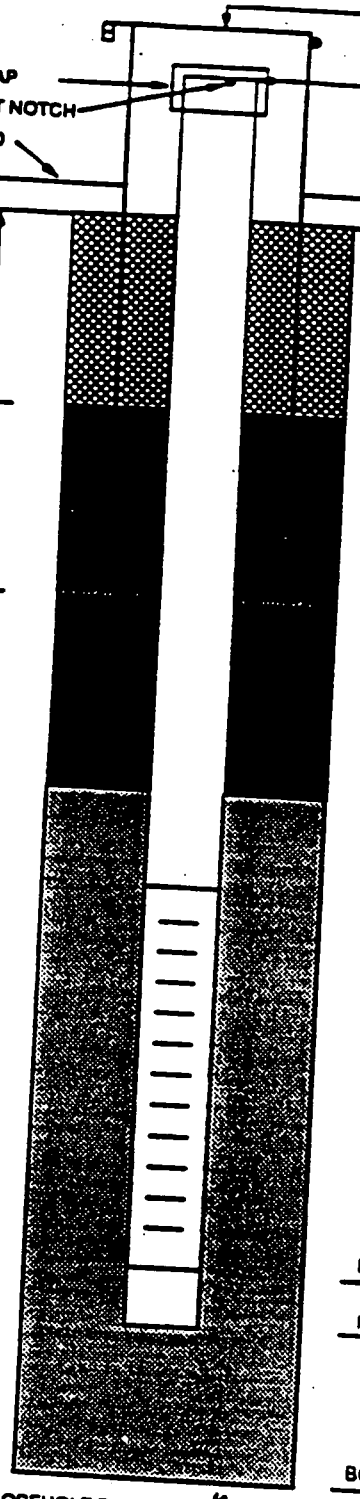
Colors identified using Munsell Color Chart

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 2432

INSTALLATION DATE: 4820 11/29/93

TOP OF PROTECTIVE WELL COVER: HEIGHT 2.5 FT

TOP OF RISER: 2.0 FT



CEMENT: .8 FT.

KP 2-1-93
VOLCLAY GROUT: ~~72.9~~ 67.2 FT.

BENTONITE SEAL: 5.2 FT.

SAND PACK: 23.8 FT.

SCREEN: 15.0 FT.

(DEPTH) (FT)

BOTTOM OF CEMENT: .8 FT

BOTTOM OF PROTECTIVE WELL COVER: 2.5 FT

TOP OF BENTONITE SEAL: 68.0 FT

TOP OF SAND PACK: 73.2 FT

TOP OF SCREEN: 78.0 FT

BOTTOM OF SCREEN: 93.0 FT

PIEZOMETER TIP: 95.0 FT

BOTTOM OF BORING: 97.0 FT

BOREHOLE DIAMETER: 10.0 IN.

MATERIALS USED

TYPE AND QUANTITY: 24 bags 4/30 sand
BENTONITE PELLETS (5-GALLON BUCKETS): 5 buckets
TYPE OF VOLCLAY GROUT: 19 - 50 lb Bags
TYPE OF CEMENT: 1 - 80 lb Bag
WATER USED: 1400 gallons
Drums Soil, 1 Drum Alcon/Water
602.04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 34.6 FT. (Top of Riser) 1-27-93
5) TOP OF CASING IS SECURED WITH A STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: K. Payne

Date 2/4/93

(0)

299

RI/FS

PIEZOMETER INSTALLATION SHEET 4820

PROJECT NAME RCRA Phase 1 FIELD ENG./GEO. K. Payne DATE 1-27-93
PROJECT NO. 602.04.27 CHECKED BY C Bell DATE 2/1/93
BORING NO. 2432
PIEZOMETER NO. 2432 DATE OF INSTALLATION 1-27-93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 97.0 FT
FLUID NA FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE O.D. x I.D. FROM 0.0 FT TO 99.0 FT
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 15.0 FT

RISER PIPE MATERIAL 316 stainless steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 8 - 10 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	Top 0.0	Bottom 0.8		
Cement + Volclay GROUT / ~~SLURRY~~ KP 1-27-93	TOP 0.8	BOTTOM 68.0	TOP	BOTTOM
BENTONITE	TOP 68.0	BOTTOM 73.2	TOP	BOTTOM
SAND	TOP 73.2	BOTTOM 97.0	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 78.0	BOTTOM 93.0	TOP	BOTTOM
PIEZOMETER TIP	95.0			
BOTTOM OF BOREHOLE	97.0			
GWL AFTER INSTALLATION	84.6 (Top of Riser)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS Cement placed from 0.0 to 0.8 FT to hold protective cove in pl

3/4/93

[redacted] 4820

Customer Number: 104 892

[redacted]: _____ SAMPLE NUMBER: 930122-045

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 153.2

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
20	32.05	20.8	20.8	78.7
30	37.87	24.6	45.4	33.5
40	44.65	29.0	74.4	16.7
60	21.32	13.9	88.3	9.8
100	8.18	5.3	93.6	5.4
200	3.72	2.4	96.0	3.0
Pan	5.03	3.3	99.3	

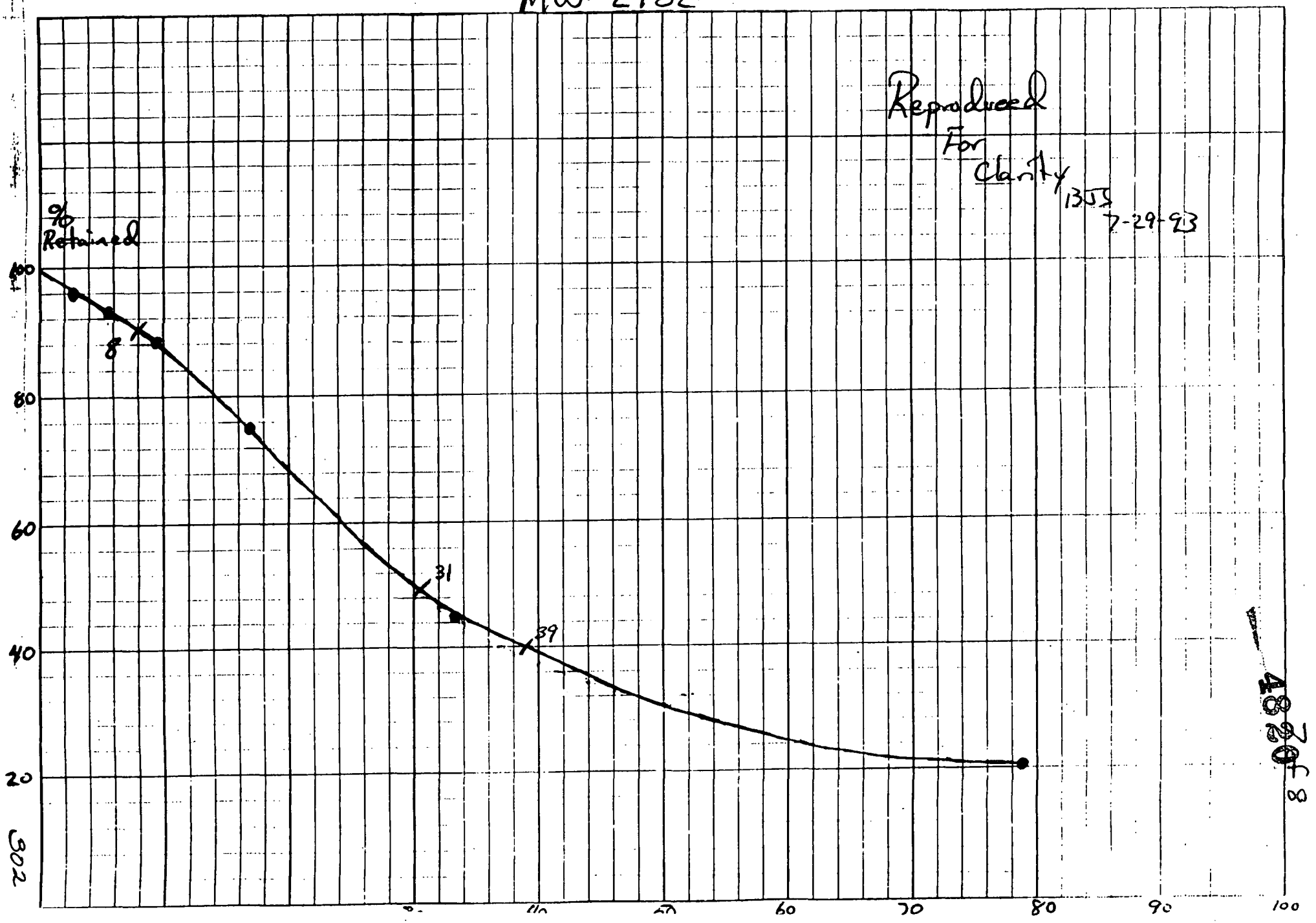
$$\frac{W_2 \times 100\%}{W_1} = R \qquad \left|\frac{\text{Original} - \text{Duplicate}}{\text{Average}}\right| \times 100\% = \text{RPD}$$

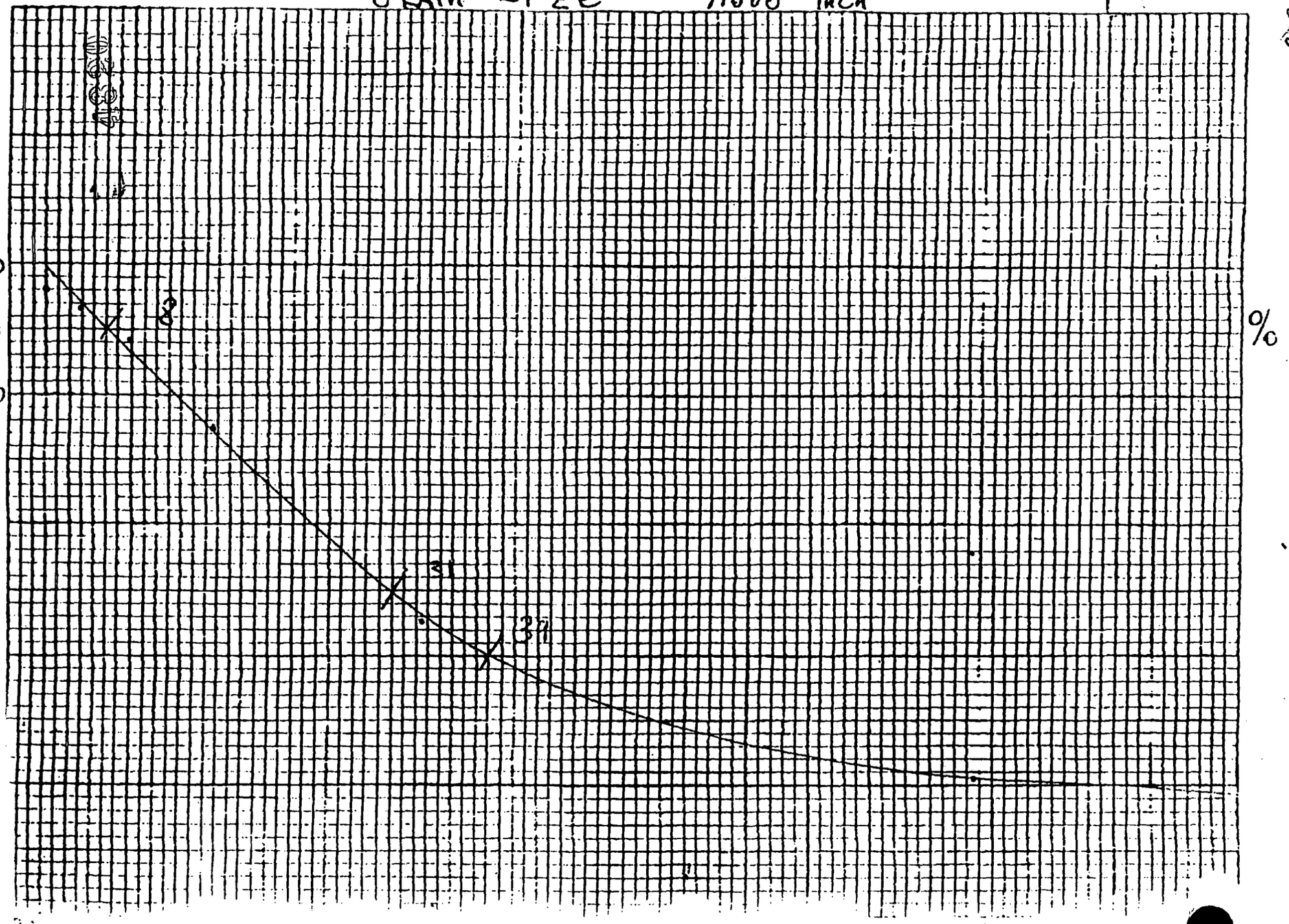
Analyzed by:	Checked by:	Date analyzed:
John Robert		1-25-93

Grain Size Retained

40 %	39
50 %	31
90 %	8

MW-2432


Reproduced For Clarity 1355 7-29-93
% Retained
100
80
60
40
20
8
31
39
60
70
80
90
100
302
4 of 8



303

Well #2432

4820

Refined Values

90% = .008

50% = .031

40% = .039

$\frac{.039}{.008} = 4.875$ 4.875 > 3 therefore a factor of 4 will be used

$4 \times .031 = .124$

The result most closely fits the coarse sand pack (4/30). Therefore a coarse sand pack along with a 0.020 inch well screen will be used in this monitoring

CB 2/6/93

4820

Monitoring Well 3432

Location #9

LOG OF BORING OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 3432	COORDINATES:	DATE 12-7-92
ELEVATION:	GWL: 9226 Date/Time 1/14/93	DATE STARTED: 12-7-92
ENGINEER/GEOLOGIST: K. Payne	Depth Date/Time	DATE COMPLETED: 1-11-93
DRILLING METHODS: Cable Tool		PAGE 1 OF 7

4820

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				* For Soil Classification from 0.0 to 148.0 feet, see Boring log of monitoring Well 4432			
74							
				HYDRO PUNCH TAKEN AT 97.0'			
148				* Continuous Sampling will begin at 148.0 and continue to 158.0 feet			

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson
Lonnie McGlokl...

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Samples collected per ASTM standard penetration test.
Colors ideitified using Munsell color chart

FMPC 04 2/9/93

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 3432	COORDINATES:	DATE 12-15-92 4820
ELEVATION:	GW Depth Seep. / Date/Time	DATE STARTED: 12-7-92
ENGINEER/GEOLOGIST. K. Payne	Depth: Date/Time	DATE COMPLETED: 12-11-93
DRILLING METHODS: Cable Tool		PAGE 2 OF 7

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
149	1410 104880 12-15-92	45 50/.4	7	Very Dense (2.5Y, 4/2) Dark Grayish Brown, medium Gravel with trace sand, non-plastic, wet	GW	N/A	HNU = 0 ppm βγ = 60-80 cpm
150 151	1440 104880 12-15-92	50/.2	2	Very Dense (2.5Y, 4/2) Dark Grayish Brown, Gravely Sand ~~with~~ FP 12-15-92 non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 40-60 cpm
152	1555 104880 12-15-92	50/.4	3	Very Dense (2.5Y, 4/3) Olive Brown Gravely Sand, non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 40-60 cpm
153 154	1620 104880 12-15-92	50/.3	2	Very Dense (2.5Y, 4/3) Olive Brown, medium Gravel with trace sand, non-plastic, wet	GP	N/A	HNU = 0 ppm βγ = 40-60 cpm
155	1645 104880 12-15-92	100/.6	6	Very Dense (2.5Y, 4/4) Olive Brown, Gravely Sand, non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 40-60 cpm
156 157	0940 104880 12-16-92	50/.4	4	Very Dense (2.5Y, 4/4) Olive Brown medium Gravel with trace sand, non-plastic, wet	GW ~~SP~~ CP 2/1/93	N/A	HNU = 0 ppm βγ = 40-60 cpm
158	0900 104880 12-16-92	45 FP 12-16-92 50/.2	7	Very Dense (5Y, 4/3) Olive fine Sand with trace Gravel non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 40-60 cpm
159 160					~~SP~~ FP 12-16-92	~~N/A~~ FP 12-16-92	
161							
162				Bottom of Boring at 162.0 Ft			
163							

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller Bob Johnson

Lonnie McBlocklin

Craig Coulter

Kevin ~~Myers~~ S

Background Readings

12/15/92 { HNU = 0 ppm, βγ = 60-80 cpm

12/16/92 { HNU = 0 ppm, βγ = 50-60 cpm

SAA - SAME AS ABOVE

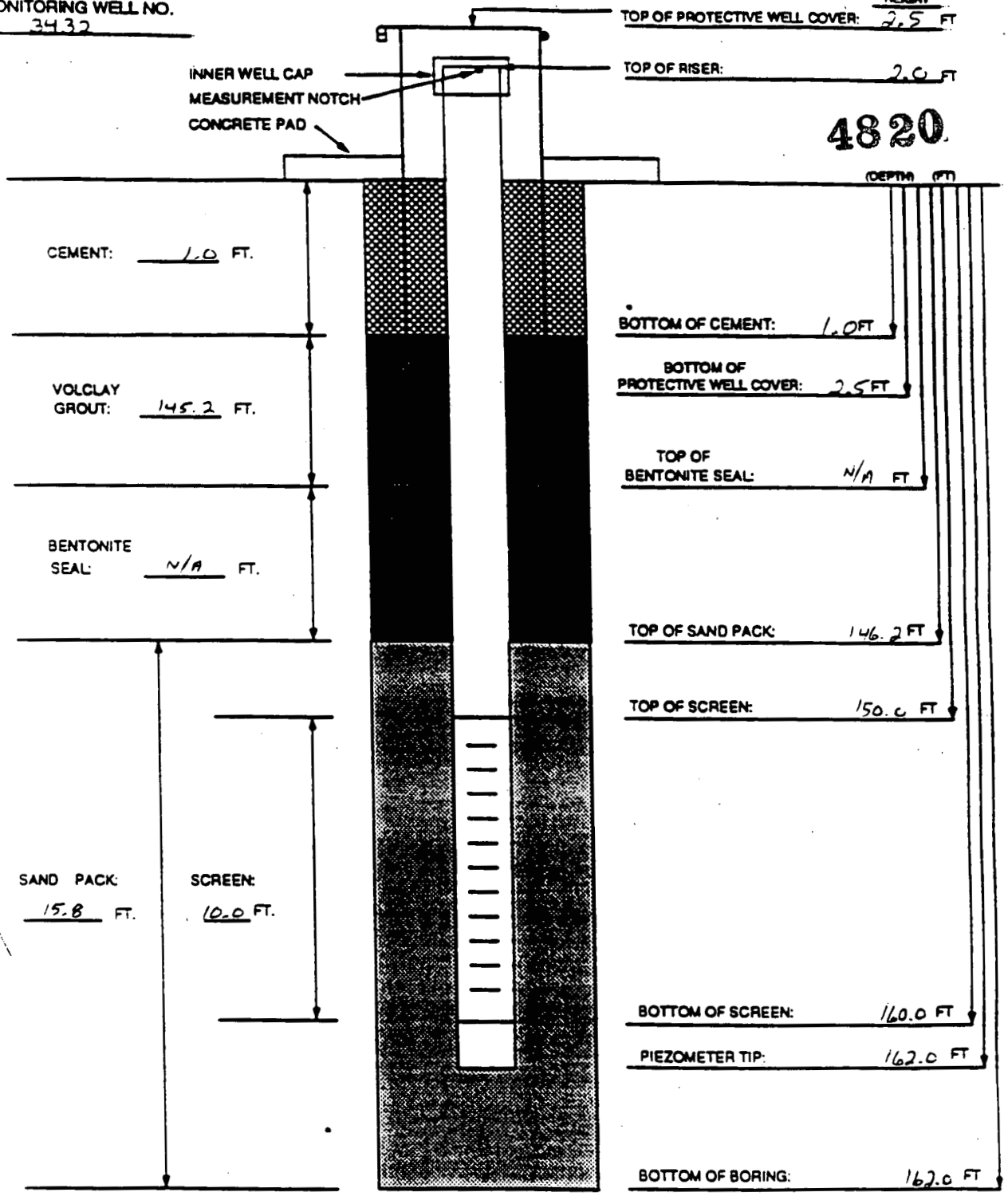
NA - NOT APPLICABLE

see p. 1

FMPC QA OK 2/16/93

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO.
3432

INSTALLATION DATE: 1/11/92



BOREHOLE DIAMETER: 10.0 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 4/30 Ottawa 12-50lb bags
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
QTY OF VOLCLAY GROUT: 53 50lb bags
QTY OF CEMENT: 1 bag 80lb bag
QTY OF WATER USED: 2500 gallons
26 Drums Soil, 1 Drum Alconox/water, 2 Drums Grout
602.04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.02 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 87.6 FT
5) TOP OF CASING IS SECURED WITH STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: K. Payne

(0)

2/9/93

308

PIEZOMETER INSTALLATION SHEET 4820

PROJECT NAME RCRA Phase I
PROJECT NO. 602.04.07
BORING NO. 3432
PIEZOMETER NO. ~~N/A~~ 3432

FIELD ENG./GEO. K. Payne DATE 1/11/
CHECKED BY C Brier DATE 02/01/9
DATE OF INSTALLATION 1/11/93

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 90.0 FT
FLUID NA FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT TO 163.0 FT
SIZE NA FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS .02 in
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 Stainless Stee
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 15-10FT, 2-2FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Hinged locking cover wit padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	CB 1/13/93 ~~2.0~~ 3.0 FT			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:	Top 0.0 FT	BOTTOM 1.0 FT		
GROUT ~~/SLURRY~~ CEMENT KP 1-12-93	TOP 1.0 FT	BOTTOM 146.2 FT	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP 146.2 FT	BOTTOM 162.0 FT	TOP	BOTTOM
GRAVEL	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 150.0 FT	BOTTOM 160.0 FT	TOP	BOTTOM
PIEZOMETER TIP	162.0'			
BOTTOM OF BOREHOLE	162.0'			
GWL AFTER INSTALLATION	82.6'			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Cement placed from 0.0 to 1.0 FT to hold protective cover in place

CB 1/13/93

015 1/13 309

mw - 3432

Customer Number 104880

MATERIAL: _____ SAMPLE NUMBER: 92 1216-064

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: ~~153.03~~ 138.3

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	67.36	48.7	48.7	78.7
20	22.04	16.0	64.7	33.5
40	21.60	15.6	80.3	16.7
60	13.24	9.6	89.9	9.8
100	4.45	3.2	93.1	5.9
200	3.56	2.6	95.7	3.0
Pan	5.64	4.1	99.8	

$$\frac{W_2 \times 100\%}{W_1} = R \qquad \left|\frac{\text{Original} - \text{Duplicate}}{\text{Average}}\right| \times 100\% = \text{RPD}$$

Analyzed by:	Checked by:	Date analyzed:
J Robert		12-18-92

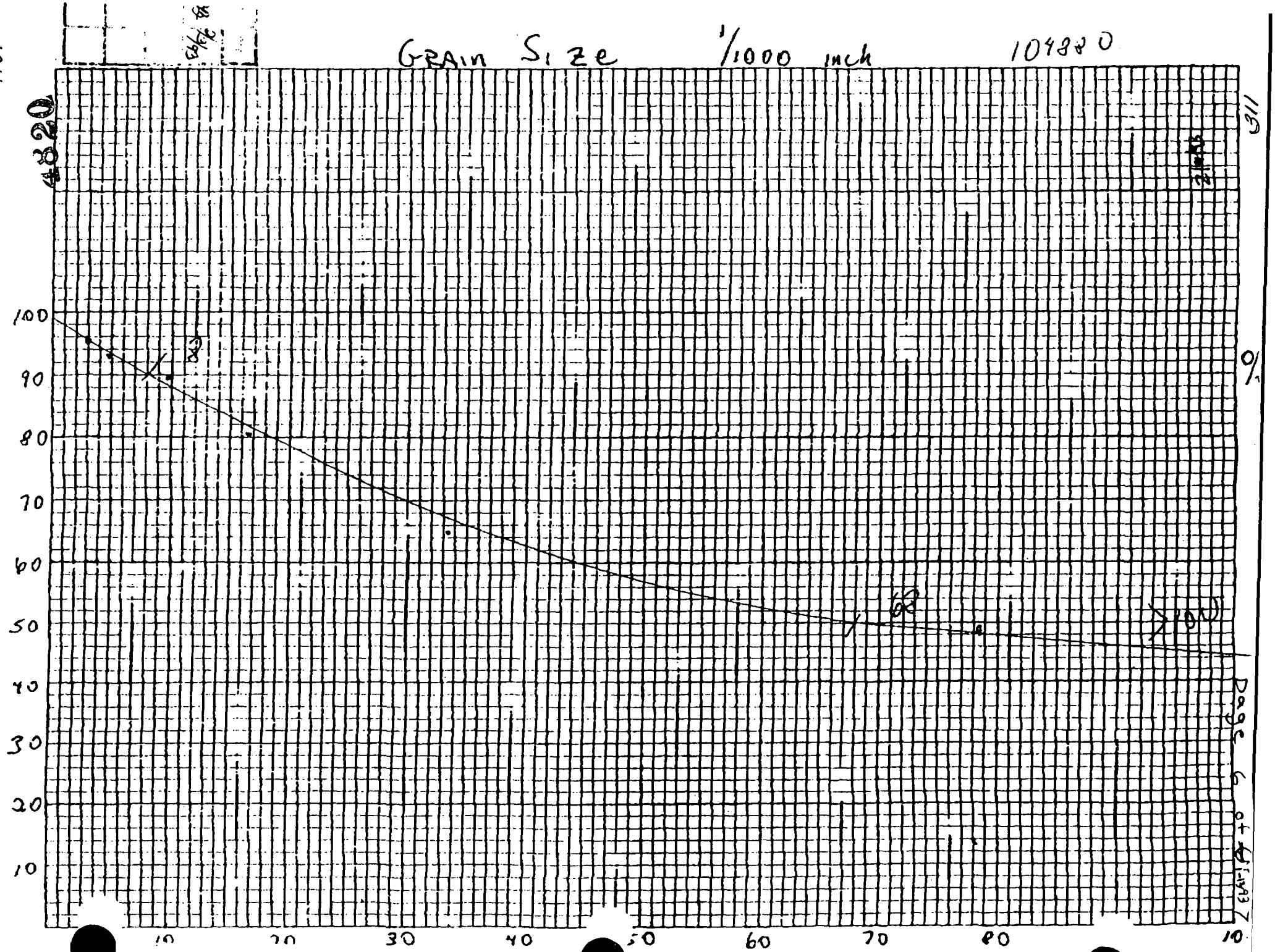
GRAIN SIZE 40% RETAINED >100 .001 in.

50% 68

90% 8

CA 2/3/93

2/4/93 310


Grain Size 1/1000 inch
104820
48320
100
90
80
70
60
50
40
30
20
10
10
20
30
40
50
60
70
80
10
%

Well = ~~[illegible]~~ 3432 KP 1-13-93

4820

Values

20% = .008

50% = .068

100% = .100

$\frac{.100}{.008} = 12.5$ 12.5 > 3 therefore a factor of 4 will be u

[illegible] .068 = .272

The result most closely fits the coarse sand pack curve (4/30). Therefore a coarse sand pack along with a 0.020 in. well screen will be used in this monitoring well.

2/9/93

312

2048 20

Monitoring Well 4432

Location #9

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10/20/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 1 OF 36

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1625 104801 10-20-92	4 5 7	16	Stiff, (7.5YR, 5/4) Brown, Silty Clay with roots, Non-plastic, Dry	CL	1.0	HNU = 0 ppm Bg = 80-100 cpm
2 3	1630 104802 10-20-92	5 9 [illegible]	16	SAA	CL	1.0	HNU = 0 ppm Bg = 80-100 cpm
4	1635 104803 10-20-92	7 [illegible] 17	[illegible]	Stiff (7.5YR, 4/3) Dark Brown, Silty Clay with trace gravel, Non-plastic, Dry	CL	1.0	HNU = 0 ppm Bg = 40-60 cpm
5 6	1640 104804 10-20-92	14 6 20	17	Very Stiff (10YR, 5/4) Yellowish Brown, Silty Clay with trace gravel, Non-plastic, Dry	CL	3.0	HNU = 0 ppm Bg = 60-80 cpm
7	1700 104805 10-20-92	24 24 33	12	Very stiff (10YR, 6/4) Light Yellowish Brown, Silty Clay with trace gravel, Non-plastic, Dry	CL	3.5	HNU = 0 ppm Bg = 40-60 cpm
8 9	1710 104806 10-20-92	21 23 26	18	Very stiff (10YR, 6/4) Light Yellowish Brown, Silty Clay with trace gravel, Non-plastic Dry	CL	2.5	HNU = 0 ppm Bg = 40-60 cpm
10	1030 104807 10-21-92	6 14 27	15	Very stiff (10YR, 5/8) Yellowish Brown Silty Clay with trace pea size gravel, Non-plastic, slightly moist	CL	2.5	HNU = 1 ppm Bg = 60-80 cpm
11 12	1045 104808 10-21-92	13 26 27	14	Hard (10YR, 5/8) Yellowish Brown Silty Clay with trace gravel, Non-plastic, slightly moist	CL	4.0	HNU = 0 ppm Bg = 60-80 cpm
13	1100 104809 10-21-92	6 10 22	10	Very Stiff (10YR, 5/1) Gray Silty Clay, Non-plastic, slightly moist	CL	3.5	HNU = 0 ppm Bg = 60-80 cpm
14 15	1415 104810 10-21-92	6 14 18	N/A	No Recovery	N/A	N/A	HNU = N/A ppm Bg = cpm

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Failure 42

Driller: Bob Johnson

Bob Test

10/20/92 Background Readings: HNU = 0 ppm, Bg = 40-60 cpm

10/21/92 Background Readings: HNU = 0 ppm, Bg = 40-60 cpm

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME.	
BORING NUMBER: 4432	COORDINATES:	DATE 10/21/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 2 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
16	1430 104810 10-21-92	6 9 14	9	Very Stiff (7.5YR, N5/) Gray Clayey Silt with trace gravel Low Plasticity, Slightly Moist	ML	3.0	HNU = 0 ppm βγ = 20-40 cpm
17	1500 104811 10-21-92	5 10 18	14	Very Stiff (7.5YR, N5/) Gray Clayey Silt, Low Plasticity, Slightly Moist	ML	3.0	HNU = 1 ppm βγ = 40-60 cpm
18	1510 ~~KP 10-21-92~~ ~~104812~~ 10-21-92	10 16 18	N/A	No Recovery	N/A	N/A	HNU = ppm βγ = N/A cpm
20 21	1650 104812 10-21-92	7 15 23	11	Very Stiff (7.5YR, N5/) Gray Clayey Silt with trace gravel, medium Plasticity, Slightly Moist	OH	3.0	HNU = 0 ppm βγ = 40-60 cpm
22	1700 104813 10-21-92	12 15 25	12	Very Stiff (7.5YR, N5/) Gray Clayey Silt with trace gravel medium Plasticity, Slightly Moist	OH	3.0	HNU = 0 ppm βγ = 40-60 cpm
23 24	0830 104814 10-22-92	6 14 33	7	Stiff (7.5YR, N4/) Dark Gray Clayey Silt with trace gravel, low plasticity, moist	~~OH~~ OL	1.5	HNU = 0 ppm βγ = 40-60 cpm
25	0850 ~~KP 10-22-92~~ ~~104815~~ 10-22-92	7 17 36	N/A	No Recovery	N/A	N/A	HNU = ppm βγ = N/A cpm
26 27	0910 104815 10-22-92	8 17 17	14	Stiff (7.5YR, N5/) Gray Clayey Silt with trace gravel, low plasticity, moist	OL	1.5	HNU = 1 ppm βγ = 20-40 cpm
28	0920 ~~KP 10-22-92~~ ~~104815~~ 10-22-92	6 10 43	N/A	No Recovery	N/A	N/A	HNU = ppm βγ = N/A cpm
29 30	1030 104816 10-22-92	4 6 13	10	Stiff (2.5YR, N5/) Gray Silty Sand, low plasticity moist	ML	1.5	HNU = 0 ppm βγ = 20-40 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson

Bob Test

SAA - SAME AS ABOVE
NA - NOT Applicable

10/21/92 Background Readings { HNU = 0 ppm, βγ = 40-60 cpm

10/21/92 Background Readings { HNU = 0 ppm, βγ = 40-60 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10/22/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST: K. Parne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 3 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
31	1040 104817 10/22/92	6 15 13	15	Stiff (2.5YR, N5/) Gray, Silty Sand, low plasticity, moist	ML	1.5	HNU = 0 ppm βγ = 20-40 cpm
32 33	1050 104818 10/22/92	10 25 13	10	Stiff (2.5YR, N5/) Gray, Clayey Silt with trace gravel, low plasticity, moist	CL	1.5	HNU = 0 ppm βγ = 40-60 cpm
34	1305 104819 10/22/92	8 7 14	11	SAA	CL	1.5	HNU = 0 ppm βγ = 40-60 cpm
35 36	1320 104820 10/22/92	9 14 24	17	SAA	CL	1.5	HNU = 0 ppm βγ = 20-40 cpm
37	1330 104821 10/22/92	9 15 18	16	SAA	CL	1.5	HNU = 0 ppm βγ = 60-80 cpm
38 39	1340 104822 10/22/92	7 23 25	14	Very Dense (7.5YR, 5/8) Strong Brown, Sandy Silt, non-plastic, moist	SC	N/A	HNU = 0 ppm βγ = 20-40 cpm
40	1355 104823 10/22/92	21 27 34	12	Very Dense (10YR, 6/8) brownish yellow, Silty Sand, non-plastic, Dry	SM	N/A	HNU = 0 ppm βγ = 20-40 cpm
41 42	1450 104824 10/22/92	10 15 44	9	Very Dense (10YR, 5/6) Yellowish Brown, Silty sand, non-plastic, Dry	SM	N/A	HNU = 0 ppm βγ = 20-40 cpm
43	N/A	N/A	N/A	No Sample Collected	N/A	N/A	N/A
44 45	N/A	N/A	N/A	SAA	N/A	N/A	N/A

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson

Bob Yost

SAA - SAME AS ABOVE
NA - NOT Applicable

10/22/92 Background Readings { HNU = 0, βγ = 40-60 cpm

RI/FS

40

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 10/22/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 4 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (PSI)	REMARKS
46	1510 104825 10-22-92	42 50	9	Very Dense (10YR, 6/3) pale brown Gravely Sand, Non-plastic, Dry	SW	N/A	HNU = 0 ppm Bγ = 20-40 cpm
47							
48							
49							
50							
51	1615 104826 10-22-92	23 50	8	Very Dense (10YR, 7/3) very pale brown Gravely Sand, non-plastic, Dry	SW	N/A	HNU = 0 ppm Bγ = 40-60 cpm
52							
53							
54							
55							
56	0850 104827 10-23-92	17 50	3	Very Dense (10YR, 6/4) Light Yellowish Brown, Gravely Sand, non-plastic, Dry	SW	N/A	HNU = 0 ppm Bγ = 40-60 cpm
57							
58							
59							
60							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

10/22/92 Background Readings: HNU = 0 ppm, Bγ = 40-60 cpm

10/23/92 Background Readings: HNU = 0 ppm, Bγ = 20-40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER 602.04.27	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 4432	COORDINATES:		DATE 10/23/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST K. Payne	Depth	Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool			PAGE 5 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	0930 104828 10-28-92	30 50	6	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-plastic, Dry	GM	N/A	HNU = 0 ppm Bγ = 60-80 cpm
62							
63							
64							
65							
66	1330 104829 10-28-92	29 50	13	Very Dense (10YR, 5/4) Yellowish Brown Gravely Sand, Non-plastic, Slightly moist	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
67							
68							
69							
70							
71	1410 104830 10-28-92	19 40 42	16	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-plastic, Dry	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
72							
73							
74							
75							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT Applicable

10/23/92 Background Readings { HNU = 0 ppm, Bγ = 20-40 cpm

10/28/92 Background Readings { HNU = 0 ppm, Bγ = 60-80 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602 04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10/28/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 6 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (UNIT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	1525 10-4831 10/28/92	30 50	3	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-Plastic, Slightly moist	SW	N/A	HNU = 0 ppm BX = 60-80 cpm
77							
78							
79							
80	1600 10-4832 10/28/92	12 26 50	7	Very Dense (5YR, 5/8) Yellowish Red Gravely Sand, Non-Plastic, Slightly moist	SW	N/A	HNU: 0 ppm BX: 60-80 cpm
81							
82							
83							
84							
85							
86	1100 ~~10-4833~~ 10-30-92	10 50	0/4	No Recovery	NA	N/A	HNU = ~~0~~ KP 10-30-92 ppm BX = ~~60-80~~ KP 10-30-92 cpm
87							
88							
89							
90							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller: Bob Johnson

Bob Yost

SAA - SAME AS ABOVE

NA - NOT Applicable

10/28/92 Background Readings { HNU = 0 ppm, BX = 60-80 cpm

Background Readings { HNU = 0 ppm, BX = 60-80 cpm

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 607.04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10-30-92
ELEVATION:	GWL: Depth 86.1 Date/Time 11-2-92/1425	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: ~~10-30-92~~ 12-3-92
DRILLING METHODS: Cable Tool		PAGE 7 OF 20

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	1345 104833 10-30-92	12 12 12	13	Medium Dense (10YR 4/3) Brown medium Sand with trace Gravel, Non-plastic, wet	SP	N/A	HNU = 0 ppm BY = 80-100 cpm
92							
93							
94							
95							
96	1500 10-30-92	10 12 15	N/A	No Recovery	N/A	N/A	HNU = ppm BY = N/A cpm
97							
98							
99							
100							
101	1550 ~~10-30-92~~ 10-30-92	7 13 18	N/A	No Recovery	N/A	N/A	HNU = ppm BY = N/A cpm
102							
103							
104							
105							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

10-30-92 Background Readings: HNU = 0 ppm; BY = 60-40 cpm

11-2-92 Background Readings: HNU = 0 ppm; BY = 40-60 cpm

KI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 11-3-92
ELEVATION:	GWL: Depth 85.9' Date/Time 11-3-92/0815	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 8 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
106	0925 104936 11-3-92	9 11 38	7	Dense (2.5Y, ~~[illegible]~~ 4/2) Dark Grayish Brown, well graded gravel, trace sand, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 40-60 ppm
107 108 109 110	~~[illegible]~~ ~~[illegible]~~ ~~104937~~						
111	1000 104937 11-3-92	19 23 21	18	Dense (2.5Y, 4/3) Olive Brown, well graded gravel, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 80-100 ppm
112 113 114							
116	1445 104838 11-3-92	16 27 39	7	Very Dense (2.5Y, 5/2) Grayish Brown, well graded gravel, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 60-80 ppm
117 118 119 120							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 412

Driller: Bob Johnson

Mark Rebold

11-3-92 Background Readings { HNU = 0 ppm, βγ = 40-60 cpm

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602 04 27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 11-3-92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 9 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	1520 104839 11-3-92	9 15 23	16	SAA	GW	N/A	HNU = 0 ppm Bγ = 80-100 cpm
122							
123							
124							
125							
126	0940 104841 11-4-92	1 12 18	9	Medium Dense (5Y, 4/2) Olive gray well graded ~~medium~~ gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 20-40 cpm
127							
128							
129							
130							
131	1020 104842 11-4-92	17 21 25	9	Dense (2.5Y, 5/3) Lt. Olive Brown Well graded medium gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
132							
133							
134							
135							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller: Bob Johnson

Mark Rebold

SAA - SAME AS ABOVE
NA - NOT Applicable

11-3-92 Background Readings { HNU = 0 ppm, Bγ = 40-60 cpm

11-4-92 Background Readings { HNU = 0 ppm, Bγ = 20-40 cpm

402-01-66

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602 04 27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 11-4-92
ELEVATION:	GWL: Depth 85.9 Date/Time 11-4-92/1325	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 10 OF 29

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	1445 104843 11-4-92	13 27 28	14	Very Dense (2.5Y, 5/2) Grayish Brown Well graded medium gravel, non-plastic wet	GW	N/A	HNU = 0 ppm Bγ = 40-60 cpm
137							
138							
139							
140							
141	1535 104844 11-4-92	21 21 28	13	SAA	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
142							
143							
144							
145							
146	1500 104846 11-5-92	21 48 50/5	10	Very Dense (5Y, 4/2) Olive Gray, Well graded medium gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
147							
148							
149							
150							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller: Bob Johnson
Jeff
David Holmes

11-4-92 Background Readings { HNU = 0 ppm, Bγ = 50-70 cpm

11-5-92 Background Readings { HNU = 0 ppm, Bγ = 60-80 cpm

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

RI/FS

40

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase 1		
BORING NUMBER: 4432	COORDINATES:		DATE 10/22/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K. Payne	Depth	Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool			PAGE 4 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	1510 104825 10-22-92	42 50	9	Very Dense (10YR, 6/3) pale brown Gravely Sand, Non-plastic, Dry	SW	N/A	HNU = 0 ppm BG = 20-40 cpm
47							
48							
49							
50							
51	1615 104826 10-22-92	23 50	8	Very Dense (10YR, 7/3) very pale brown Gravely Sand, non-plastic, Dry	SW	N/A	HNU = 0 ppm BG = 40-60 cpm
52							
53							
54							
55							
56	0850 104827 10-23-92	17 50	3	Very Dense (10YR, 6/4) Light Yellowish Brown, Gravely Sand, non-plastic, Dry	SW	N/A	HNU = 0 ppm BG = 40-60 cpm
57							
58							
59							
60							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

10/22/92 Background Readings: HNU = 0 ppm, BG = 40-60 cpm

10/23/92 Background Readings: HNU = 0 ppm, BG = 20-40 cpm

KI/PS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602 04 27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 11-3-92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 9 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 FOOT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	1520 104839 11-3-92	9 15 23	16	SAA	GW	N/A	HNU = 0 ppm Bγ = 80-100 cpm
122							
123							
124							
125							
126	0940 104841 11-4-92	1 12 18	9	Medium Dense (5Y, 4/2) Olive gray well graded ~~medium~~ gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 20-40 cpm
127							
128							
129							
130							
131	1020 104842 11-4-92	17 21 25	9	Dense (2.5Y, 5/3) Lt. Olive Brown well graded medium gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
132							
133							
134							
135							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson

Mark Rebold

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

11-3-92 Background Readings { HNU = 0 ppm, Bγ = 40-60 cpm

11-4-92 Background Readings { HNU = 0 ppm, Bγ = 20-40 cpm

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 607.04.27	PROJECT NAME. RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 10-30-92
ELEVATION:	GWL: Depth 86.1 Date/Time 11-2-92/1425	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: ~~10-30-92~~ 12-3-92
DRILLING METHODS: Cable Tool		PAGE 7 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
91	1345 104833 10-30-92	12 12 12	13	Medium Dense (R/R, 4/3) Brown medium Sand with trace Gravel, Non-plastic, wet	SP	N/A	HNU = 0 ppm BY = 80-100 cpm
92							
93							
94							
95							
96	1500 10-30-92	10 12 15	N/A	No Recovery	N/A	N/A	HNU = ppm BY = N/A cpm
97							
98							
99							
100							
101	1550 ~~104837~~ 10-30-92	7 13 18	N/A	No Recovery	N/A	N/A	HNU = ppm BY = N/A cpm
102							
103							
104							
105							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

10-30-92 Background Readings { HNU = 0 ppm, BY = 60-90 cpm

11-2-92 Background Readings { HNU = 0 ppm, BY = 40-60 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602 04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10/28/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 6 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	1525 10-4831 10/28/92	30 50	3	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-Plastic, Slightly moist	SW	N/A	HNU = 0 ppm BY = 60-80 cpm
77							
78							
79							
80	1600 10-4832 10/28/92	12 26 50	7	Very Dense (5YR, 5/8) Yellowish Red Gravely Sand, Non-Plastic, Slightly moist	SW	N/A	HNU: 0 ppm BY: 60-80 cpm
81							
82							
83							
84							
85							
86	1100 ~~10-4833~~ 10-30-92	10 50	N/A	No Recovery	NA	N/A	HNU = ~~0~~ KP 10-30-92 ppm BY = ~~60-80~~ KP 10-30-92 cpm
87							
88							
89							
90							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller: Bob Johnson

Bob Yost

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

10/28/92 Background Readings { HNU = 0 ppm, BY = 60-80 cpm

Background Readings { HNU = 0 ppm, BY = 60-80 cpm

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602 04 37	PROJECT NAME. KCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 11-4-92
ELEVATION:	GWL: Depth 85.9 Date/Time 11-4-92/1325	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 10 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (FT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	1445 104843 11-4-92	13 27 28	14	Very Dense (2.5Y, 5/2) Grayish Brown Well graded medium gravel, non-plastic wet	GW	N/A	HNU = 0 ppm Bγ = 40-60 cpm
137							
138							
139							
140							
141	1535 104844 11-4-92	21 21 28	13	SAA	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
142							
143							
144							
145							
146	1500 104846 11-5-92	21 48 50/5	10	Very Dense (2.5Y, 4/2) Olive Gray, Well graded medium gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm Bγ = 60-80 cpm
147							
148							
149							
150							

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 22

Driller: Bob Johnson
Jeff
David Holmes

11-4-92 Background Readings { HNU = 0 ppm, Bγ = 50-70 cpm

11-5-92 Background Readings { HNU = 0 ppm, Bγ = 60-80 cpm

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

KI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER 602.04.27	PROJECT NAME RCRA Phase 1	
BORING NUMBER: 4432	COORDINATES:	DATE 11-3-92
ELEVATION:	GWL: Depth 85.9 Date/Time 11-3-92/0815	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST: K Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 8 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	0925 1048 36 11-3-92	9 11 38	7	Dense (2.5Y, ~~Dark~~ 4/2) Dark Grayish Brown; well graded gravel, trace sand, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 40-60 ppm
107	~~11-3-92~~ ~~11-3-92~~ ~~1048 37~~						
108							
109							
110							
111	1000 1048 37 11-3-92	9 23 21	18	Dense (2.5Y, 4/3) Olive Brown, well graded gravel, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 80-100 ppm
112							
113							
114							
116	1445 1048 38 11-3-92	16 27 39	7	Very Dense (2.5Y, 5/2) Grayish Brown, well graded gravel, non-plastic, wet	GW	N/A	HNU = 0 cpm βγ = 60-80 ppm
117							
118							
119							
120							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone L12

Driller: Bob Johnson

Mark Rebold

11-3-92 Background Readings: HNU = 0 ppm; βγ = 40-60 cpm

SAA - SAME AS ABOVE

NA - NOT Applicable

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER 601.04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 10/23/92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED: 12/3/92
DRILLING METHODS: Cable Tool		PAGE 5 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	0930 104928 10-28-92	30 50	6	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-plastic, Dry	GM	N/A	HNU = 0 ppm βγ = 60-80 cpm
62							
63							
64							
65							
66	1330 104929 10-28-92	29 50	13	Very Dense (10YR, 5/4) Yellowish Brown Gravely Sand, Non-plastic, Slightly moist	SP	N/A	HNU = 0 ppm βγ = 60-80 cpm
67							
68							
69							
70							
71	1410 104930 10-28-92	19 40 42	16	Very Dense (10YR, 5/3) Brown Gravely Sand, Non-plastic, Dry	SP	N/A	HNU = 0 ppm βγ = 60-80 cpm
72							
73							
74							
75							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Bob Yost

SAA - SAME AS ABOVE
NA - NOT Applicable

10/23/92 Background Readings { HNU = 0 ppm, βγ = 20-40 cpm

10/28/92 Background Readings { HNU = 0 ppm, βγ = 60-80 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 4432	COORDINATES:	DATE 11-5-92
ELEVATION:	GWL: Depth 86.3 Date/Time 11-5-92/1340	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth 86.9 Date/Time 11-6-92/0830	DATE COMPLETED: 12-3-92
DRILLING METHODS: Cable Tool		PAGE 11 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	1580 104847 11-5-92	12 25 21	11	Dense (5Y, 4/2) Olive Gray Coarse Sand with trace gravel, non-plastic, wet	GW	N/A	HNU = 0 ppm; Bγ = 60-80 cpm
152							
153							
154							
155							
156	1546 11-6-92 104848 11-6-92	9 23 44	N/A	No Recovery	N/A	N/A	HNU = N/A ppm; Bγ = N/A cpm
157							
158							
159							
160							
161	1630 KP 11-6-92 104849 104848 11-6-92	30 16 23	17	Very Dense (5Y, 4/2) Olive Gray Poorly Graded medium sand with trace gravel, non-plastic, wet	SP	N/A	HNU = 0 ppm; Bγ = 60-80 cpm
162							
163							
164							
165							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: ~~Bob Johnson~~ KP 11-5-92 Cyclone 42

Driller: Bob Johnson, David Holmes, John Vandine

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

11-5-92 Background Readings: HNU = 0 ppm; Bγ = 60-80 cpm

11-6-92 Background Readings: HNU = 0 ppm; Bγ = 60-80 cpm

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27 PROJECT NAME: RCRA: Phase I

BORING NUMBER: 4432 COORDINATES:

ELEVATION: GW DEPTH: Date/Time

ENGINEER/GEOLOGIST: K. Payne WATER DEPTH: Date/Time

DRILLING METHODS: Cable Tool

DATE: 11-9-92

DATE STARTED: 10-20-92

DATE COMPLETED: 12-3-92

PAGE 12 OF 20

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
166	1000 104849 11-9-92	50/4	4	Very Dense (10YR, 5/3) Brown Poorly graded medium sand with trace gravel, non plastic, wet	SP	N/A	HNU = 0 ppm Bγ = 20-40 cpm
167							
168							
169							
170							
171	1050 104850 11-9-92	20 32 45	17	Very Dense (5Y, 4/2) Olive Gray Coarse Sand poorly graded, non plastic, wet	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
172							
173							
174							
175							
176	1100 11-10-92 ~~11-10-92~~ ~~11-9-92~~	50/1	N/A	No Recovery	N/A	N/A	HNU = N/A Bγ =
177							
178							
179							
180							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson, Lennie McGloklin

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

11-9-92 Background Readings: HNU = 0 ppm, Bγ = 20-40 cpm

11-10-92 Background Readings: HNU = 0 ppm, Bγ = 40-60 cpm

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER. 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4432	COORDINATES:		DATE 11/16/92
ELEVATION:	GRID COORDINATES:	Date/Time	DATE STARTED: 10/20/92
ENGINEER/GEOLOGIST. K. Payne	GEOLOGIST:	Date/Time	DATE COMPLETED: 12-3-92
DRILLING METHODS. Cable Tool			PAGE 13 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
181	1540 104852 11-16-92	15 42 5/3	18	Very Dense (2.5Y, 4/3) Olive Brown Poorly Graded Medium Sand, non plastic, wet	SP	N/A	HNU = 0 ppm Bγ = 40-60 cpm
182							
183							
184							
185							
186	1655 11-16-92 ~~104859~~	28 23 24	N/A	No Recovery	N/A	N/A	HNU = N/A ppm Bγ = N/A cpm
187							
188							
189							
190							
191	0905 11-17-92 ~~104859~~	9 15 15	6	Medium Dense (2.5Y, 4/3) Olive Brown Poorly Graded Medium Sand, non plastic, wet	SP	N/A	HNU = 0 ppm Bγ = 80-100 cpm
192							
193							
194							
195							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cyclone 42

Driller: Bob Johnson
Lonnie McGlocklin
David Holmes

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

11/16/92 Background Readings { HNU = 0 ppm, Bγ = 60 cpm

11/17/92 Background Readings { HNU = 0 ppm, Bγ = 40-60 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER 602.04.27	PROJECT NAME. RCRA Phase	
BORING NUMBER: 4432	COORDINATES:	DATE 11-17-92
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST K. Payne	Depth Date/Time	DATE COMPLETED: 12-3-92
DRILLING METHODS: Cable Tool		PAGE 14 OF 20

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (UNIT)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
196	0945 ~~KP 11-17-92~~ ~~104854~~ 11-17-92	10 11 30	5	Dense (2.5Y, 5/3) Light Olive Brown Silty Sand with trace layer of (2.5Y, N2/) Black organics, non-plastic, wet	SM	N/A	HNU = 0 ppm βγ = 100-120 cpm
197							
198							
199							
200							
201	1440 ~~KP 11-17-92~~ ~~104856~~ 11-17-92	6 12 20	8	Dense (2.5Y, 4/4) Olive Brown Poorly Sorted medium sand non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 80-100 cpm
202				Resume Continuous Sampling for Sieve Analysis			
203							
204	1520 104857 11-17-92	19 27 35	10	Very Dense (2.5Y, 4/4) Olive Brown Poorly Sorted Fine sand non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 60-80 cpm
205	1700 104858 11-17-92	35 38 28	16	Very Dense (2.5Y, 4/2) Dark grayish brown, Poorly Sorted Fine Sand non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 60-80 cpm
206 207	0920 104859 11-18-92	45 43 50/5	18	Very Dense (2.5Y, 4/3) Olive Brown Poorly Sorted Silty Fine Sand non-plastic, wet	~~KP 11-18-92~~ ~~SP~~ SM	N/A	HNU = 0 ppm βγ = 40-60 cpm
208 209	0955 104860 11-18-92	23 33 28	16	Very Dense (2.5Y, 4/4) Olive Brown Poorly sorted Silty Fine Sand non-plastic, wet	SM	N/A	HNU = 0 ppm βγ = 40-60 cpm
210	1025 ~~104861~~ 11-18-92	28 47 50/5	12	Very Dense (5Y, 4/4) olive Poorly Sorted Fine Sand non-plastic, wet	SP	N/A	HNU = 0 ppm βγ = 60-80 cpm

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cyclone 42

Driller: Bob Johnson
David Holmes
Lonnie McGloklin

11-17-92 Background Readings { HNU = 0 ppm, βγ = 40-60 cpm

11-17-92 Background Readings { HNU = 0 ppm, βγ = 20-40 cpm

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase		
BORING NUMBER: 4432	COORDINATES:		DATE 11-18-92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10-20-92
ENGINEER/GEOLOGIST. K. Payne	Depth	Date/Time	DATE COMPLETED: 12-3-92
DRILLING METHODS. Cable Tool			PAGE 15 OF 20

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
211	1040 104862 11-18-92	14 28 38	18	Very Dense (2.5Y, 4/3) Olive Brown Poorly Sorted Medium Sand, non-plastic, wet	SP	N/A	HNU = 0 ppm Bγ = 60-80 cpm
~~212~~ 213	1350 104863 11-18-92	28 50/1	12	(2.5Y, 4/4) Olive Brown Poorly sorted medium sand, Bedrock	SH	N/A	HNU = 0 ppm Bγ = 40-60 cpm
214							
215							
216							
217							
218							
219							
220							
221							
222							
223							
224							

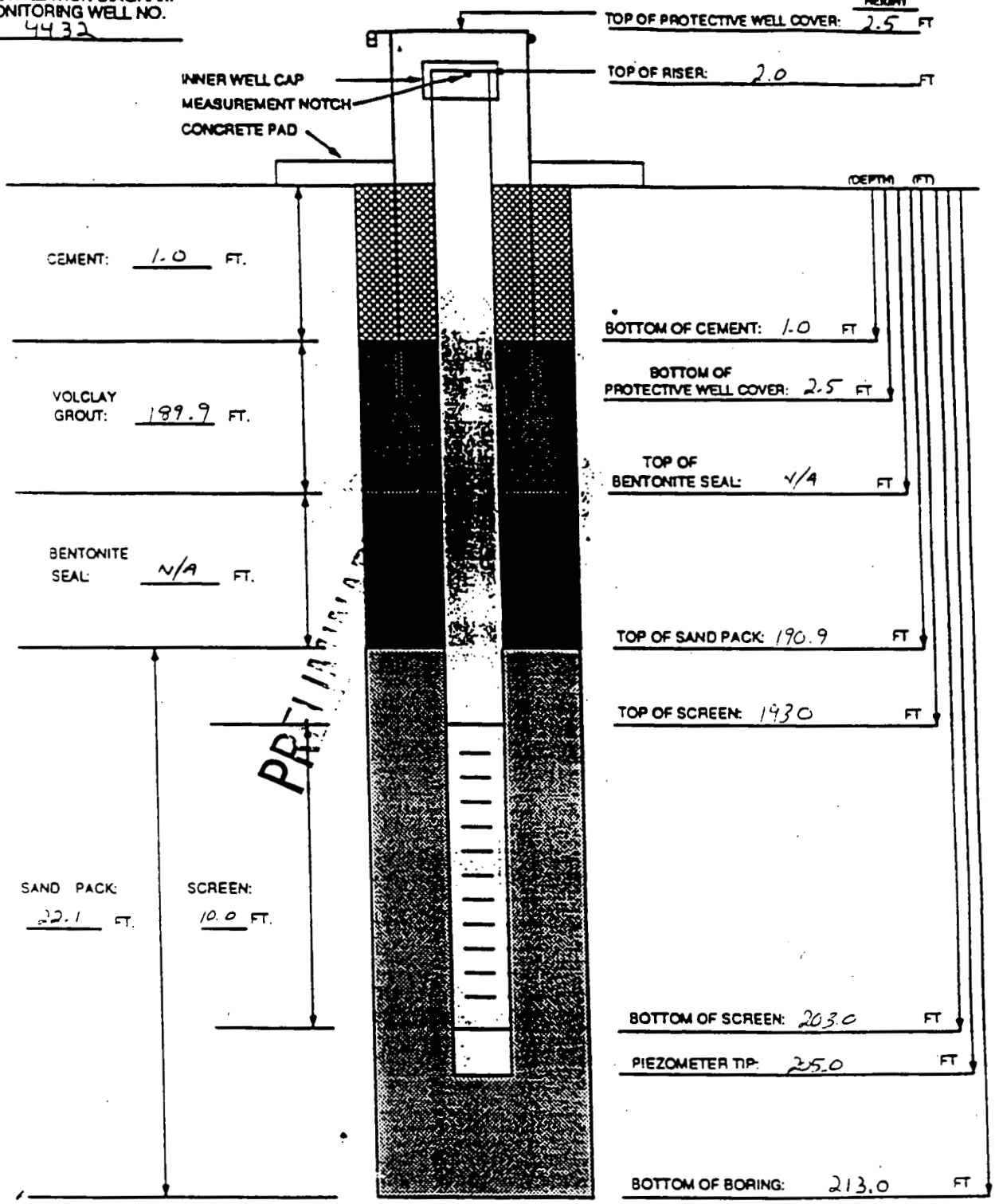
Contractor Pennsylvania Drilling
Equipment Cyclone 42
Bob Johnson
Lonnie McGlocklin

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

11-18-92 Background Readings { HNU = 0 ppm, Bγ = 20-40 cpm

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 4432

INSTALLATION DATE: 12/3/92



BOREHOLE DIAMETER: 10.0 IN.

MATERIALS USED

SAND TYPE AND QUANTITY: 10/20 13 50 lb. bags
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 48 50 lb bags
AMOUNT OF CEMENT: 1/2 bag
AMOUNT OF WATER USED: 2500 gallons
OTHER:
TASK: 602.04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.01 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 86.8 FT/
5) TOP OF CASING IS SECURED WITH STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BE GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: K. Payne

316 Stainl Steel pipe sections: 19 - 10.0 ft; 1 - 10.0 ft. screen with 2.0 ft. sump

ASI FORM 0157 REV. (0)

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

820

PROJECT NAME RCRA Phase 1 FIELD ENG./GEO. Keith Payne DATE 12-3-
PROJECT NO. 602.04.27 CHECKED BY _____ DATE _____
BORING NO. 4432
PIEZOMETER NO. N/A DATE OF INSTALLATION 12-3-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 120.0 FT
FLUID _____ FROM _____ TO _____

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 IN ID FROM 0.0 FT TO 213.0 F
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE ~~Cable Tool~~ Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 ID
PERFORATION TYPE:
SLOTS [X] HOLES [ ] SCREEN [ ]
AVERAGE SIZE OF PERFORATIONS 0.01 IN
TOTAL PERFORATED AREA 10.0 ft.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 IN I.D. 4.0 IN.
LENGTH OF PIPE SECTIONS 19 - 10 FT
JOINING METHOD Screw type - flush joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft.
PROTECTIVE PIPE O.D. 10 3/4 IN.

OTHER PROTECTION Hinged locking cover with pad lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0 FT			
GROUND SURFACE	0.0 FT			
BOTTOM OF PROTECTIVE PIPE	2.5 FT			
BOREHOLE FILL MATERIALS:				
GROUT / SLURRY	TOP 1.0 FT	BOTTOM 190.9 FT	TOP	BOTTOM
BENTONITE	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND	TOP 190.9 FT	BOTTOM 213.0 FT	TOP	BOTTOM
GRAVEL - None Used	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 193.0 FT	BOTTOM 203.0 FT	TOP	BOTTOM
PIEZOMETER TIP	205.0 FT			
BOTTOM OF BOREHOLE	213.0 FT			
GWL AFTER INSTALLATION	86.8 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES [ ] NO [X]
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES [ ] NO [X]
REMARKS Cement placed from 0.0 to 1.0 FT to hold protective cover in p

482U

MW-4432

Customer Number 1040

MATERIAL: _____ SAMPLE NUMBER: 921119-033

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 166.2

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	12.58	7.6	7.6	78.7
20	16.88	10.2	17.8	33.5
40	40.75	24.5	42.3	16.7
60	18.51	11.1	53.4	9.8
100	41.01	24.7	78.1	5.9
200	24.09	14.5	92.6	3.0
Pan	11.50	6.9	99.5	

$$\frac{W_2 \times 100\%}{W_1} = R$$

$$\left|\frac{\text{Original} - \text{Duplicate}}{\text{Average}}\right| \times 100\% = \text{RPD}$$

Analyzed by: John Roberts

Checked by:

Date analyzed: 11-18-92

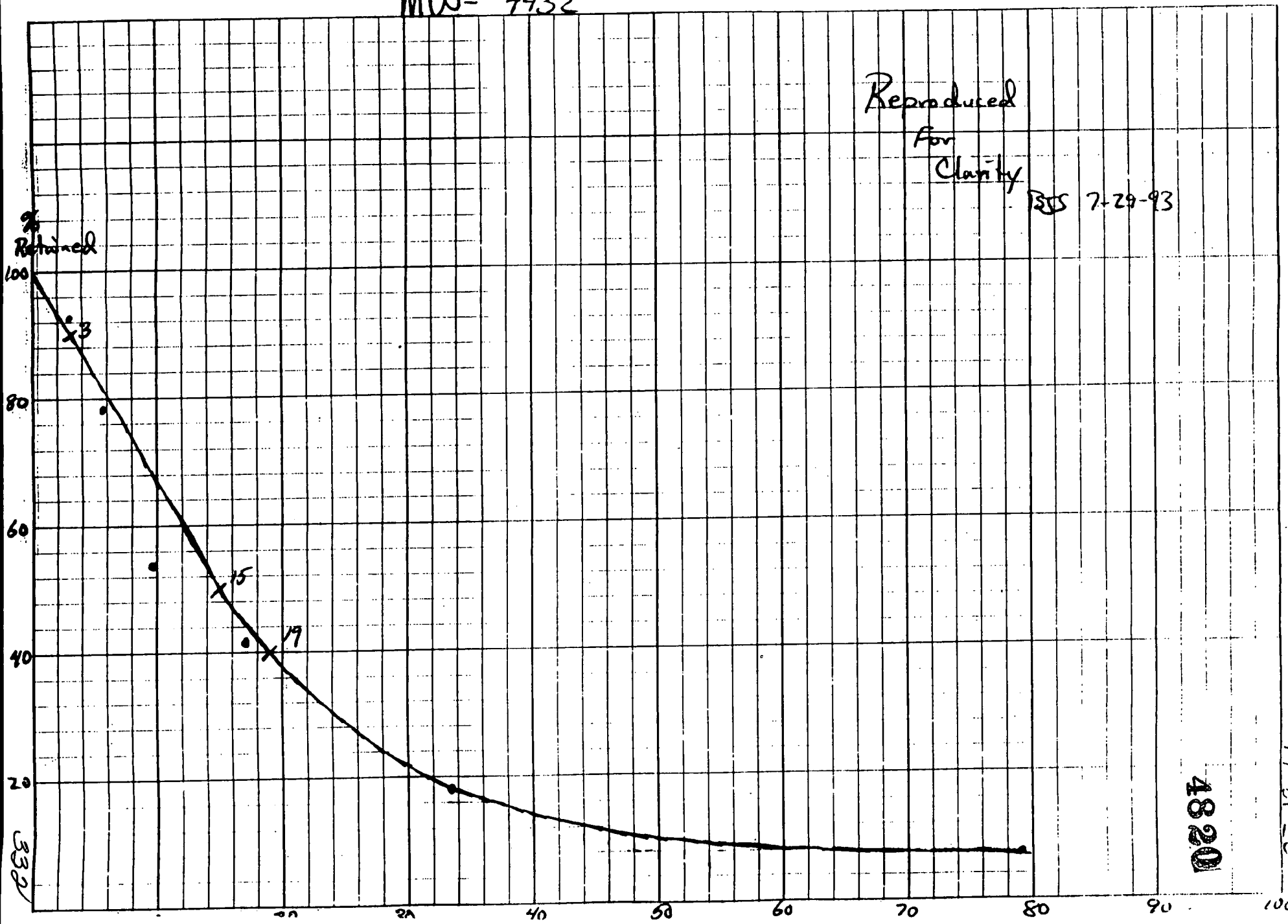
GRAIN SIZE 40% RETAINED 19 .001 inc

50% 15

90% 3

MW- 4432

Reproduced
for
Clarity
BJS 7-29-93



332

4820

$d_{11} = .0432$

Retained Values

90% = .003

50% = .015

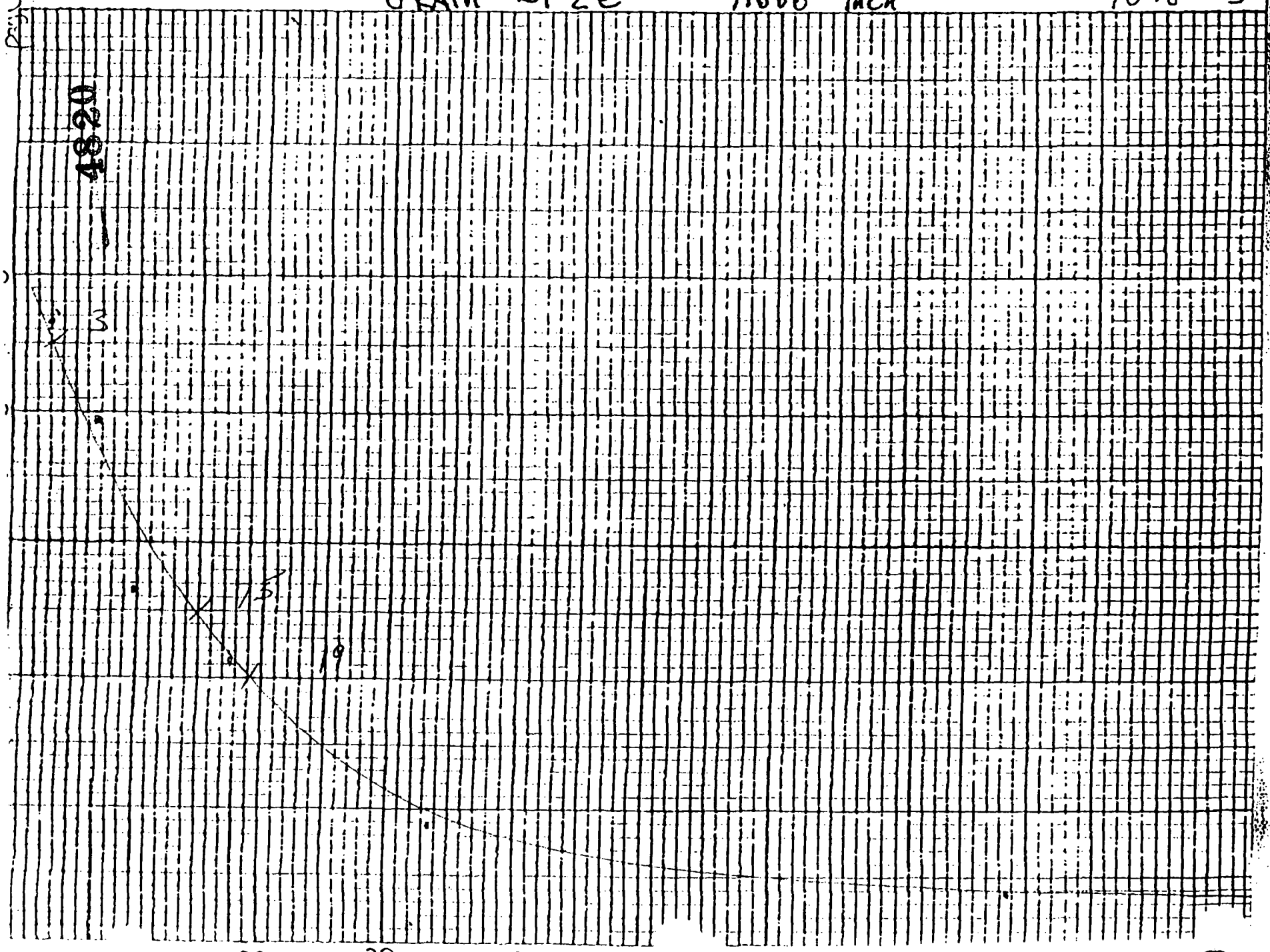
40% = .019

$\frac{40\%}{90\%} = \frac{.019}{.003} = 6.33$ 6.33 > 3 ∴ use factor of 4

(50%) .015 × 4 = .06

Since .06 is closer to the medium (10/20) sand curve than the coarse (4/ and curve; therefore, medium sand was choosen as a result. A 0.01 in. Screen will also be used.

Grain Size 1/1000 inch 104853



4820

Monitoring Well 2733

Location #10

335

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602 3.22	PROJECT NAME: FEMP RI/FS		
BORING NUMBER: 2330 2333	COORDINATES:		DATE 12 11 91
LOCATION:	GWL: Depth	Date/Time	DATE STARTED: 12-11-91
ENGINEER/GEOLOGIST: J WHEAT	Depth	Date/Time	DATE COMPLETED: 01-06-92
DRILLING METHODS: Cable tool			PAGE 1 OF 19

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	100301 10:00 12:11:91	3	6	stiff, yellowish brn (10YR 5/4) silty clay dry moist low plasticity	CL	1.5	Archive
	"	12	6	S/A	CL	1.5	NA
1	"	17	4	S/A	CL	1.5	NA
	100302 11:00 12-11-91	17	6	HARD, (10YR 7/6), yellow, silty clay, dry	CL	>4.5	Archive
2	"	25 36	4	SAA	CL	>4.5	
	"	34 42	0	SAA No Recovery	NA	NA	
3							

NOTES

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602 3.22	PROJECT NAME: ENMF RI/FS FEAP		
BORING NUMBER: 2345 2450 1/8/92	COORDINATES:	DATE 12 11 91	
LOCATION:	GWL: Depth Date/Time	DATE STARTED: 12 11 91	
ENGINEER/GEOLOGIST: J. Wheat	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: Cable tool		PAGE 2 OF 19	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
3	100303 1100 12/11/91	26	6	very dense, (10YR 8/6) yellow, clayey silt, ~~trace~~ sand, gravel, dry	ML	U/A	
	"	36	6	SAA	ML	U/A	
4	"	42	0	No ~~Sa~~ Recovery CH 01/24/92	N/A	NA	
	100304 1100 12/11/91 100319 Analysis	55	6	CH 01/24/92 ~~very dense~~ Hard (10YR 8/3) very pale brn, sandy clay, some sand and gravel, dry	~~CLS~~ CL CH 01/24/92	>4.5	Dist. Geotech
5	"	54	6	SAA	CL	>4.5	
	"	40	6	SAA	CL	>4.5	
6							

NOTES Sample # 100301 Archive 0-18"
Sample # 100302 " " 18-36"
" " 100303 " " 3-4.5
" " 100304 " " 4.5-6 disturbed geotech
6-8

	1st Key in	2nd Key in	Hand Copy Verification
Initial			
Date	1/24/92	1/25/92	

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602 3.12	PROJECT NAME: ENMF RI/FS FEMP		
BORING NUMBER: DESERT 2732-2733	COORDINATES:		DATE 12-11-91
ELEVATION:	GWL: Depth Date/Time		DATE STARTED: 12-11-91
ENGINEER/GEOLOGIST: J. Wright	Depth Date/Time		DATE COMPLETED: 01-06-92
DRILLING METHODS: Cable tool			PAGE 3 OF 19

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
6	100304 11:00 12-11-91	42	6	HARD (10YR 8/6) yellow, silty clay, dry	CL	>4.5	dist. geotect
7	"	50/.2	2	SAA	CL	>4.5	
	✓	NA	0	No Recovery	NA	NA	
8	100304 1630 12-11-91	11 10 ~~6~~ ~~12~~	6	HARD (10YR 8/8) yellow, silty clay with some sand and gravel, moist	CL	>4.5	disturbed geotech
	"	23 ~~2~~ ~~23~~	2	SAA	CL	>4.5	
9	"	32 ~~0~~ ~~32~~	0	No Recovery	NA	NA	

NOTES

Hand Copy Verific. date	2nd Key in	1st Key in	
			Input
			Use

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602 3.22	PROJECT NAME: ENMF RI/FS FEMP		
BORING NUMBER: ~~2730~~ 2735 DAS 1/13/92	COORDINATES:	DATE 12/1/91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12/1/91	
ENGINEER/GEOLOGIST: J. Wheat	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: Cable tool		PAGE 4 OF 19	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	100345 1700 121191	5 ~~6~~ CB 01/20/92	6 ~~5~~	very stiff, 10YR 6/6, brownish yellow, silty cly, with sand and gravel, moist	CL	4.0	archive
	"	12 ~~6~~ CB 01/20/92	6 ~~6~~	SOA	CL	4.0	
10	"	20 ~~1~~ CB 01/20/92	1 ~~20~~	SOA	CL	4.0	
	100346 1700 121191	3 ~~6~~ CB 01/20/92	6 ~~3~~	medium stiff, 10YR 6/6, gray, cly, with some sand & gravel, moist	CL	1.0	Archive
11	"	9 ~~6~~ CB 01/20/92	6 ~~9~~	SOA	CL	1.0	
	"	18 ~~1~~ CB 01/20/92	1 ~~18~~	SOA	CL	1.0	
12							

NOTES

	1st Reviewer	2nd Reviewer	Lead Geologist
Initial			
Date			

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.22	PROJECT NAME: EWMF RI/FS FEMP		
BORING NUMBER: ~~2730~~ 2737	COORDINATES:		DATE 12/12/91 4820
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 12/6/91
ENGINEER/GEOLOGIST: J. Wheat	Depth	Date/Time	DATE COMPLETED: 01-06-92
DRILLING METHODS: Cable tool			PAGE 5 OF 19

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
12	100307 1600 121291	3	6	Very stiff, 10YR 5/1, gray clay, with some sand & gravel moist	CL	3.5	HNU 0 ppm BY 0 cpm
R.A.D. Screen	100309 1600 121291						Geochemical spoon
	100309 1600 121291	7	6	SAA	CL	3.00	
13	100310 1600 121291 RAD SCREEN						
	100311 1600 121291	13	6	SAA	CL	3.5	
	100312 1600 121291 RAD SCREEN						
		21	0	No Recovery	NA	NA	
14	100313 1600 121291	~~20~~ Shelby	~~6~~ 0	Stiff, 10YR 5/1, gray, clay with some sand and gravel, moist	CL	1.25	Shelby Tube pushed from 14.0 to 17.0 ft shelby tube
	100314 1600 121291 RAD SCREEN	~~10~~	~~6~~	SAA	CL	1.5	shelby tube
15							

NOTES

3 RAD screens
3 geochemical tubes

HNU Cal. Initials	2nd Initials	1st Initials	
			Initials
	12/12/91		Date

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602 3.22	PROJECT NAME: ENMF RI/FS FEMP		
BORING NUMBER: 0231-1432 2336-2433	COORDINATES:	DATE 12 12 91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12 11 91	
ENGINEER/GEOLOGIST: J. Wheat	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: Cable tool		PAGE 6 OF 19	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15		5 n e 1		SAA	CL	NA	
		b Y T	30"	SAA	CL	NA	
16		u b e		SAA	CL	NA	
	100315 1600 121291 240 screw	↓		SAA	CL	NA	
17	100316 1600 121291	3	6	Very stiff, 10yr 5/1, gray clay some sand and gravel, moist	CL	2.5	Archive
18		13	4	SAA	CL	2.5	

NOTES:

	1st Rev in	2nd Rev in	Hard Copy Verified
Initial			
Date			

VISUAL CLASSIFICATION OF SOILS

8-20

PROJECT NUMBER: 602 3.22	PROJECT NAME: ENMF RI/FS FEMP		
BORING NUMBER: 2737 BOS	COORDINATES:		DATE 12 12 91
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 12 11 91
ENGINEER/GEOLOGIST: J. Wheat	Depth	Date/Time	DATE COMPLETED: 01-06-92
DRILLING METHODS: Cable tool			PAGE 7 OF 19

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
18	100316 1600 12-11-91	15	4	SBA	CL	2.0	
18.5				Log continues on next page			

NOTES

Hand Cone Penetrometer	2nd Reading	1st Reading	
			Initial
			Final

RI/FS

VISUAL CLASSIFICATION OF SOILS 20

PROJECT NUMBER: 602.3.22	PROJECT NAME: FEMP RI/FS EWMF		
BORING NUMBER: ~~2730~~ 2733	COORDINATES:	DATE: 12-18-91	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST: P. CASSEDAY	Depth / Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 19	

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS (Readings are minus Background)
18.5	12-18 900 100315 PC 12-18 100320	4	6	HARD (2.5Y, N5/) GRAY CLAY WITH INTERMITTENT GRAVEL, SOME SILT. DRY, NOT VERY PLASTIC.	~~7.0~~ CL		HNU = 0 ppm α = 0 cpm BB = 0 cpm
19.0		8	6	SAA	~~7.0~~ CL		HNU = 0 ppm α = 0 cpm BB = 0 cpm
		12	2	SAA	~~7.0~~ CL		HNU = 0 ppm α = 0 cpm BB = 0 cpm
20.0	12-18 PC 1115 100321	↑ SHELBY TUBE PUSHED	30	MEDIUM DENSE (2.5Y, N5/) GRAY CLAY WITH MINOR SILT, VERY PLASTIC, ALMOST FLOWS. WET.	~~7.0~~ CL	2.0	SHELBY TUBE PUSHED 20.0' - 23.0' - NO RECOVERY, PUSHED AGAIN AT NEW SPOT, SAME DEPTH, FULL RECOVERY
	RTD SCREEN (BW) 100322				~~7.0~~ 6.0	~~NA~~ NA	BB = 0 cpm α = 0 cpm HNU = 0 ppm
21.0	RTD SCREEN BOTTOM 100323						
21.5 ~~20.5~~							

NOTES: PENN DRILL
DRILLER - J. BARILE
HELPER - J. STRAPPAZON

NOTE - PAUL CASSEDAY ASSUMED RESPONSIBILITY FOR WELL ~~2730~~ 2733 ON 12-18-91 AT DEPTH OF 18.5 FT AND ASSUMES NO RESPONSIBILITY FOR ANY LOGS NOTES OR SAMPLES FOR THIS WELL PRIOR TO 12/18/91

NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH - C. JOHNSON, D. SOTTA

Paul Casseday

Background Readings:
α = 0 cpm
BB = 20 - 60 cpm
HNU = 0 ppm

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22	PROJECT NAME: Femp RI/FS EWMF		DATE 12-18-91
DRILLING NUMBER: W-~~2730~~ PC 2733	COORDINATES:		DATE STARTED: 12-17-91
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 01-06-92
ENGINEER/GEOLOGIST: P. Cassedy	Depth	Date/Time	PAGE 9 OF 19
DRILLING METHODS: Cable Tools			

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
21.5							
22.0		SHELBY TUBE PUSHED					
22.5				VER: ~~DENSE~~ STIFF (2.5Y, N5/) GRAY CLAY WITH SOME SILT AND SAND, GRAVEL BACKING. SLIGHTLY MOIST, NOT VERY PLASTIC	CL	2.0	
				CH 01/20/92			
23.0	100324 1510 12-18	3	6	SOFT (2.5Y, N5/) GRAY CLAY WITH GRAVEL AND SILT THROUGHOUT, WET AND PLASTIC	CL	0.35	TOOK GEOCHEM SAMPLE 23.0'-25.0' FULL RECOVERY IN EACH SLEEVE.
	100325						
	RSD screened	JM 8/25/92					
23.5	100326 1510 12-18	7	6	SAA	CL	0.25	
	100327 rad screen						
24.0	100328 1510 12-18	9	6	SAA	CL	0.25	
	100329 rad screen						
24.5							

NOTES: PENN DRILL
DRILLER - J BARUE
HELPER - J STRAPPAZON

	1st Review	2nd Review	Third Cert Verification
Initial			
Date			

NR - No Recovery
NA - Not Applicable
SAA - Same As Above

SAMPLE TECH - CHRIS JOHNSON DAVE SPATTA

402-11-86

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER. 602.3.22	PROJECT NAME. FEMP RI/FS EWMF		
BORING NUMBER: W-~~2730~~ 2733	COORDINATES:	DATE 12-18-91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 19	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
24.5	100330 1500 12-18 100331 Polymer	14	6	MEDIUM STIFF, ~~Medium Dense~~ (2.5Y N5/) GRAY CLAY WITH MINOR PEBBLES AND SOME SILT, SLIGHTLY MOIST, SLIGHTLY PLASTIC. (LB 01/30/92)	CL	1.0	DECREASE IN MOISTURE TOP TO BOTTOM MAY BE FROM WATER USED TO DRIVE CASING. HNU=0 ppm α=0 cpm BR=0 cpm
25.0	100332 12-18 1525	5	6	VERY SOFT, ~~MEDIUM DENSE~~ (2.5Y, N5/) GRAY CLAY WITH SOME PEBBLES, MINOR SILT THROUGHOUT WET, FLOWS. (LB 01/30/92)	CL	0.25	HNU=0 ppm α=0 cpm BR=0 cpm VERY WET, EITHER FROM DRILL WATER OR perched water zone
		5	0	NR	NA		
26.0		7	0	NR	NA		
	12-18 1535	5	6	VERY STIFF, ~~MEDIUM DENSE~~ (2.5Y, N5/) GRAY CLAY WITH SOME SILT AND GRAVEL. SLIGHTLY MOIST, MIN. PLASTICITY. (LB 01/30/92)	CL	2.5	HNU=0 ppm α=0 cpm BR=0 cpm
27.0		7	6	SAA	CL	3.0	HNU=0 ppm α=0 cpm BR=0 cpm
27.5							

NOTES: PENN DRILL
DRILLER - J BARILE
HELPER - J. STRAPPAZON

Hand Cone Penetrometer	2nd Reading	1st Reading	
			Initial
			Date

NA - NOT APPLICABLE
N2 - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH - C. JOHNSON, D. SPATTA

402-11-86

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

CT NUMBER. 602.3.22	PROJECT NAME. FEMP RI/FS EWMA		
G NUMBER: W-~~2730~~ PL-1-4 2733	COORDINATES:	DATE 12-18-91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 11 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6in.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
	12-18 1535	15	6	CJ 01/30/92 VERY STIFF, ~~MEDIUM DENSE~~ (2.5Y, N5/) GRAY CLAY WITH SOME GRAVEL SAND AND SILT, SLIGHTLY MOIST MINOR PLASTICITY.	CL	2.5	HNU = 0 ppm α = 0 cpm BR = 0 cpm
23	12-18 1550 1DC333	7	6	CJ 01/30/92 ~~VERY SOFT~~, MEDIUM DENSE (2.5Y, N5/) GRAY CLAYEY SILT WITH SOME GRAVEL VERY WET, FLOWS.	ML ~~CL~~ CJ 01/30/92	NA	HNU = 0 ppm α = 0 cpm BR = 0 cpm PERCHED WATER FILL 2AD INS 1AD SCREEN
		11	0	NR	NA	NA	HNU = NA BR = NA α = NA TAKEN
29.0		14	0	NR	NA	NA	2 FT SPOON TAKEN DISREGARD LINE AT 29.5 HNU = NA BR = NA α = NA
		7	0	CJ 01/30/92 NR	NA	NA	HNU = NA BR = NA α = NA
36.0				SEE TOP OF NEXT PAGE			

NOTES: PENN DRILL
DRILLER - J. BARILE
HELPER - J. STRAPPAZON

	1st Key In	2nd Key In	Data Capture Verification
Initials	[illegible]	[illegible]	
Date	[illegible]	[illegible]	

NA. NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH - C. JOHNSON, D. SPATTA

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

ECT NUMBER. 10323.22	PROJECT NAME. FEMP RI/FS EU'MF		
NG NUMBER: ~~2730~~ PC 109 2733	COORDINATES:	DATE 12-19-91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS:		PAGE 12 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6in	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS βγ = 20 cpm background
30	12-19 920 100334	7	6	MEDIUM DENSE, ~~VERY SOFT~~ (2.5Y, N4/) GRAVEL WITH INTERMIXED SILT AND SAND WET, FLOWING. CB 01/30/92	~~GC~~ GM	~~>2.5~~ NA	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
	100335 0920 12-19	13	6	MEDIUM DENSE, ~~VERY SOFT~~ (2.5Y, N3/) GRAY CLAYEY SILT WITH LARGE GRAVEL CONTENT. CB 01/30/92.	ML ~~GC~~ CB 01/30/92	NA ~~>2.5~~	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
31		19	6	SAA	ML	NA ~~>2.5~~ CB 01/30/92	HNU = 0 ppm βγ = 0 cpm α = 0 cpm
	100336 0920 12-19	15	6	MEDIUM ~~DENSE~~ STIFF, STIFF (2.5Y, N5/) CLAY CLAY WITH SILT. VERY MOIST, PLASTIC	CL ~~ML~~ CB 01/30/92	1.5	HNU = 0 ppm βγ = 0 cpm α = 0 cpm
32	12-19 935 100337	9	6	MEDIUM DENSE, ~~VERY SOFT~~ (2.5Y N4/) GRAY GRAVEL AND CLAY MIX, VERY WET, FLOWS CB 01/30/92	GC	NA ~~>2.5~~ CB 01/30/92	HNU = 0 ppm βγ = 0 cpm α = 0 cpm
33	100338 0935 12-19	11	6	~~MEDIUM DENSE~~, MEDIUM STIFF (2.5Y, N5/) GRAY CLAY WITH MINOR SILT, VERY PLASTIC, MOIST	CL	1.0	HNU = 0 ppm βγ = 0 cpm α = 0 cpm

NOTES: PENN DRILL
DRILLER - J. BARILE
HELPER - J. STRAPPAZON

Hand Grip Penetrometer	1st 15 cm	2nd 15 cm	3rd 15 cm	
				Initial
				Final

NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH - C. JOHNSON, D. SPATTA

402-11-88

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.3.22	PROJECT NAME. FEMP RI/FS EWMF		
BORING NUMBER: W-2750 PC 1-4 2733	COORDINATES:	DATE 12-19-91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 13 OF 19	

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS βγ = 20 cpm (Background)
33	12-19 935 100338	11	6	CH 01/30/92 ~~MEDIUM DENSE~~, MEDIUM STIFF (2.5Y, N5/) GRAY CLAY WITH MINOR SILT, VERY PLASTIC, MOIST.	CL	1.0	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
		14	6	SAA	CL	0.5	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
34	12-19 945	10	0	NR	NA	NA	HNU = NA α = NA βγ = NA
		12	0	NR	NA	NA	HNU = NA α = NA βγ = NA
35	12-19 950 100339	13	0	NR (SAMPLE FLOWED FROM SLEEVE ONTO GROUND)	NA	NA	HNU NA α = NA βγ = NA
	100340 100341	26	6	STIFF, ~~DENSE~~ (CH 01/31/92) (2.5Y, N5/) GRAY CLAY WITH MINOR SILT AND SOME GRAVEL AND SAND, WET	CL	2.0	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
36	100342 100343	22	6	STIFF, ~~DENSE~~ (CH 01/31/92) (2.5Y, N5/) GRAY CLAY INTERMIXED WITH (10YR, 5/4) BROWN CLAY, SOME SILT AND SAND, GRADING TO ~~VERY DENSE~~ (CH 01/31/92) DENSE (10YR, 5/4) YELLOWISH BROWN GRAVELLY SAND, WET.	CL/SM	1.5	HNU = 0 ppm α = 0 cpm βγ = 0 cpm
BASE OF TILL	100344	31	0	NR	NA	NA	HNU = NA α = NA βγ = NA
37							

NOTES:
PENN DRILL
DRILLER: J. BARNE
HELPER: J. STRAPPAZON

BASE OF TILL ENCOUNTERED at 36.5 ft

Total Depth Drilled	Total Depth in Hole	Total Depth in Hole	
			Initial
			Date

NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECHS: C. JOHNSON, D. SPATTA

402-11-86

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.22	PROJECT NAME: FEMP RI/FS EWMF		
BORING NUMBER: W-2730 12 1-4 2733	COORDINATES:	DATE: 12-19-91	
ELEVATION:	GWL: Depth / Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST: P. CASSEDAY	Depth / Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 14 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6 in.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
37				Sample interval will Continue at 5.0 ft intervals in Aquifer			
38							
39							
40	12-19 100345 1030	7 6 11	8	CB 01/24/92 ~~VERY LOOSE~~, MEDIUM DENSE (10YR, 5/4) YELLOWISH BROWN, GRAVELLY SAND, MINOR SILT AND CLAY, WET	SW ~~SM~~ CB 01/24/92	NA ~~70.75~~	HNU = 0 ppm α = 0 cpm β/γ = 0 cpm
41							
42							
43							
44							
45	12-19 1300 100346	28 50/.3	18	CB 01/24/92 ~~VERY LOOSE~~, VERY DENSE (10YR, 5/3) BROWN SAND AND GRAVEL. LITTLE TO NO SILT OR CLAY. WET	SW ~~SM~~ CB 01/24/92	NA ~~70.75~~	HNU = 0 ppm α = 0 cpm β/γ = 0 cpm
46							
47							
48							
49							
50	12-19 1341 100347	32 42 44	18	CB 01/30/92 ~~VERY LOOSE~~, VERY DENSE (10YR, 4/3) DARK BROWN INTERMIX OF SAND AND GRAVEL. NO GROUNDWATER PRESENT, FAIRLY SORTED DRY	SW GW	NA	HNU = 0 ppm α = 0 cpm β/γ = 0 cpm
51							
52							

NOTES: PENN DRILL
DRILLER: J. BARILE
HELPER: J. STRAPPAZON

SAMPLE TECHS: C. JOHNSON, D. SPATTA

NA - NOT APPLICABLE
SAA - SAME AS ABOVE
NR - NO RECOVERY

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.3.22	PROJECT NAME. FEMP RI/FS EWMF		
DRILLING NUMBER: ~~2730~~ PC 1-4 2733	COORDINATES:		DATE 12-19-91
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 12-11-91
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth	Date/Time	DATE COMPLETED: 01-06-92
DRILLING METHODS: CABLE TOOL			PAGE 15 OF 19

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS BG = 20 ppm (background)
~~52~~							
53							
54							
55	12-19 1605 100349	19 38 50/.3	9	CJ 01-30-92 ~~LOOSE~~, VERY DENSE (10YR 4/3) DARK BROWN SAND WITH GRAVEL (SOME VERY COARSE) POORLY SORTED, ~~POORLY GRADED~~. VERY DRY CJ 2/5/92	SW ~~SP~~	NA ~~LOOSE~~ CJ 1/30/92	HNU = 0 ppm α = 0 cpm BG = 0 cpm
56							
57							
58							
59							
60	12-19 1659 100350	6 15 19	18	PC12-A ~~LOOSE, VERY~~ DENSE (10YR, 5/3) BROWN SAND AND GRAVEL (SOME COARSE) POORLY SORTED, ~~POORLY GRADED~~, SLIGHTLY MOIST CJ 2/5/92	SW ~~SP~~	NA ~~LOOSE~~ CJ 01/30/92	HNU = 0 ppm α = 0 cpm BG = 0 cpm
61							
62							
63							
64							
65	12-20 1010 100351	18 50/.4	10	CJ 01/30/92 ~~LOOSE~~, VERY DENSE (10YR, 5/3) BROWN SAND CONTAINING COARSE GRAVEL, POORLY SORTED ~~POORLY GRADED~~, DRY. CJ 2/5/92	SW ~~SP~~	NA ~~LOOSE~~ CJ 1-30-92	HNU = 0 ppm α = NA BG = 0 cpm
66							
67							

NOTES:
PENN DRILL
J. BARILE - DRILLER
J. STRAPPAZON - HELPER

	1st Rev in	2nd Rev in	Final Cog Verification
Initial			
Date			

NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH. - CHRIS JOHNSON

402-11-86

DATE 3/10/92

350

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

ECT NUMBER. 602.3.22	PROJECT NAME. FEMP RI/FS EWMF		DATE: 12-20-91
NG NUMBER: ~~2730~~ PC 1-4 2733	COORDINATES:		DATE STARTED: 12-11-91
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 01-06-92
ENGINEER/GEOLOGIST. P. CASSEDAY	Depth	Date/Time	PAGE 16 OF 19
DRILLING METHODS: CABLE TOOL			

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN.	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
67							
68							
69							
70	12-20 1045 100352	19 19 50/.4	12	CH 01/30/92 ~~LOOSE~~, VERY DENSE (10 YR, 5/3) BROWN SAND WITH LENSES OF COARSE GRAVEL. LITTLE TO NO SILT OR CLAY. SLIGHTLY MOIST	SP	NA ~~<0.25~~ CH 01/30/92	HNU = 0 ppm α = NA β/γ = 0 cpm
71							
72							
73							
74							
75	12-20 1355 100353	20 50/.2	8	CH 01/30/92 ~~LOOSE~~, VERY DENSE (10 YR, 4/3) VERY DARK BROWN SAND, POORLY SORTED. CONTAINS VARIOUS SIZED PEBBLES THROUGHOUT. LITTLE SILT OR CLAY SLIGHTLY MOIST	SW ~~SP~~	NA ~~<0.25~~ CH 01/30/92	HNU = 0 ppm α = NA. β/γ = 0 cpm
76							
77							
78							
79							water table of PENETRATED AQUIFER
80	12-20 1425 100354	11 19 38	13	CH 01/30/92 ~~LOOSE~~ Very DENSE (10 YR, 5/3) BROWN COARSE SAND AND GRAVEL. POORLY GRADED. LITTLE TO NO SILT OR CLAY. WET	SP	NA ~~<0.25~~ CH 1-30-92	HNU = 0 ppm α = NA β/γ = 0 cpm
81							
82							

NOTES: PENN DRILL
J. BARLE - DRILLER
J. STRAPPAZON - HELPER

	1st Key In	2nd Key In	Hand Copy Verification
Initial			
Date			

NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

SAMPLE TECH. - CHRIS JOHNSON

402-11-86

2/10/92

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 6023.22	PROJECT NAME. FEMP RI/FS EWMF		
BORING NUMBER: ~~2730~~ RE 1-4 2733	COORDINATES:	DATE 12-20-91 / 12-21-91	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 12-11-91	
ENGINEER/GEOLOGIST. P. CASSIDAY	Depth Date/Time	DATE COMPLETED: 01-06-92	
DRILLING METHODS: CABLE TOOL		PAGE 17 OF 19	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
~~82~~							
83							
84							
85	12-20 1630 100355	50/.4	4	CH 01/30/92 ~~LOOSE~~, VERY DENSE (10YR, 5/3) BROWN GRAVEL WITH SOME SAND AND SILT. LITTLE TO NO CLAY. COARSE, POORLY SORTED. ~~GRAVEL~~ ANGULAR. WET	GW ~~GP~~ CH 01/30/92	NA	HNu = 0 ppm α = NA βγ = 0 cpm
86							
87							
88							
89							
90	12-21 1255 100356	21 50/.3	9	CH 01/30/92 ~~LOOSE~~, VERY DENSE (10YR, 5/3) GRAYISH BROWN GRAVEL WITH SAND. MINOR SILT LITTLE TO NO CLAY. POORLY SORTED ~~AND GRADED~~. WET CH 01/30/92	GW ~~GP~~ CH 01/30/92		HNu = 0 ppm α = NA βγ = 0 cpm
91							
92							
93							
94				TOTAL DEPTH = 94.0 FT.			
95							
96							
97							

NOTES: PENNSYLVANIA DRILLING
DRILLER - J. BARILE
HELPER - J. STRAPPAZON
SAMPLE TECHS - C. JOHNSON, D. SPATA

	1st Sample	2nd Sample	Final Completion
Initials			
Date			

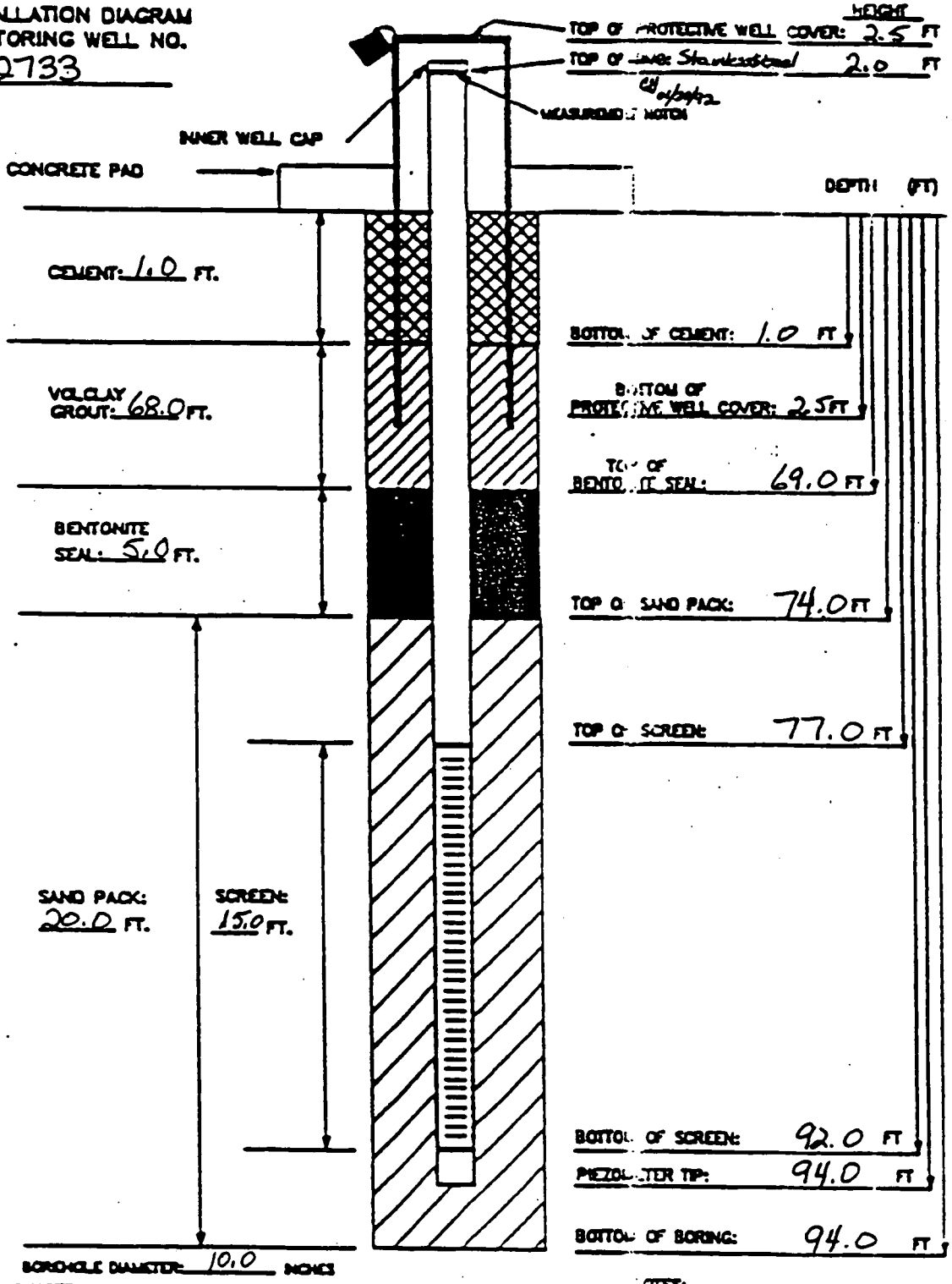
NA - NOT APPLICABLE
NR - NO RECOVERY
SAA - SAME AS ABOVE

402-11-86

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.
2733

INSTALLATION DATE: ~~[illegible]~~ 1-6-92



MATERIALS USED:
SAND TYPE AND QUANTITY: 17 sks of 10/20 sand
BENTONITE PELLETS (5-GALLON BUCKETS): 5
BAGS OF VOLCLAY GROUT: 14 sks
AMOUNT OF CEMENT: NA
AMOUNT OF WATER USED: 500 gal.
OTHER:

NOTES:
1) RISER PIPE IS ~~2-INCH SCHEDULE 40~~ 4 in 316 Stainless Steel PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS ~~2-INCH SCHEDULE 40~~ 4 in 316 Stainless Steel PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SLAP.
4) WATER DEPTH/DATE: 88.06 Below Surface

TASK: 602.03.22 FEMP RI/FS EWMF GEOLOGIST/ENGINEER: R. P. GASSEDAY

REVIEWED BY [illegible] DATE 5/10/92

FERNALD
RI/FS

4820

PIEZOMETER INSTALLATION SHEET

OJECT NAME FEMP RI/FS EWMF
ROJECT NO. 602.3.22
BORING NO. 2733
PIEZOMETER NO. 2733

FIELD ENG./GEO. R.P. Cassady DATE 1-6-92
CHECKED BY [illegible] DATE 3/4/92
DATE OF INSTALLATION 1-6-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 TO 94.0
FLUID — FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 ft TO 94.0 ft
SIZE — FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 15.0 ft

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 5-10 ft
JOINING METHOD Screwtype - Flushjoint Threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinge Locking Cap with Padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS: Volclay GROUT / ~~SLURRY~~ CEMENT PC 1-6	TOP 0.0 / 1.0	BOTTOM 1.0 / 69.0	TOP	BOTTOM
BENTONITE PELLETS	TOP 69.0	BOTTOM 74.0	TOP	BOTTOM
SAND - 10/20	TOP 74.0	BOTTOM 94.0	TOP	BOTTOM
GRAVEL - None used	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP ~~78.0~~ 77.0 PC 1-6	BOTTOM 92.0	TOP	BOTTOM
PIEZOMETER TIP	94.0			
BOTTOM OF BOREHOLE	94.0			
GWL AFTER INSTALLATION	85.06 BGL			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

RKS

408-11-86

4820

Monitoring Well 3733

Location #10

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER. 602.0427	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 3733	COORDINATES:	DATE 10/2/92	
ELEVATION: MK	GWL: Depth 86.5 Date/Time 10/28/92	DATE STARTED: 10/2/92	
ENGINEER/GEOLOGIST. B. Yeardley	Depth Date/Time	DATE COMPLETED: ~~10/5/92~~ 10/2	
DRILLING METHODS: Cable Tool		PAGE 1	OF ~~14~~ 13

CB 11/4/93

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1545 104601 10/2/92	9 10 7	5	Soft 7.5 YR (5/3) Brown, silty clay, low plasticity, dry	OL	.25	HNU = 0 ppm αβ = 60 cpm
2 3	1530 104602 10/2/92	9 8 9	10	Firm 10 YR (6/6) brownish yellow silty clay, low plasticity, moist	CL	1.5	HNU = 0 ppm αβ = 60 cpm
4	1555 104603 10/2/92	4 5 8	12	Soft 10 YR (6/8) brownish yellow silty clay low plasticity, moist to silty clay, med plasticity, moist	CL	.5 to 4.0	HNU = 0 ppm αβ = 60 cpm
5 6	1600 104604 10/2/92	10 11 13	18	V. hard 10 YR (5/6) yellow brown silty clay w/ gravel, med. plasticity, moist	CL	4.5	HNU = 0 ppm αβ = 60 cpm
7	1630 104605 10/2/92	6 9 15	15	Hard 10 YR (5/4) yellowish brown, silty clay w/ gravel, med plasticity moist	CL	2.5	HNU = 0 ppm αβ = 60 cpm
8	1635 10/2/92	12 9 7	0	No Recovery	NA	NA	NA
9 10	1650 104606 10/2/92	9 21 17	17	Hard 10 YR (5/4) yellowish brown w/ gray 2.5Y (5/1) streaks silty clay w/ fine - crse gravel, med plasticity, moist	CL	3.25	HNU = 0 ppm αβ = 60 cpm
11 12	1700 104607 10/2/92	9 18 28	18	Hard 5 YR (3/3) DK brown and 5 YR (5/1) Gray silty clay w/ fine to crse gravel, med. plasticity, moist BJY 10/14/92	CL	3.75	HNU = 0 ppm αβ = 60 cpm
13	1100 104609 10/5/92	7 35 33	14	Hard 2.5Y (5/1) Gray silty clay w/ gravel, med. plasticity, moist BY 11/4/92	CL	2.75	HNU = 0 ppm αβ = 60 cpm
14 15	1110 104610 10/5/92	7 21 28	16	Hard, 2.5Y (5/1) Gray silty, gravelly clay, med. plasticity, moist	CL	2.5	HNU = 0 ppm αβ = 60 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter, David Holmes

SAA = Same as above

NA = Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

402-11-88

CB 11/4/93

356

FMPC 04 015

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.0427	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3733	COORDINATES:		DATE 10/5/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/2/92
ENGINEER/GEOLOGIST: B Yeardley	Depth	Date/Time	DATE COMPLETED: ~~10/5/92~~
DRILLING METHODS: Cable Tool			PAGE 2 OF ~~4~~ 13

CB 2/4/93

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16 – 16.5	1120 10/5/92	12 19 23	NA	No Recovery By 11/4/92	NA	NA	HNU = ~~0 ppm~~ NA αβ = ~~60 cpm~~ NA By 11/4/92
17 – 18	1130 104611 10/5/92	33 22 47	17	Very Dense 2.5YR(5/1) Gray silty sand, wet By 11/4/92	SM	NA	HNU – 0ppm αβ – 60 cpm
19	1310 104612 10/5/92	12 17 23	14	Hard 2.5YR(5/1) Gray, silty clay w/ gravel, med. plasticity, moist By 11/4/92	CL	2.0	HNU 0 ppm αβ - 60 cpm
20 – 21	1320 104613 10/5/92	6 22 36	9	Hard 2.5YR(5/1) Gray, silty gravelly clay, med. plasticity, moist	CL	3.0	HNU: 0 ppm αβ: 60 cpm
22	1335 104614 10/5/92	12 19 33	15	V. Dense 2.5YR(5/1) Gray, clayey silt, low plasticity, moist w/ gravel Hard 2.5YR(5/1) Gray, silty clay w/ gravel, med plasticity, moist	ML CL	NA 2.5	HNU: 0 ppm αβ: 60 cpm
23 – 24	1445 104615 10/5/92	8 12 14	12	SAA	ML CL	NA 2.5	HNU: 0ppm αβ: 60cpm
25	1500 10/5/92	6 15 19	0	No Recovery By 11/4/92	NA	NA	HNU: αβ: NA
26 – 27	1515 104616 10/5/92	2 5 9	13	Firm 2.5YR(5/1) Gray, silty, gravelly clay, med plasticity, moist By 11/4/92	CL	1.75	HNU: 0ppm αβ: 60cpm
28	1530 104617 10/5/92	12 10 17	17	Firm 2.5YR(5/1) Gray, silty gravelly clay, med plasticity, moist	CL	1.25	HNU: 0ppm αβ: 60 cpm
29 – 30	1540 10/5/92	5 11 14	0	No recovery	NA	NA	HNU: NA αβ: NA

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

CB 2/4/93

-02-11-66

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER. 602.0427	PROJECT NAME. RCRA Phase I		
BORING NUMBER: 3733	COORDINATES:	DATE 10/5/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/3/92	
ENGINEER/GEOLOGIST. B. Yeardley	Depth Date/Time	DATE COMPLETED: 10/6/92	
DRILLING METHODS: Cable Tool		PAGE 3 OF ~~14~~ 13	

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	1550 104018 10/5/92	4 7 17	12	Firm 2.5Y(5/1) Gray, silty, gravelly clay, med plasticity, moist	CL	1.25	HNU 0ppm αβ 60 cpm
32 33	1655 104619 10/5/92	1 15 17	18	SAA	CL	1.75	HNU 0ppm αβ 60 cpm
34	1710 104620 10/5/92	4 9 17	18	SAA	CL	1.5	HNU 0ppm αβ 60ppm
35 36	1955 104621	4 7 7	8	SAA 2.5Y(5/1) Gray gravelly clay, low plasticity, moist	CL	1.5	HNU = 0ppm BS = 110 cpm
37	1010 10/6/92	5 14 18	0	No Recovery	NA	NA	
38 39	1025 104622 10/6/92	50/5	10	V. Stiff. 10YR5/6 Yellowish Brown gravelly clay. Bottom inch coarse-med grained sand, moist	CL	2.0	HNU = 0ppm BS = 40 cpm
40	1050 104623 10/6/92	2 32 50/5	18	V. Dense 2.5Y(5/4) Light olive brown coarse sand with gravel, dry	SW	NA	HNU = 0ppm BS = 40 cpm
41				Begin 5ft. sampling			
42							
43							
44							
45							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 34 Cyclone

Driller: Chris Coulter

David Holmes

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 3733	COORDINATES		DATE 10/6/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 10/2/92
ENGINEER/GEOLOGIST B. Yeardley	Depth	Date/Time	DATE COMPLETED: 10/27/92
DRILLING METHODS: Cable Tool			PAGE 4 OF ~~4~~ 13

CB 3/4/93

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46.5	1440 104624 10/6/92	50/5	4	V. Dense Light olive brown 2.5Y (5/4) crse. sand & gravel, well ~~sorted~~ graded, dry. Bg 11/4/92	SW	NA	HNU = 0 ppm αβ = 60 cpm
50							
51.5	1500 104625 10/6/92	35 24 35	15	SAA	SW	NA	HNU = 0 ppm αβ = 80 cpm
55							
56.5	1620 10/6/92	50/5	0	No Recovery	NA	NA	NA

NOTES

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 38 Cyclone

Driller Chris Coulter

David Holmes

SAA - Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration

Colors identified using Munsell Color Char

CB 3/4/93

VISUAL CLASSIFICATION OF SOILS

482U

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: ~~4424~~ 3733	COORDINATES:		DATE 10/6/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/2/92
ENGINEER/GEOLOGIST: D. O'Brien	Depth	Date/Time	DATE COMPLETED: 10/7/92
DRILLING METHODS: Cable Tool			PAGE 3 OF 13

CB 2/4/93

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61.5	RS 104626 01/6/92	50/5	3	V. Dense 2.5Y (5/4) Light olive brown coarse sand & gravel well ~~graded~~ silty graded CB 1/4/93	SW	NA	HNU = 0 ppm RS = 10 ppm
65							
66.5	1345 104627 10/7/92	50/5	5	V. Dense 2.5Y (5/4) light olive brown med sand, poorly graded, dry. Bottom 2 in ~~poorly~~ well graded, gravel	SP	NA	HNU = 0 ppm αβ = 60 ppm
70							
71.5	1405 104628 10/7/92	24 36 35	12	V Dense 2.5Y (6/4) light yellowish brown, coarse gravelly sand, well graded, dry	SW	NA	HNU = 0 ppm αβ = 60 ppm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: BY 11/1/92 38 ~~42~~ Cyclone

Driller: Craig Coulter, Kevin Myers, Chris Coulter, ~~David Holmes~~

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

CB 2/4/93

360

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3733	COORDINATES:	DATE 10/7/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/2/92	
ENGINEER/GEOLOGIST B. Yeardley	Depth Date/Time	DATE COMPLETED: 10/8/92	
DRILLING METHODS: Cable Tool		PAGE 6 OF ~~X~~ 13	

CB 2/4/93

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76.5	1530 104029 10/7/92	23 27 24	5	V. Dense 2.5Y (5/4) light olive brown coarse sand and gravel, well graded, moist BJY 10/7/92	SW	NA	HNU = 0 ppm αβ = 60 cpm
90							
84.5	1600 104630 10/9/92	50/5	5	SAA	SW	NA	HNU = 0 ppm αβ = 60 cpm
95							
95.5	0915 104631 10/9/92	50/5	5	V. Dense 10YR (5/6) yellowish brown, gravel w/ sand and clay, well graded, moist	GW	NA	HN = 0 ppm αβ = 60 cpm

NOTES.

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: BJY 10/1/92 ~~42~~ 38 Cyclone

Driller: Chris ~~Craig~~ Coulter

~~Kevin Myers~~ 10/8/92

David Holmes BJY

SAA - Same as Above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

CB 2/4/93

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 3733	COORDINATES	DATE 10/9/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED 10/2/92	
ENGINEER/GEOLOGIST B. Yeardley	Depth Date/Time	DATE COMPLETED: 10/27/92	
DRILLING METHODS Cable Tool		PAGE 7 OF ~~11~~ 13	

03/24/93

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90	1000	20		Med. Dense 2.5 Y (5/4) lt. olive brown			HNU = 0ppm
	104682	15	9	fine to medium sand w/ gravel, well	SW	NA	αβ ~ 60cpm
91.5	10/9/92	13		graded, wet			
							Water table found at 87', hydro punch dry to 93.5. Sample #1046
95	1420	26		lt. olive brown Med. Dense 2.5 Y (5/4) medium to crse.			HNU: 0 ppm
	104684	15	8	gravelly sand, well graded, wet	SW	NA	αβ = 60cpm
96.5	10/9/92	5					
100	1525	24		Dense 2.5Y (5/4) lt. olive brown, fine			HNU = 0ppm
	104685	21	12	to coarse gravelly sand, well graded,	SW	NA	αβ = 60cpm
101.5	10/9/92	29		wet			

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 38 Cyclone
Driller Chris Carter
David Holmes

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetratio
Colors identified using Munsell Color Cha

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 3733	COORDINATES		DATE 10/9/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 10/8/92
ENGINEER/GEOLOGIST B. Yeardley	Depth	Date/Time	DATE COMPLETED 10/13/92
DRILLING METHODS Cable Tool			PAGE 8 OF ~~11~~ 13

CB 3/4/93

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105	1630 104636 10/9/92	17 24 35	14	V. Dense 2.5Y(5/4) lt. olive brown, med to coarse gravelly sand, well graded, wet	SW	NA	HNU = 0 ppm αβ = 60 cpm
106.5							
110	0955 104637 10/10/92	26 27 21	12	Dense 2.5Y(5/3) lt. olive brown, gravel w/ crse sand, well graded, wet	GW	NA	HNU = 0 ppm αβ = 60 cpm
111.5							
115	1100 104638 10/13/92	17 19 21	18	Dense 2.5Y(5/3) lt. olive brown, fine to course sandy gravel, well graded, wet	GW	NA	HNU = 0 ppm αβ = 60 cpm
116.5							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 38 Cyclone
Driller Chris Coulter
David Holmes

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell Color Char

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 3733	COORDINATES		DATE 10/13/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED 10/13/92
ENGINEER/GEOLOGIST B Yeardley	Depth	Date/Time	DATE COMPLETED 10/14/92
DRILLING METHODS Cable Tool			PAGE 9 OF 13

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	1345 104634 10/13/92	45 30 25	4	V. Dense 2.5 (5/3) fine to coarse sandy gravel, well graded, wet	GW	NA	HNU = 0 ppm ∝β = 60 cpm
125							
	1430 ~~104641~~ 10/14/92	B3M w/14 82	0	No Recovery	NA	NA	NA
130	1515 104641 10/14/92	17 21 21	14	Dense 2.5Y (5/3) lt olive brown med sand w/ fine to coarse gravel, well graded, wet	SW	NA	HNU = 0 ppm ∝β = 60 cpm
135							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 38 Cyclone
Driller Chris Coulter
David Holmes

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell Color Char

364

FERNALD
RI/FS

3820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER 602 04 27	PROJECT NAME RCRA Phase I		
BORING NUMBER 3733	COORDINATES:		DATE 10/15/92
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 10/15/92
ENGINEER/GEOLOGIST B. Yeardley	Depth	Date/Time	DATE COMPLETED: 10/16/92
DRILLING METHODS Cable Tool			PAGE 10 OF 13

CB 2/4/93

DEPTH (ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135.0	104642 0945 10/15/92	37 50/5	6	V. Dense 2.5Y (5/4) lite olive brown med - crse gravelly sand, well graded, wet	SW	NA	HNU = 0 ppm αβ = 600 cpm
136.5							
140	104643 1015 10/15/92	15 21 15	13	Dense 2.5Y (5/4) lite olive brown med. gravelly sand, poorly graded, wet	SP	NA	HNU = 0 ppm αβ = 600 cpm
145							
145	1300 10/16/92	100/4	0	No Recovery	NA	NA	NA
146.5							

NOTES

Drilling Contractor Pennsylvania Drilling
Drilling Equipment 38 cyclone
Driller Chris Coulter
David Holmes

SAA - Same as above
NA - Not Applicable

Samples collected per ASTM standard penetration
Colors identified using Munsell Color Cha

9/93
CB

VISUAL CLASSIFICATION OF SOILS

A000

PROJECT NUMBER: 602.0427	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 3733	COORDINATES:	DATE 10/16/92	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 10/16/92	
ENGINEER/GEOLOGIST: B. Yeardley	Depth Date/Time	DATE COMPLETED: 10/19/92	
DRILLING METHODS: Cable Tool		PAGE 11 OF 13	

CB 2/9/93

DEPTH (Ft.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
150.0	1345	16		Dense 2.5Y(5/4) light olive brown			
151	104644 10/16/92	16 6	12	med. gravelly sand, well graded, wet	SW	NA	HNU=0 ppm ∝β=60cpm
152	1020 104646 10/19/92	50/6	5	V. Dense 2.5Y(5/4) light olive brown SAA	SW	NA	HNU=0 ppm ∝β=40 cpm
153	1045	17		Dense 2.5Y(5/4) light olive brown			
154	10/19/92	15 5	3	med grained sand w/ crse gravel well graded, wet	SW	NA	HNU=0ppm ∝β=40cpm Sample used for Sieve Ana
155	1115 104647 10/19/92	21 32 50/5	18	V. Dense 2.5Y(5/4) light olive brown med grained gravelly sand, well graded, wet	SW	NA	HNU=0ppm ∝β=40cpm
156	1340 104648 10/19/92	21 34 26	8	V. Dense 2.5Y(5/4) lt. olive brown, med. gr. sand w/ coarse gravel, well graded, wet	SW	NA	HNU=0ppm ∝β=40cpm
158	1405 104649 10/19/92	30 39 48	10	V. Dense 2.5Y(5/4) lt. olive brown, med. gravelly sand, ~~SAA~~, well graded, wet By 11/4/92	SW	NA	HNU=0ppm ∝β=40cpm
159	1515 104650 10/19/92	50/4	5	V. Dense 2.5Y(5/4) SAA	SW	NA	HNU=0ppm ∝β=40cpm
160							
161				(Drilled to 162.0)			
162							
163							
164							
165							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 38 cyclone

Driller: Chris Coulter

Dave Holmes

* Sieve Analysis sample @ 104651 from 150.0-160.0 ft.

SAA = Same as above

NA - Not Applicable

Samples collected per ASTM standard penetration test

Colors identified using Munsell Color Chart

402-11-46

Date 2/4/92

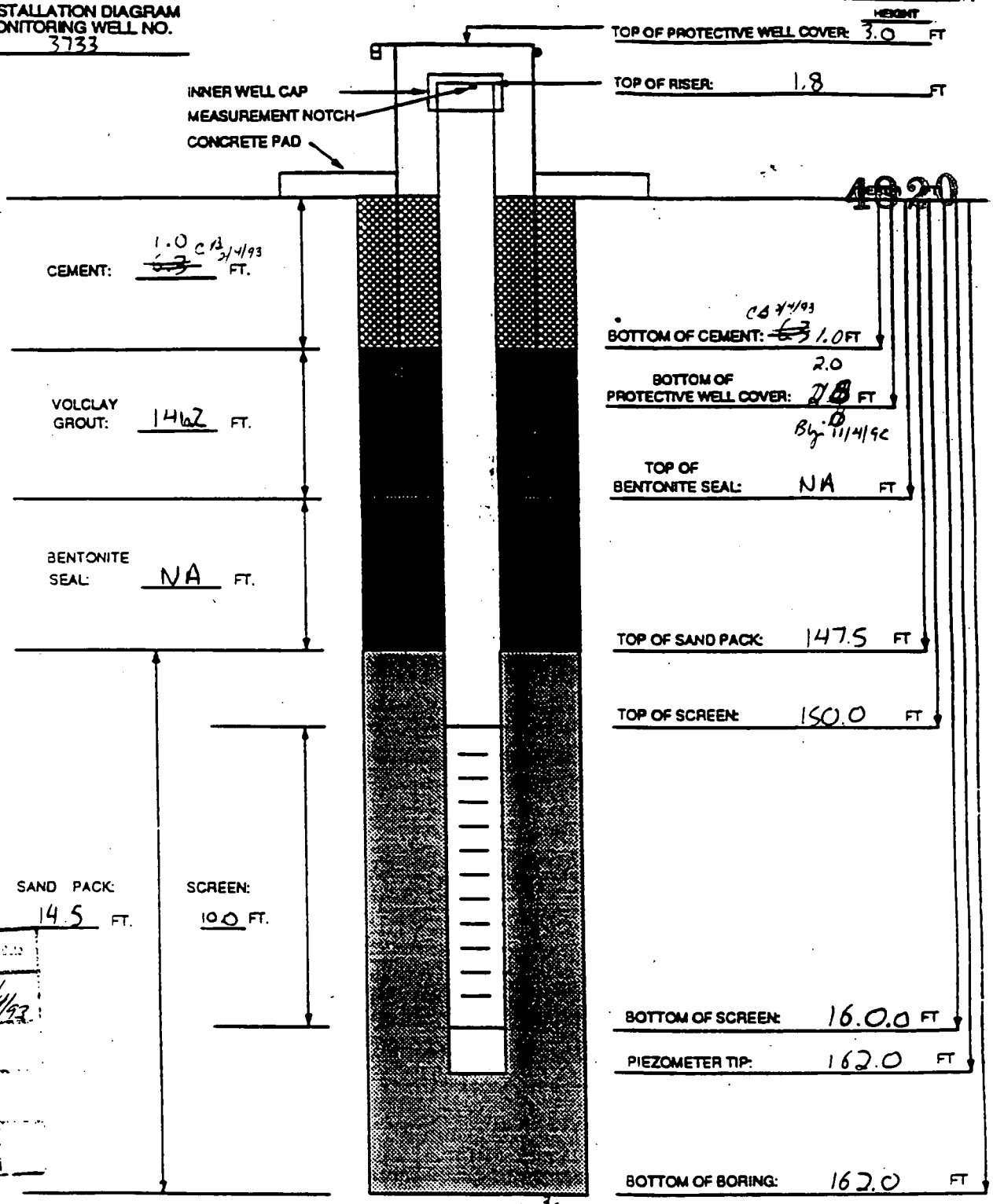
Initial CB

366

12.05-12

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 3733

INSTALLATION DATE: 10/28/92



TOP OF PROTECTIVE WELL COVER: 3.0 FT (HEIGHT)

TOP OF RISER: 1.8 FT

MATERIALS USED

SAND TYPE AND QUANTITY: 8 50lb bags of coarse (14/30)
BENTONITE PELLETS (5-GALLON BUCKETS): N/A
BAGS OF VOLCLAY GROUT: 50 50lb. bags
AMOUNT OF CEMENT: 1 bag
AMOUNT OF WATER USED: 1750 gal
OTHER: 26 barrels of soil 1 barrels water
TASK: 602 04.27

NOTES:

1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.020 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 86.5 FT
5) TOP OF CASING IS SECURED WITH STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Brian Yearsley

ASI FORM 0157 REV. (0)

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 4820

PROJECT NAME RCRA Phase I FIELD ENG./GEO. Brian Yeandley DATE 11/3/92
PROJECT NO. 602 04.27 CHECKED BY [illegible] DATE 2/4/93
BORING NO. 04 ~~3430~~ ~~2430~~ 3733
PIEZOMETER NO. 12/2/92 ~~3430~~ ~~2430~~ 3733 DATE OF INSTALLATION 10/28/92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 TO ~~162.0~~ 87.0 BY 11/4/92
FLUID NA FROM – TO –

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.75 in ID FROM 0.0 TO 162.0
SIZE NA FROM – TO –

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in
TOTAL PERFORATED AREA 10.0 ft.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 10.0 ft., 2 ft.
JOINING METHOD Screw type - flush threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinged locking cover w/ padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft.)		ELEVATION ( )	
TOP OF RISER PIPE	1.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.0			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM ~~6.3~~ 1.0 By 11/4/92		
Volcky Cement GROUT / ~~SLURRY~~ By 11/3/92	TOP ~~6.3~~ 1.0 By 11/4/92	BOTTOM 147.5	TOP	BOTTOM
BENTONITE - NA	TOP NA	BOTTOM NA	TOP	BOTTOM
SAND	TOP 147.5	BOTTOM 162.0	TOP	BOTTOM
GRAVEL - N/A	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 150.0	BOTTOM 160.0	TOP	BOTTOM
PIEZOMETER TIP	162.0			
BOTTOM OF BOREHOLE	162.0			
GWL AFTER INSTALLATION	86.5 (from ground surface)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

4820

Monitoring Well 2070

Location #11

270 4820

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
GROUND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S 1		SOFT DARK BROWN-ORANGE SILT AND CLAY, TRACE ROOTS, MOIST 0.7'	ol		
590.0		S 2		SOFT ORANGE-BROWN AND DARK GRAY MOTTLED SILTY CLAY, TRACE ROOTS, MOIST 3.8'	ml/cl		
	5.0	S 3		SOFT ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, WET ~7.0'	ml/cl		PERCHED GROUND WATER FROM 6.5' TO 7.5'; VISIBLE AFTER AUGER REMOVAL.
		S 4		MEDIUM STIFF BROWN SILTY CLAY, SOME FINE TO MEDIUM GRAVEL, TRACE FINE TO COARSE SAND, MOIST 8.5'	ml/cl ml/cl		
	10.0			MEDIUM STIFF BROWN SILTY CLAY, TRACE FINE GRAVEL, MOIST ~12.0'			
580.0		S 5		MEDIUM STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST 14.4'	cl ml		
	15.0						
		S 6		VERY STIFF GRAY SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, SOME FINE SAND STRINGERS, MOIST ~22.0'	ml		HARD GRAVELLY MATERIAL FROM 19.75' TO 21.5'.
	20.0						
570.0		S 7		MEDIUM STIFF GRAY CLAYEY SILT, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST ~26.0'	cl/ml		
	25.0						
		S 8		MEDIUM STIFF GRAY CLAY, SOME SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST 32.5'	cl		GRAVELLY ZONES AT 31' AND 32'
	30.0						
560.0		S 9		DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, MOIST TO DRY ~38.0'	sw		
	35.0						
	40.0						
550.0		S 10		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, DRY TO MOIST ~48.0'	sw	67	
	45.0						
	50.0			DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY			

PROJECT NO. 303083

BORING NO. IT-5A
SHEET 1 OF 3

370

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
UND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
540.0							
		S 11		DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY	sp		
	55.0						
				~58.0'			
	60.0						
530.0				VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, DRY			
		S 12			sw	61	
	65.0						
				~66.0'			
3-25-86							
		S 13		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, DRY	sw/gw	98	
	70.0						
20.0							
				73.2'	sw/gw		
		S 14			sp		S-14 RETAINED FOR CHEMICAL ANALYSES.
	75.0			DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET			
				~79.0'			
	80.0						
510.0							
		S 15		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET	sw		
	85.0						
	90.0						
				~91.0'			
500.0				VERY DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET			
		S 16			sw	82	
	95.0						
				~96.0'			
				VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET			
		S 17			sw/gw	82	
	100.0						

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 2 OF 3

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
ND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
490.0				VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET			
489.2	103.0						
				BOTTOM OF BORING 103.0'			

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 3 OF 3

270

4820

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
GROUND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
590.0		S 1		SOFT DARK BROWN-ORANGE SILT AND CLAY, TRACE ROOTS, MOIST 0.7'	cl		
		S 2		SOFT ORANGE-BROWN AND DARK GRAY MOTTLED SILTY CLAY, TRACE ROOTS, MOIST 3.8'	ml/cl		
	5.0	S 3		SOFT ORANGE-BROWN AND LIGHT GRAY MOTTLED SILTY CLAY, TRACE FINE TO COARSE SAND AND FINE GRAVEL, WET ~7.0'	ml/cl		PERCHED GROUND WATER FROM 6.5' TO 7.5'; VISIBLE AFTER AUGER REMOVAL
	10.0	S 4		MEDIUM STIFF BROWN SILTY CLAY, SOME FINE TO MEDIUM GRAVEL, TRACE FINE TO COARSE SAND, MOIST 8.5'	ml/cl ml/cl		
580.0				MEDIUM STIFF BROWN SILTY CLAY, TRACE FINE GRAVEL, MOIST ~12.0'			
	15.0	S 5		MEDIUM STIFF GRAY CLAY, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST 14.4'	cl ml		
	20.0	S 6		VERY STIFF GRAY SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, SOME FINE SAND STRINGERS, MOIST ~22.0'	ml		HARD GRAVELLY MATERIAL FROM 19.75' TO 21.5'.
570.0	25.0	S 7		MEDIUM STIFF GRAY CLAYEY SILT, TRACE FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST ~26.0'	cl/ml		
	30.0	S 8		MEDIUM STIFF GRAY CLAY, SOME SILT, TRACE FINE TO COARSE SAND AND FINE GRAVEL, MOIST 32.5'	cl		GRAVELLY ZONES AT 31' AND 32'
560.0	35.0	S 9		DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, MOIST TO DRY ~38.0'	sw		
	40.0						
550.0	45.0	S 10		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE SILT, DRY TO MOIST ~48.0'	sw	67	
	50.0			DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY			

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 1 OF 3

373

DATE BEGAN: 3-24-86
DATE FINISHED: 3-25-86
ROUND SURFACE EL.: 592.2'

BORING NO. IT-5A

N 476,752 E 1,382,029

FIELD ENGINEER: P. E. NEMANIC
CHECKED BY: S. E. TITUSKIN

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
540.0							
		S 11		DENSE GRAY FINE SAND, TRACE FINE GRAVEL, DRY	sp		
	55.0						
				~58.0'			
	60.0						
530.0				VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, DRY			
		S 12			sw	61	
	65.0						
				~66.0'			
3-25-86							
		S 13		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, DRY	sw/gw	98	
	70.0						
520.0							
				73.2'	sw/gw		
		S 14			sp		S-14 RETAINED FOR CHEMICAL ANALYSES.
	75.0			DENSE GRAY FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET			
				~79.0'			
	80.0						
510.0							
		S 15		VERY DENSE GRAY FINE TO COARSE SAND AND FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET	sw		
	85.0						
	90.0						
				~91.0'			
500.0							
		S 16		VERY DENSE GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE COARSE GRAVEL, TRACE SILT, WET	sw	82	
	95.0						
				~96.0'			
		S 17		VERY DENSE GRAY FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET	sw/gw	82	
	100.0						

PROJECT NO. 303063

BORING NO. IT-5A
SHEET 2 OF 3

Monitoring Well 3070

Location #11

ERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B3010	COORDINATES:	DATE: 2/10/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 1 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1½ ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS	
1	08035 1320 2/10	1 2 3	13	stiff, yellow-brown 10YR 3/6 silt and clay, abundant organic material, roots, dry. (0.4)	cl	1.75	HNU=0 ppm βB=60cpm α=0cpm	
				stiff, yellow-brown 10YR 3/6 clay and silt, some organic material, dry.	cl			
2	08036 1325 2/10	2 4 4	12	stiff, yellow-brown 10YR 3/6 clay with some silt, trace organic material	cl	1.5	HNU=0ppm βB=60cpm α=0cpm	
3								
4	08037 1330 2/10	4 4 4	2	(very soft) yellow-brown 10YR 3/4 silt and clay, wet.	cl	Unk.	HNU=0ppm βB=60cpm α=0cpm	Insufficient recovery for consistency.
	08038 1335 2/10	3 4 4	8	soft, yellow-brown 10YR 3/4 silt and clay, wet. (4.7)	cl	0.5	HNU=0 ppm βB=100 cpm α=0 cpm	Cobble smashed in spoon.
6				medium stiff, yellow-brown 10YR 4/4 clay with some silt, sand, and gravel, moist. (6.0)	cl	0.75		
7	08039 1340 2/10	3 5 8	18	very loose, yellow-brown 10YR 3/4 sand, some silt, clay, and gravel, wet. (6.5)	Sm	NA	HNU=0ppm βB=80cpm α=0cpm	Abundant red sand and gravel 6.0-6.5
8	08040 1450 2/10	7 6 10	13	stiff, yellow-brown 10YR 4/4 gravelly clay, some sand and silt, moist. (7.3)	cl	1.25		
9				very soft, yellow-brown 10YR 4/4 silty clay, some gravel, trace sand, moist. (8.0)	cl	<0.25	HNU=0ppm βB=80cpm α=0cpm	Cobble in spoon
10	08041 1505 2/10	6 15 23	13	very stiff, yellow-brown 10YR 4/4 clay with some sand and gravel, moist.	cl	3.5	HNU=0ppm βB=80cpm α=0cpm	Pushed shelby tube 0.5ft., no recovery; bent tube.
11	08042 1610 2/10	12 17 23	16	very stiff, yellow-brown 10YR 4/4 clay with some gravel, moist.	cl	4.25		
				hard, yellow-brown 10YR 3/3 clay, some gravel and pebbles, dry. (11.0)	cl	>5	HNU=0ppm βB=60cpm α=0cpm	
12				hard, gray 10YR 4/1 clay, some gravel, dry. (12.0)	cl			
13	08043 1645 2/10	3 9 11	14	very stiff, gray-green 5Y 4/1 clay with some fine gravel, wood fragments present, dry.	cl	3.5	HNU=0ppm βB=80cpm α=2cpm	
14	08044 1705 2/10	4 9 14	14	very stiff, gray 10YR 4/1 clay with some gravel, trace silt, dry. (gravelly clay at 14.9-15.0)	cl	3.25	HNU=0ppm βB=80cpm α=0cpm	

Background: HNU=0 ppm βB=60-100 cpm α=0-2 cpm 2/10/88

TES

Pennsylvania Drilling Co.
Bucyrus Erie 24-W Drilling Rig
Driller: Dave Newman
Helper: Joe Barile/Bob Johnson
Blows on sampler follow ASTM standard for 2in x 1¾in split spoon.
Soil Color: Follow Munsell color charts. Approx. 350 gallons used in drilling.

FERNALD RI/FS

DLB 2-4-89

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B3070	COORDINATES:	DATE: 2/10/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 2 OF 4

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15							
16	08045 1720 2/10	5 7 9	10	hard, gray 10YR 4/1 clay with trace gravel and silt, dry.	cl	4.25	HNU=0ppm γB=80cpm α=0cpm
17	08046 0845 2/11	7 9 13	18	very stiff, gray 10YR 4/1 clay, some gravel and silt, dry.	cl	2.25	HNU=0 ppm γB=80cpm α=0 cpm
18				very stiff, gray 10YR 5/1 clay, some silt, trace gravel, dry. 18.5	cl	2.50	HNU=0 ppm γB=60cpm α=0 cpm
19	08047 0900 2/11	4 10 14	14	very stiff, gray 10YR 5/1 clay and silt, some gravel, dry. 19.5	cl/ml	3.50	
21	08048 0950 2/11	NA Shelby	NA Tube	very stiff, gray 10YR 4/1 clay, some gravel, dry. 21.0	cl	>5	HNU=0ppm γB=60cpm α=0cpm; Shelby tube pushed 1.0 ft., 0.9 ft. recovered. Tube was dented.
22	08049 1115 2/16	6 8 12	7	stiff, gray-green 5Y 4/1 clay, some gravel, trace silt, dry. 22.5	cl	2.0	HNU=0ppm γB=80cpm α=0cpm
23	08050 1130 2/16	7 10 12	14	stiff, gray-green 5Y 4/1 gravelly clay, trace silt, dry. 22.9	cl	2.0	HNU=0ppm γB=100cpm α=Unknown; Alpha meter not functioning.
24				very stiff, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	2.5	
25	08051 1145 2/16	6 8 12	7	very stiff, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	3.5	HNU=0ppm γB=60cpm α=Unknown; No recovery 1st try, 7in. 2nd try.
26	08052 1250 2/16	5 10 13	13	hard, gray-green 5Y 4/1 clay, some gravel and pebbles, dry.	cl	4.25	HNU=0ppm γB=80cpm α=Unknown
27							
28	08053 1305 2/16	8 13 19	18	hard, gray-green 5Y 4/1 clay, some gravel, trace silt, dry.	cl	4.25	HNU=0ppm γB=80cpm α=Unknown
29	08054 1330 2/16	4 8 15	14	very stiff, gray-green 5Y 4/1 clay, some gravel, trace silt, dry.	cl	3.5	HNU=0ppm γB=140cpm α=Unknown

NOTES:

FERNALD RI/FS

DLW 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: B3070	COORDINATES:	DATE: 2/16/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 3 OF 12	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	08055 1440 2/16	8 10 17	5	very stiff, gray-green 5y 4/1 clay, some gravel and pebbles, trace silt, dry.	cl	3.25	HNU = 0 ppm; γB = 80 cpm; α = Unknown
32	08056 1455 2/16	12 7 13	13	very stiff, gray-green 5y 5/1 clay, some gravel, some silt, dry.	cl	3.5	HNU = 0 ppm; γB = 60 cpm; α = Unknown
33				very stiff, gray-green 5y 4/1 clay, some gravel, some silt dry. 33.5	cl	2.5	HNU = 0 ppm; γB = 80 cpm; α = Unknown
34	08057 1525 2/16	15 17 19	14	dense, gray 10YR 4/1 gravelly sand, some silt, dry.	SW	NA	
35	08058 1540 2/16	15 27 32	7	very dense, gray 10YR 5/1 gravelly sand, some silt, dry.	SW	NA	HNU = 0 ppm; γB = 110 cpm; α = Unknown; Cobble smashed in spoon.
36							
37							
38							
39							
40							
41	08059 1620 2/16	37 25 38	15	very dense, gray 10YR 4/1 gravelly sand, some pebbles, some silt, dry.	SW	NA	HNU < 0 ppm; γB = 60 cpm; α = Unknown
42							
43							
44							

Base of till at 33.5 ft.

FERNALD RI/FS

DLO 2/4/89

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B370~~ B3070	COORDINATES:	DATE: 2/16/88	
ELEVATION: 88 1-3-89	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 4 OF 14	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	08060 0905 2/17	27 32 29	12	very dense, gray 10YR 4/1 gravelly sand, some silt, some pebbles, dry.	SW	NA	HNU = 0ppm μB = 80cpm α = Unknown
47							
48				48.0			
49							
51	08061 1035 2/17	7 13 21	11	dense, gray 10YR 4/1 medium sand, trace gravel, some silt, dry.	Sm	NA	HNU = 0ppm μB = 100cpm α = Unknown
52							
53							
54							
55							
56	08062 1305 2/17	6 22 50	14	very dense, gray 10YR 3/1 fine sand, some silt, trace gravel, dry.	Sm	NA	HNU = 0ppm μB = 60cpm α = Unknown
57							
58							
59							

TES

FERNALD RI/FS

DLG 2/4/89

482U

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 3070	COORDINATES:	DATE: 2/17/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 5 OF 10

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	08063 1340 2/17	8 13 30	13	dense, gray 10YR 4/1 fine sand, some silt, dry.	Sm	NA	HNU = 0ppm ∂B = 80cpm α = Unknown
62							
63							
64							
				very dense, gray 10YR 4/1 fine sand, some silt, dry. 65.2	Sm		
66	08064 1520 2/17	8 48 50	15	very dense, gray 10YR 4/1 sand and gravel, some pebbles, some silt, trace clay, dry.	gm	NA	HNU = 0 ppm ∂B = 60 cpm α = Unknown
67							
68							
69							
70							
71	08065 1635 2/17	17 21 39	14	very dense, gray 10YR 5/1 sand and gravel, some pebbles, some silt, trace clay, dry.	gm	NA	HNU = 0ppm ∂B = 60 cpm α = Unknown
72							
73				73.0			
74							

TES:

FERNALD RI/FS

DLB 2/4/89

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6023.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B 3070	COORDINATES:	DATE: 2/18/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 6 OF 18

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	08066 0815 2/18	10 11 18	11	med. dense, gray 10YR 4/1 fine to medium sand, some silt, trace gravel, wet.	SM	NA	HNU = 0ppm ⅋B + α = no meters
77							
78							
79							
				med. dense, gray 10YR 4/1 medium sand, some silt, wet. 80.3	SM		
81	08067 0355 2/18	8 9 11	10	med. dense, gray 10YR 4/1 sandy gravel, some pebbles, some silt, wet. 80.6	GP	NA	HNU = 0ppm ⅋B, α = no meters.
82				med. dense, gray 10YR 3/1 coarse sand, some gravel, some silt, wet.	SP		
83							
84							
85	08068 1030 2/18	8 14 22	13	dense, gray 10YR 4/1 medium to coarse sand, some gravel, some silt, trace clay, wet.	SP	NA	HNU = 0 ppm ⅋B, α = No meters.
86							
87							
88				88.0			
89							

NOTES

FERNALD RI/FS

DLB 2/4/89

PAC

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: ~~B-370~~ B3070	COORDINATES:	DATE: 2/18/88	
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88	
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88	
DRILLING METHODS: Cable Tool		PAGE 7 OF 11	

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	08069 1100 2/18	4 7 10	13	med. dense, gray 10YR 4/1 fine gravel and coarse sand, some silt, wet. 90.3 / 90.6	gm / sm	NA	HNU=0ppm RB, d=No meters. Cobble smashed in spoon.
92				med. dense, gray 10YR 3/1 fine sand, some silt, wet.	SW		
93				med. dense, gray 10YR 4/1 gravelly sand; fine to coarse sand, some silt, some pebbles, trace clay, wet. 94.0			
94							
96	08070 1305 2/18	3 24 34	18	very dense, gray 10YR 4/1 fine to coarse sand, some gravel, some silt, wet. 96.0	sm	NA	HNU=0ppm RB=60cpm d=0cpm
97				very dense, gray 10YR 5/1 gravel, some sand, some pebbles, some silt, trace clay, wet.	gm		
98							
99				99.0			
100	08071 1350 2/18	5 6 8	11	med. dense, gray 10YR 4/1 coarse sand, some gravel, some silt, wet.	SM	NA	HNU=0ppm RB=80cpm d=0cpm
101							
102							
103							
104							

TTLS.

FERNALD RI/FS

DLB 2/4/89

482v

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: ~~B370~~ B3070 BB	COORDINATES:	DATE: 2/18/88
ELEVATION:	GWL: Depth 76.05 Date/Time 2/19/88 0840	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 8 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	08072 1555 2/18	5 10 16	13	med. dense, gray 10YR 3/1 coarse sand, some fine gravel, some silt, wet.	SM	NA	HNU= 0ppm γB= 60cpm α= 2cpm
107							
108							
109							
				med. dense, gray 10YR 4/1 coarse sand, some fine gravel, trace silt, wet. 110.3	SM		
111	08073 1635 2/18	5 10 14	12	med. dense, gray 10YR 4/1 fine sand, some silt, trace fine gravel, wet. (1" fine gravel lens at 111.0).	SM	NA	HNU= 0ppm γB= 60cpm α= 2 cpm
112							
113							
114							
115							
116	08074 0905 2/19	5 21 43	18	very dense, gray 10YR 4/1 fine to coarse sand, some fine gravel, some pebbles, some silt, trace clay, wet.	SM	NA	HNU= 0ppm γB= 60 cpm α= 4 cpm
117							
118							
119							

TFS

FERNALD RI/FS

DLB 2/4/89

YAK

-020

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	DATE: 2/19/88
BORING NUMBER: ~~B370~~ B3070 GB 1004	COORDINATES:	DATE STARTED: 2/10/88
ELEVATION:	GWL: Depth 75.8 Date/Time 2/20/88 0800	DATE COMPLETED: 2/20/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	PAGE 9 OF 16
DRILLING METHODS: Cable Tool		

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	08075 0950 2/19	1 4 5	17	loose, gray 10YR4/1 fine to medium sand, some silt, trace coarse sand, trace silt, wet. 120.5	Sm gm	NA	HNU=0ppm γB=60cpm α=2cpm
122				loose, gray 10YR 4/1 sand and gravel; fine to coarse sand, fine gravel with some pebbles, some silt, wet. 124.0			
123							
124				very dense, gray 10YR 4/1 fine to medium sand, some silt, trace clay, wet. 125.3	Sm		HNU=0ppm γB=60cpm α=0cpm
126	08076 1450 2/19	27 34 46	18	very dense, gray 10YR 3/1 sandy gravel; fine to coarse sand, fine gravel with some pebbles, some silt, wet. 128.0	gp	NA	
127							
128							
129							
130	08077 08077 2/20	7 24 52	11	very dense, gray 10YR 3/1 medium sand, some silt, wet. 131.2	Sm	NA	HNU=0ppm γB=60cpm α=2cpm Cobble caught in mouth of spoon
131				very dense, gray 10YR 4/1 gravelly sand; fine to coarse sand, some pebbles, some silt, wet. 134.0	SW		
132							
133							
134							

NOTES:

FERNALD RI/FS

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B370 B3070 1-5-89	COORDINATES:	DATE: 2/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 10 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1/2 ft.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	08078 0900 2/20	13 16 17	16	dense, gray 10YR 5/1 gravelly sand; fine to coarse sand, some clay, some silt, some pebbles, wet. (135.3)	SC Sm	NA	HNU=0ppm γB=60cpm α=2cpm
137				dense, gray 10YR 3/1 fine to coarse sand, some silt, trace gravel, wet.			
138							
139							
141	08079 1105 2/20	4 9 22	18	dense, gray 10YR 4/1 fine to coarse sand, some silt, trace fine gravel, wet.	Sm	NA	HNU=0ppm γB=60cpm α=2cpm
142							
143				(143.0)			
144							
145	08080 1335 2/20	11 43 54	3	very dense, gray 10YR 4/1 sandy gravel; fine gravel to pebbles, medium to coarse sand, trace silt, wet.	GP	NA	HNU=0ppm γB=60cpm α=2cpm
146							
147							
148							
149				(149.0)			

NOTES:

FERNALD RI/FS

DLC 2/4/89

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: B3010	COORDINATES:	DATE: 2/20/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 2/10/88
ENGINEER/GEOLOGIST: T. Sullivan	Depth Date/Time	DATE COMPLETED: 2/20/88
DRILLING METHODS: Cable Tool		PAGE 11 OF 11

DEPTH (ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (1/2 ft.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	08081 1600 2/20	14 19 17	7	dense, gray 10YR 4/1 coarse sand, some gravel and pebbles, trace silt, wet.	SW	NA	NNM=0 ppm $\gamma\beta$=60 cpm α=2 cpm
152				End of boring 151.5 ft.			

386

DLG 2/4/89

4820

RNALD
RI/FS

PIEZOMETER INSTALLATION SHEET

ROJECT NAME Fernald RI/FS FIELD ENG./GEO. T. Sullivan DATE 2/23/88
RCJECT NC. 602.3.2 CHECKED BY R Galbraith DATE 2/7/89
ORING NO. 3070
IEZOMETER NO. 3070 DATE OF INSTALLATION 2/23/88

OREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID Water FROM 0 TO 90 ft.	SIZE 10in. ID FROM 0 TO 150 ft.
FLUID — FROM — TO —	SIZE — FROM — TO —

IEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4in.	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 in. I.D. 4in.
SLOTS ☐ HOLES ☐ SCREEN ☒	LENGTH OF PIPE SECTIONS 10ft, 2 ft.
AVERAGE SIZE OF PERFORATIONS 0.010in.	JOINING METHOD Screw flush
TOTAL ~~PERFORATED AREA~~ SCREEN LENGTH 10 ft.	joint threads.

ECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft.	OTHER PROTECTION Locking cap
PROTECTIVE PIPE O.D. 10 3/4 in.	and lock.

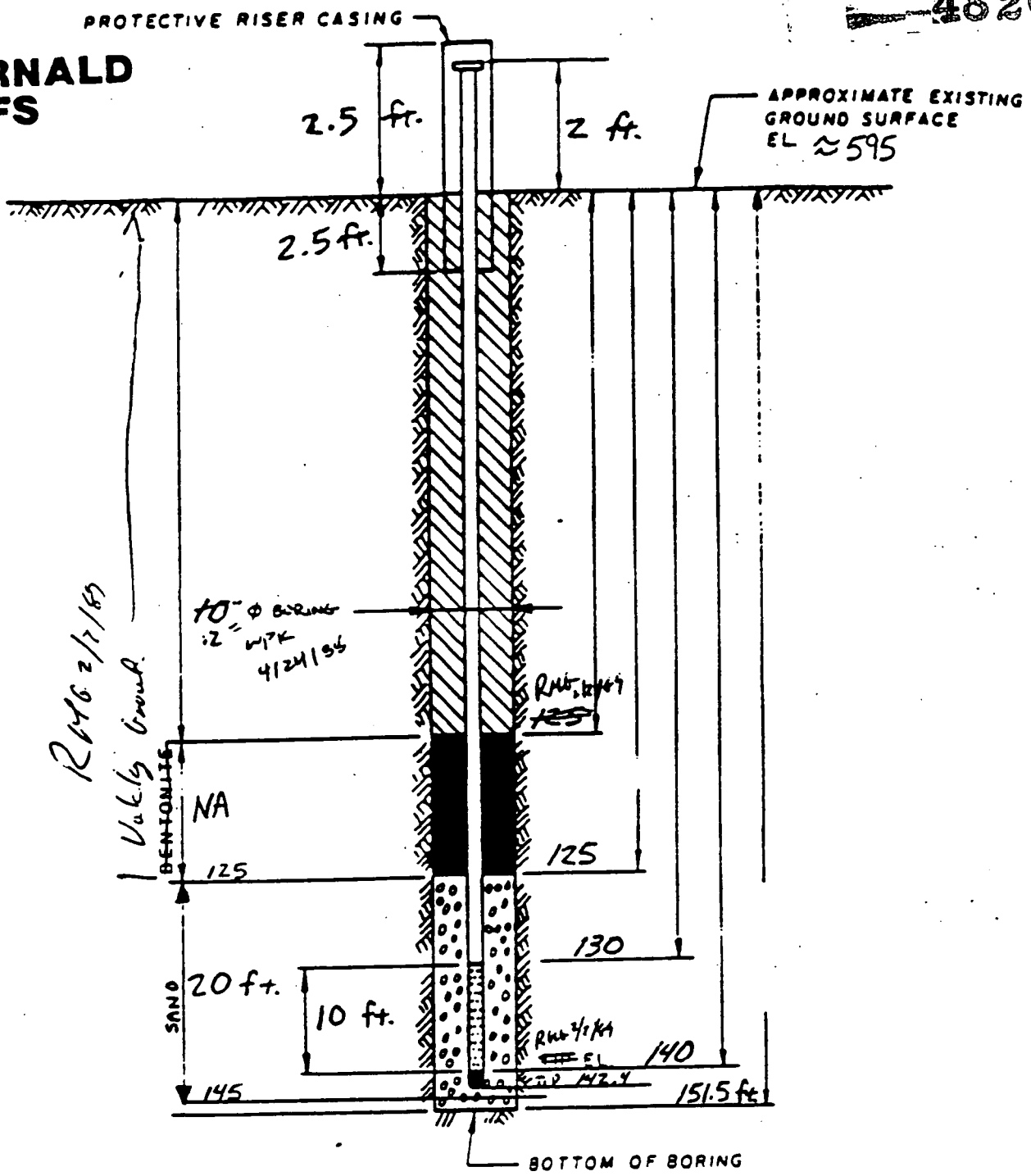
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 125	TOP	BOTTOM
BENTONITE (None used)	TOP —	BOTTOM —	TOP	BOTTOM
SAND	TOP 125	BOTTOM 145	TOP	BOTTOM
GRAVEL (None used)	TOP —	BOTTOM —	TOP	BOTTOM
PERFORATED SECTION	TOP 130	BOTTOM 140	TOP	BOTTOM
PIEZOMETER TIP	142.4			
BOTTOM OF BOREHOLE	151.5			
GWL AFTER INSTALLATION	73.65 ft			

E PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
AS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
EMARKS Natural material cave-in from 151.5 up to 145 ft., sand pack placed above 145 ft.

DLO 2/4/89

4820

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D. S.S. PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 73.65 ft. below grd. surface.
5. WATER LEVEL READING ON 2/24/88, 08:50

INSTALLATION DETAILS
MONITORING WELL ~~370~~ 3070

PREPARED FOR BB 1-5-89

DRAWING NUMBER

CHECKED BY

APPROVED BY

RWG 2/7/89

Valley Grout

*Natural material cave-in 145 to 151.5 ft.

4820

Monitoring Well 2398

Location #12

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS		
BORING NUMBER: 2398	COORDINATES:	DATE 11-11-91	
ELEVATION: 578.8	GWL: Depth 60.65 Date/Time 11-14-91	DATE STARTED: 11-11-91	
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 11-14-91	
DRILLING METHODS: Cable Tool		PAGE 1 OF 8	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	33502 1500 11-11-91	6 10 13	5	med dense, yellowish brown, (10yr 5/4) clayey silt, some organics, moist.	ML	NA	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
2	33503 1505 11-11-91	6 6 14	5	S.A.A, trace organics	ML	NA	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
3 4	33504 1510 11-11-91	8 12 15	16	med dense, light yellowish brown. (10yr, 6/3) silt, some clay, moist.	ML	NA	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
5	33505 1515 11-11-91	14 13 10	13	med dense, light yellowish brown (10yr, 6/3) silt, some clay, moist.	ML	NA	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
6				med dense, light yellowish brown, (10yr 6/3) silt, some clay, laminar sand and gravel, moist.	ML	NA	
7	33506 1520 11-11-91	30 20 18	12	Dense, yellowish brown (10yr, 5/6) clayey silt laminar sand & gravel, moist.	ML	NA	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
8 9	33507 1525 11-11-91	4 14 14	2	v. st-ff, yellowish brown. (10yr, 5/6) silty clay. Trace sand, trace gravel, low plast., moist.	CL	2.0	Hnu - 0 ppm Bg - 40 cpm α - 0 cpm
10	33508 1530 11-11-91	2 3 3	10	st.ff, gray. (10yr, 5/1) silty clay, trace gravel, moist. low plasticity.	CL	1.5	Hnu - 0 ppm Bg - 50 cpm α - 0 cpm
11 12	33509 1640 11-11-91	6 10 14	13	S.A.A.	CL	1.75	Hnu - 0 ppm Bg - 50 cpm α - 0 cpm
13	33510 1645 11-11-91	3 6 10	12	S.A.A.	CL	1.75	Hnu - 0 ppm Bg - 50 cpm α - 0 cpm
14 15	33511 1650 11-11-91	8 50/0	6	S.A.A.	CL	1.75	Hnu - 0 ppm Bg - 50 cpm α - 0 cpm

NOTES Drilling Contractor - Penn Drilling
Drilling Equipment - Cyclone 45
Driller - Craig Coulter
Asst - Gary Dye

S.A.A Same as Above
N.R. No Recovery

Backgrounds
Hnu - 0 ppm
Bg - 50 cpm
α - 0 cpm

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2398	COORDINATES:	DATE 11-11-91
ELEVATION:	GWL: Depth Date/Time See pg 1	DATE STARTED: 11-11-91
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 11-14-91
DRILLING METHODS: cable tool		PAGE 2 OF 8

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	33512 0830 11-12-91	5 6 8	0	N.R.	NA	NA	Hnu - Bz - NA. α -
17–18	33513 0845 11-12-91	9 8 50/5	2	Stiff, gray (10yr, 5/1) silty clay, trace gravel, low plasticity, moist. Large gravel stopped recovery	CL	2.0	Hnu - 0 ppm Bz - 50 cpm α - 0 cpm
19	33514 0855 11-12-91	16 10 19	0	N.R.	NA	NA	Hnu - Ø Bz - N.A. α -
20–21	33515 0900 11-12-91	5 9 11	5	Stiff, gray (10yr, 5/1) silty clay, some gravel, low plasticity, moist.	CL	2.0	Hnu - 0 ppm Bz - 50 cpm α - 0 cpm
22	33516 0905 11-12-91	5 8 10	7	Stiff, gray, (10yr, 5/1) silty clay, trace gravel, med plasticity, moist	CL	1.75	Hnu - 0 ppm Bz - 50 cpm α - 0 cpm
23–24	33517 0950 11-12-91	6 9 14	10	S.A.A.	CL	1.75	Hnu - 0 ppm Bz - 50 cpm α - 0 cpm
25	33518 1000 11-12-91	9 15 27	9	24.5' = base of till S.A.A Dense, yellowish brown, (10yr, 5/4) poorly sorted gravelly sand, trace silt, moist.	CL SW	1.75 NA	Hnu - 0 ppm Bz - 50 cpm α - 0 cpm
26–27	~~33519~~ ~~1055~~ ~~11-12-91~~			Aquifer met at 24.5' Samples to be taken at 5 ft intervals			
28	~~33520~~	J.L 11-12-91					
29–30	~~33521~~						

NOTES: See page 1

FERNALD
RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER 602.3.23	PROJECT NAME FEMP RI/FS	DATE 11-12-91
BORING NUMBER 2398	COORDINATES	DATE STARTED 11-11-91
ELEVATION	GWL: Depth Date/Time see pg 1	DATE COMPLETED 11-14-91
ENGINEER/GEOLOGIST J. Lear	Depth Date/Time	PAGE 3 OF 8
DRILLING METHODS Cable Tool		

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30							
31	33579 1055 11-12-91	15 27 30	9	Very dense, yellowish brown, (10yr 5/4) well sorted med. sand, trace gravel, moist.	SP	NA	Hnu - 0 ppm Bd - 50cpm α - 0 cpm
32							
33							
34							
35	33520 0850 11-13-91	50/5	6	S.A.A.	SP	NA	Hnu - 0 ppm Bd - 50cpm α - 0cpm
36							
37							
38							
39							
40	33521 0905 11-13-91	9 11 14	12	med dense, yellowish brown, (10yr 5/4) fine sand (well sorted), moist.	SP	NA	Hnu - 0 ppm Bd - 50 cpm α - 0 cpm
41				med dense, yellowish brown, (10yr 5/6) well sorted fine sand, dry	SP	NA	
42							
43							
44							
45							

NOTES

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6.02.3.23	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2398	COORDINATES:	DATE 11-13-91
ELEVATION:	GWL: Depth Date/Time See pg1	DATE STARTED: 11-11-91
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 11-14-91
DRILLING METHODS: Cable Tool		PAGE 4 OF 8

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45							
46	33522 0955 11-13-91	50/4	5	Very dense, yellowish brown (10yr, 5/6) gravelly sand, Trace clay, moist	SW	NA	Hnu - 0 ppm; Bg - 50 cpm; α - 0 cpm
47							
48							
49							
50	33523 1040 11-13-91	7 13 50	6	Very dense, yellowish brown, (10yr, 5/6) ~~and~~ well sorted med sand, Trace large gravel, moist	SP	NA	Hnu - 0 ppm; Bg - 50 cpm; α - 0 cpm
51							
52							
53							
54							
55	33524 1120 11-13-91	50/5	2	Very dense, pale brown, (10yr, 6/3) well sorted fine sand, trace gravel, moist.	SP	NA	Hnu - 0 ppm; Bg - 50 cpm; α - 0 cpm
56							
57							
58							
59							
60							

NOTES See page4

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2.3	PROJECT NAME: FEMP RI/FS	
BORING NUMBER: 2598	COORDINATES:	DATE 11-13-91
ELEVATION:	GWL: Depth Date/Time See pg 1	DATE STARTED: 11-11-91
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 11-14-91
DRILLING METHODS: cable tool		PAGE 5 OF 8

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60							
61	33525 1135 11-13-91	16 20 25	6	Dense, pale brown, (10yr 6/3) gravelly Sand, Trace clay, w. moist. 11-13-91	SW	NA	H_{eu} - 0 ppm; $\beta\gamma$ - 50 cpm; α - 0 cpm
62							
63							
64							
65	33526 1410 11-13-91	11 27 34	10	V. Dense, yellowish brown. (10yr. 5/4) Poorly sorted gravelly clay, Trace clay wet.	SW	NA	H_{eu} - 0 ppm; $\beta\gamma$ - 50 cpm; α - 0 cpm
66							
67							
68							
69							
70	33527 1435 11-13-91	6 9 12	15	med dense, yellowish brown (10yr. 5/4) Poorly sorted Sand, Some gravel, trace clay. wet.	SW	NA	H_{eu} - 0 ppm; $\beta\gamma$ - 50 cpm; α - 0 cpm
71							
72							

NOTES See page 1

394

FERNALD RI/FS

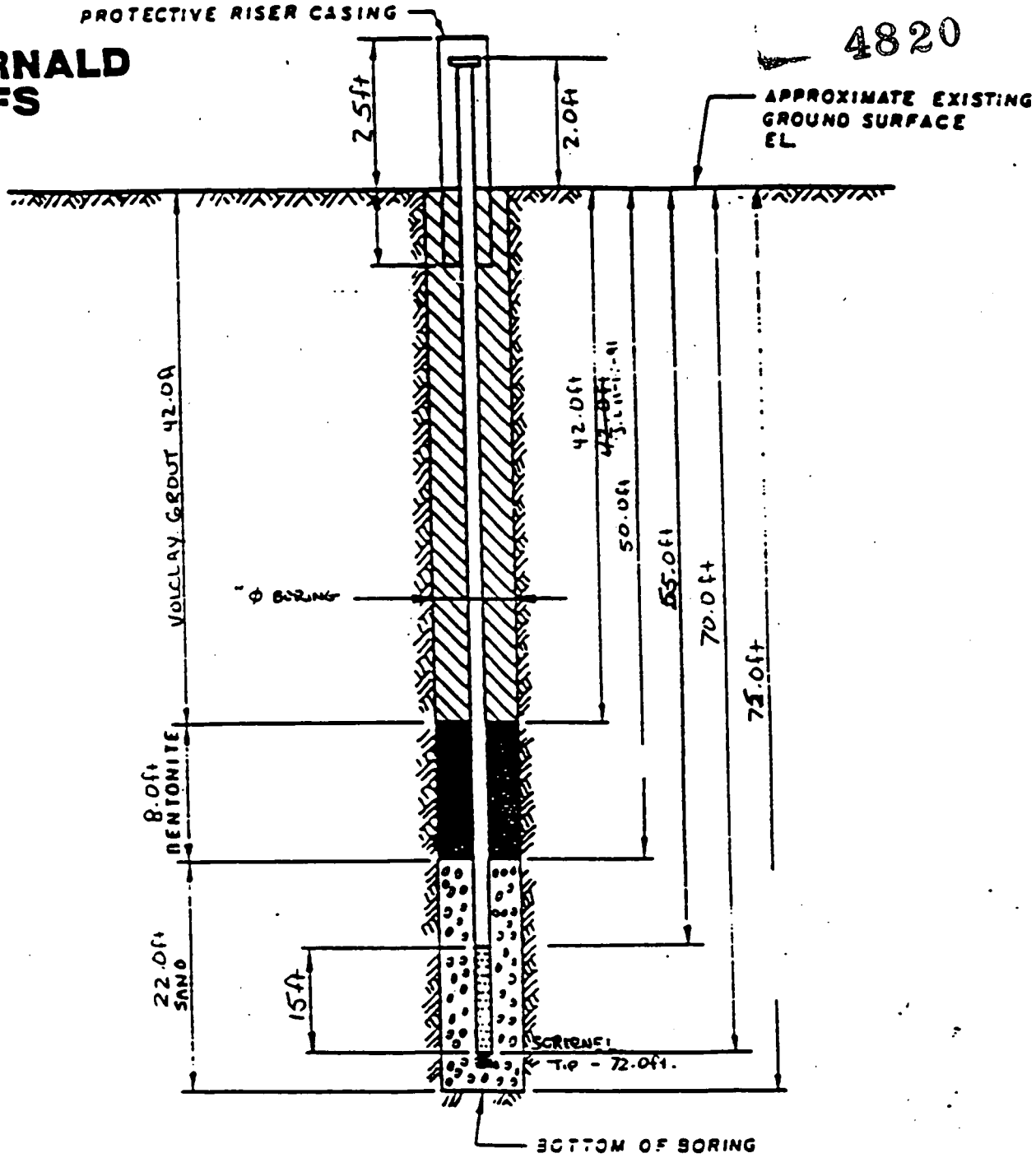
VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER: 602.3.23	PROJECT NAME: Femp RI/FS	
BORING NUMBER: 2398	COORDINATES:	DATE 11-13-91
ELEVATION:	GWL: Depth Date/Time see pg 1	DATE STARTED: 11-11-91
ENGINEER/GEOLOGIST: J. Lear	Depth Date/Time	DATE COMPLETED: 11-14-91
DRILLING METHODS: cable Tool		PAGE 6 OF 8

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	33528 1515 11-13-91	6 21 12	13	Dense, yellowish brown (10yr 5/4) well sorted med sand, Trace gravel, wet	SP	NA	Hnu - 0 ppm Gs - 50 cpm α - 0 cpm
72				Drilling ends at 72.0'			
				Sampling ends at 76.5'			
78				Screen set at 70.0'			
79							

NOTES: See page 1

FERNALD RI/FS



DRAWN BY	J. Lear 11-18-91	CHECKED BY	APPROVED BY	DRAWING NUMBER

NOTES:

1. RISER PIPE IS 4.0 IN I.D SCHEDULE 40 S.S. PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

5 5 gal buckets of bentonite pellets
8 bags of 80 lb 10x20 sand
7 50 lb bags voiclay grout
500 gals H_2O used

INSTALLATION DETAILS
MONITORING WELL
2398
PREPARED FOR
Fernald RI/FS

Amount of stainless - 1- 2ft RISER 1-5ft section
5- 10ft sections 1-15ft sc
1- 2ft sump

FERNALD
RI/FS

4820

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FEMP RI/FS
FIELD ENG./GEO. J. Lear
DATE 11-15-91
PROJECT NO. 1602.3.23
CHECKED BY
DATE
BORING NO. 2398
PIEZOMETER NO. 2398
DATE OF INSTALLATION 11-14, 11-15-91

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
TYPE OF BIT Cable Tool Bit
DRILLING FLUID (S) USED: H_2O
CASING SIZE (S) USED: 8 in
FLUID H_2O FROM 0 ft TO 75 ft
SIZE 8 in FROM 0 TO
FLUID NA FROM NA TO NA
SIZE NA FROM NA TO NA

PIEZOMETER DESCRIPTION

TYPE 4 in ID Stainless Steel
RISER PIPE MATERIAL 4 in Stainless
DIAMETER OF PERFORATED SECTION 4 in
RISER PIPE DIAMETERS:
PERFORATION TYPE:
O.D. 4 3/8 I.D. 4.0 in
SLOTS ☐ HOLES ☐ slotted SCREEN ☑
LENGTH OF PIPE SECTIONS 10 ft, 5 ft, 2 ft
AVERAGE SIZE OF PERFORATIONS
JOINING METHOD Threaded, flush joined
TOTAL PERFORATED AREA

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 ft
OTHER PROTECTION well cap, vented, hinged, locked cover
PROTECTIVE PIPE O.D. 10.75 in

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.8			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 42.0	TOP	BOTTOM
BENTONITE	TOP 42.0	BOTTOM 50.0	TOP	BOTTOM
SAND	TOP 50.0	BOTTOM 72.0	TOP	BOTTOM
J.L 11-15-91 ~~GRAVEL~~	TOP NA	BOTTOM NA	TOP	BOTTOM
PERFORATED SECTION	TOP 55.0	BOTTOM 70.0	TOP	BOTTOM
PIEZOMETER TIP	72.0			
BOTTOM OF BOREHOLE	75.0			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑

REMARKS

482v

Monitoring Well 3398

Location #12

398

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I Perimeter Well Installation	
NG NUMBER: ~~4398~~ 3398	COORDINATES:	DATE 9-23-92
ELEVATION:	GWL: Depth 6.06 ft Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 1 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	0900 103160 9-23-92	3 7 8	14	Stiff (10YR, 4/6) dark yellowish brown silty clay with organics, low plasticity, slightly moist	Cl	1.5	HNU = 0 ppm Bγ = 40 ~~ppm~~ cpm 9-23-92
2 3	0910 103161 9-23-92	8 15 13	14	SAA - Hard	Cl	4.0	HNU = 0 ppm Bγ = 40 cpm
4	0915 103162 9-23-92	16 14 12	10	Stiff (10YR, 5/8) yellowish brown clay with trace gravel, medium plasticity, slightly moist	Cl	1.5	HNU = 0 ppm Bγ = 40 cpm
5 6	0920 103163 9-23-92	10 11 16	10.	Medium dense (10YR, 5/8) yellowish brown silty clay with trace sand, moist	ML	N/A	HNU = 0 ppm Bγ = 40 cpm
7	0923 103164 9-23-92	13 15 22	18	Hard (2.5Y, 5/4) light olive brown, mottled with gray, silty clay with trace gravel, low plasticity, slightly moist	Cl	4.5	HNU = 0 ppm Bγ = 40 cpm
8 9	0925 N/A 9-23-92	21 33 34	0	NO RECOVERY	N/A	N/A	N/A
10	1300 103165 9-23-92	6 11 21	14	Very stiff (2.5Y N5/) gray clay with trace gravel, medium plasticity, moist	Cl	2.5	HNU = 0 ppm Bγ = 40 cpm
11 12	1310 N/A 9-23-92	21 23 27	0	NO RECOVERY	N/A	N/A	N/A
13	1345 103166 9-23-92	21 23 29	18	Stiff (2.5Y, N5/) gray clay with trace gravel, medium plasticity, slightly moist	Cl	2.0	HNU = 1 ppm Bγ = 40 cpm
14 15	1410 103167 9-23-92	4 7 15	6	SAA	Cl	2.0	HNU = 0 ppm Bγ = 40 cpm

PRELIMINARY

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment Cable Tool - 72 Speedstar

Joe Barile

Mark Rebold

SAA - SAME AS ABOVE
NA - NOT Applicable

Background Readings { HNU = 0 ppm, Bγ = 40 cpm

* Samples collected per ASTM standard Penetration Test.
* All colors identified by Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
ING NUMBER: ~~4398~~ 10-1-92 3398	COORDINATES:	DATE:
/ATION:	GWL: Depth 60.6 ft Date/Time 10-7-92	DATE STARTED:
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS: Cable Tool		PAGE OF

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1420 103168 9-23-92	19 50/.5	14	Very stiff (2.5Y, N4) dark gray silty clay, trace gravel, low plasticity, moist	Cl	2.5	HNU = 0 ppm Bγ = 40 cpm
17 18	1440 N/A 9-23-92	50/.5	0	NO RECOVERY	N/A	N/A	HNU = 0 ppm Bγ = 40 cpm
19	1515 103169 9-23-92	50/.4	5	Very dense (2.5Y, N3) gray clayey gravel, non plastic, moist	GC	N/A	HNU = 0 ppm Bγ = 40 cpm
20 21	1600 103170 9-23-92	11 13 17	3	Medium dense SAA	GC	N/A	HNU = 0 ppm Bγ = 40 cpm
	1640 103171 9-23-92	13 7 12	5	SAA	GC	N/A	HNU = 0 ppm Bγ = 40 cpm
23 24	0830 103172 9-24-92	13 7 19	15	Stiff (2.5Y, N5/) gray clay, trace gravel, low plasticity, moist	Cl	1.5	HNU = 0 ppm Bγ = 40 cpm
25	0845 103173 9-24-92	14 27 42	15	SAA - top 8 inches Bottom 7 inches, Very dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, dry	Cl SW	1.5 N/A	HNU = 0 ppm Bγ = 40 cpm
26 27				Samples will be taken at 5 FT. intervals starting at 29.5 FT.			
28							
29							
30				see page 3 for classification	29.5	to	31.0

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

: Joe Barile

Mark Rebold

* samples collected per ASTM standard Penetration Test

* Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE

NA - NOT Applicable

Background Readings { HNU = 0 ppm, Bγ = 40 cpm

PRELIMINARY

RI/FS

VISUAL CLASSIFICATION OF SOILS — 4820

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I	
ING NUMBER: ~~4398~~ 10-1-92 3398	COORDINATES:	DATE 9-24-92
ELEVATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS:		PAGE 3 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	0940 103174 9-24-92	47 50/3	16	Very dense (2.5Y, 5/4) light olive brown well graded coarse sand, trace gravel, slightly moist	SW	N/A	HNU = 0 ppm Bq = 40 cpm
32							
33							
34							
35	1105 103175 9-24-92	8 19 21	12	Dense, SAA	SW	N/A	HNU = 0 ppm Bq = 40 cpm
36							
38							
39							
40	1310 103176 9-24-92	25 21 22	15	Dense (2.5Y, 5/4) light olive brown poorly graded medium fine sand, slightly moist	SP	N/A	HNU = 0 ppm Bq = 40 cpm
41							
42							
43							
44							
45				See page 4 for description from 44.5 - 46.0			

PRELIMINARY

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Joe Barile

Mark Rebold

SAA - SAME AS ABOVE
NA - NOT Applicable

Background { HNU = 0 ppm, Bq = 40 cpm

* samples collected per ASTM standard Penetration Test
* All colors identified by the Munsell Color Chart

RI/FS

482U

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I	
NG NUMBER: ~~4398~~ 10-7-92 3398	COORDINATES:	DATE 9-24-92
ELEVATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST. Michael Worley	Depth Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 4 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 FOOT	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	1840 103177 9-24-92	50/.5	5	Very dense (2.5Y, 4/4) olive brown poorly graded sand, trace gravel, moist	SP	N/A	HNU = 0 ppm Bg = 40 cpm
47							
48							
49							
50	1500 103178 9-24-92	13 37 29	14	Very dense (2.5Y 5/3) light olive brown well graded gravel, trace sand, moist	GW	N/A	HNU = 0 ppm Bg = 40 cpm
51							
52							
53							
54							
55	1650 103179 9-24-92	19 50/.3	12	Very dense, SAA	GW	N/A	HNU = 0 ppm Bg = 40 cpm
56				Samples at even foot, 5 foot intervals from this point.			
57							
58							
59	9-24-92			WATER LEVEL			
60							

PRELIMINARY

NOTES:

Drilling Contractor Pennsylvania Drilling

Drilling Equipment 72 Speedstar

Y: Joe Barile

Mark Rebold

* Samples collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE

NA - NOT APPLICABLE

Background { HNU = 0 ppm, Bg = 40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS — 4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	9-26-92
G NUMBER: ~~4390~~ 10-1-93 3398	COORDINATES:	DATE 9-25-92
ELEVATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth: Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 5 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	0860 103181 9-26-92	13 23 25	12	Dense (2.5Y, 5/3) light olive brown well graded gravel, trace sand, wet	GW	N/A	HNu = 0 ppm Bγ = 40 cpm
62							
63							
64							
65							
66	0950 103182 9-26-92	50/.4	18	Very dense, SAA	GW	N/A	HNu = 0 ppm Bγ = 40 cpm
68							
69							
70							
71	1100 103183 9-26-92	15 13 15	18	Medium dense, SAA	GW	N/A	HNu = 0 ppm Bγ = 40 cpm
72							
73							
74							
75							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Joe Barile

Mark Rehold

SAA - SAME AS ABOVE

NA - NOT Applicable

Background { HNu = 0 ppm, Bγ = 40 cpm

* Samples collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
VG NUMBER: ~~4398~~ 3398 10-1-92	COORDINATES:	DATE: 9-25-92
...VATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth: Date/Time:	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 6 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (6in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	1430 103185 9-25-92	21 37 35	18	Very dense (2.5Y, 5/4) light olive brown well graded sand, trace gravel, wet	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
77							
78							
79							
80							
81	1500 103186 9-25-92	24 30 39	18	SAA	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
83							
84							
85							
86	1645 103187 9-25-92	35 50/.3	14	SAA	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
87							
88							
89							
90							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Joe Barile

Mark Reboold

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { HNu = 0 ppm, Bγ = 40 cpm

* = samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

404

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
HOLE NUMBER: ~~4398~~ 10-1-92 3398	COORDINATES:	DATE: 9-28-92
ELEVATION:	GWL: Depth 60.6 ft Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth: Date/Time:	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 7 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	0945 103188 9-28-92	4 4 11	16	Medium dense (2.5Y, 5/4) light olive brown well graded coarse sand, trace gravel, wet	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
92 93 94							
95 96	1100 103189 9-28-92	11 17 23	18	Dense (2.5Y, 5/2) grayish brown well graded, coarse sand, trace gravel, wet	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
98 99							
100 101	1350 103191	9 13 17	18	medium dense, SAA	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
102 103 104 105							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Joe Barile

Mark Rebold

* Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { HNU = 0 ppm, Bγ = 40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

820

PROJECT NUMBER: 6002.04.27	PROJECT NAME: RCRA Phase I	
ING NUMBER: ~~4270~~ 10-1-92 3398	COORDINATES:	DATE 9-28-92
VATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 8 OF 12

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INS	RECOVERY (INS)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
106	1515 103142 9-28-92	12 33 49	18	Dense (2.5Y, 4/2) dark grayish brown well graded coarse sand, trace gravel, wet	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
107 108 109							
110 111	1545 103193 9-28-92	12 15 14	13	Medium dense SAA	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
113 114							
115 116	0830 103144 9-29-92	21 26 17	18	Dense, SAA	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
117 118 119 120							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Joe Barile

Mark Rebold

samples collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE

NA - NOT Applicable

Background { HNu = 0 ppm, Bγ = 40 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
G NUMBER: ~~11248~~ 3398 10-1-92	COORDINATES:	DATE: 9-29-92
ELEVATION:	GWL: Depth 60.6 ft Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth: Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 9 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
121	0850 N/A 9-29-92	3 4 9	10	medium dense (2.5Y, 4/2) dark grayish brown poorly graded medium sand, trace gravel, wet	SP	N/A	HNU = 0 ppm Bq = 40 cpm Sample used for screen ~~and~~ analysis 10-1-92
122							
123							
124							
125	1630 N/A 9-29-92	19 24 35	18	Very dense, SAA	SP	N/A	HNU = 0 ppm Bq = 40 cpm Sample used for screen analysis
126							
127							
128							
129							
130	1650 N/A 9-29-92	21 25 31	5	SAA	SP	N/A	HNU = 0 ppm Bq = 40 cpm Sample used for screen analysis
131							
132							
133							
134							
135							

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Joe Barile

Mark Rebold

SAA - SAME AS ABOVE

NA - NOT APPLICABLE

{ HNU = 0 ppm
{ Bq = 40 cpm

* Samples collected per ASTM Standard Penetration Test

* All colors identified by the Munsell Color Chart

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: ~~4248~~ 3398	COORDINATES:	DATE: 9-30-92
ELEVATION:	GWL: Depth 60.6 FT Date/Time 10-7-92	DATE STARTED: 9-23-92
ENGINEER/GEOLOGIST: Michael Werley	Depth Date/Time	DATE COMPLETED: 10-7-92
DRILLING METHODS: Cable Tool		PAGE 10 OF 12

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
136	0930 N/A 9-30-92	28 35 42	18	Very dense (2.5Y, 5/2) grayish brown well graded sand, trace gravel, wet	SW	N/A	Hnu = 0 ppm Bq = 40 cpm Sample used for screen analysis
137							
138							
139							
140	1020 103197 9-30-92	23 50/.4	12	SAA	SW	N/A	Hnu = 0 ppm Bq = 40 cpm Gravel is cobble size
142							
143							
144							
	1500 103198 9-30-92	27 29 36	18	Very dense (2.5Y, 5/2), SAA	SW	N/A	Hnu = 0 ppm Bq = 40 cpm

PRELIMINARY

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

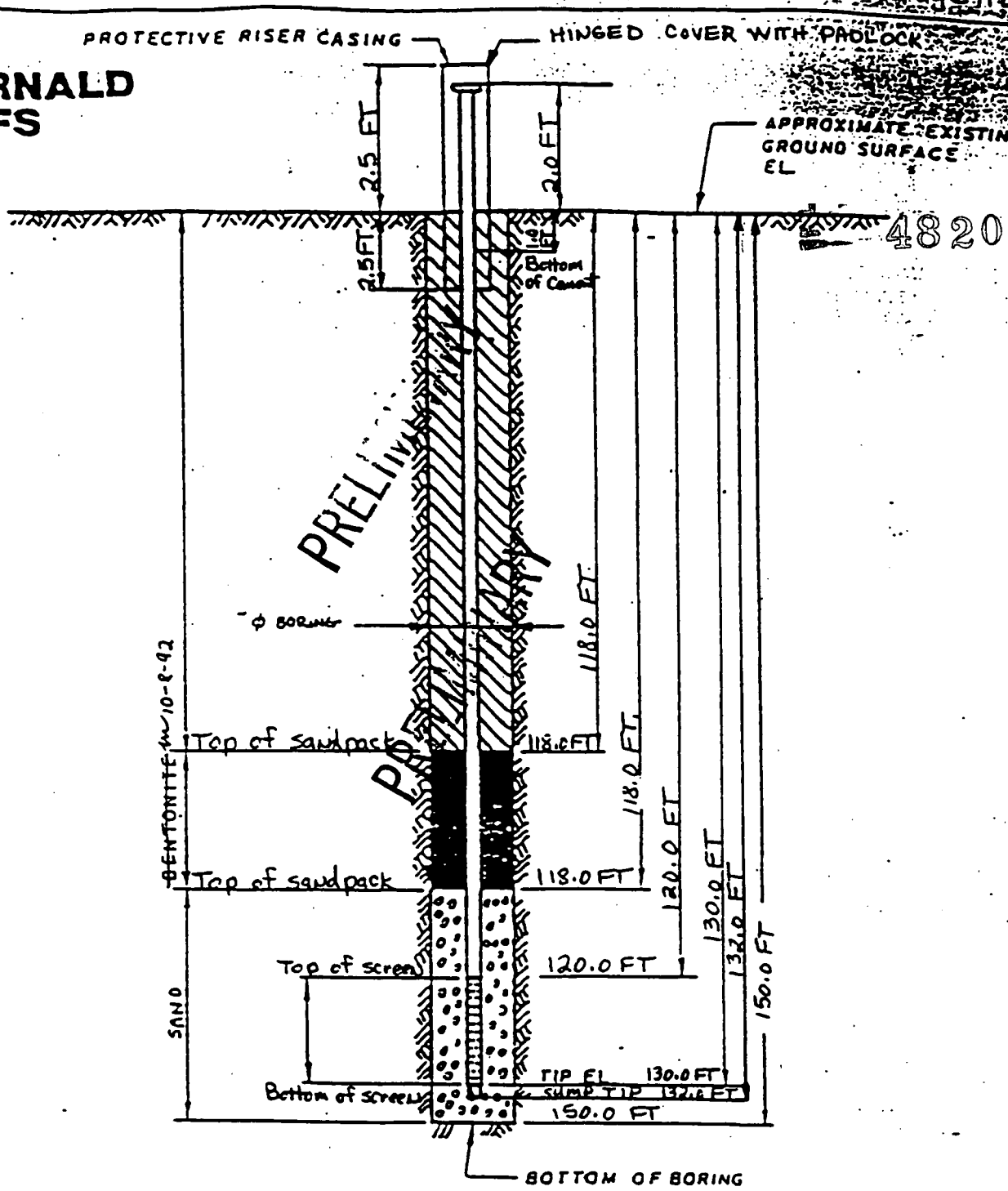
Joe Barile

Jeff Bentley

* Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE
{ Hnu = 0 ppm
{ Bq = 40 cpm

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4.0 IN I.D. SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4.0 IN I.D 316 PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED. [with welded silttrap]
4. ELEVATION OF WATER LEVEL 60.6 FT
5. WATER LEVEL READING ON 10-7-92

INSTALLATION DETAILS
MONITORING WELL # 3398

PREPARED FOR

FMPC RI/FS

materials used during well installation:

15 50lb. bags of 4/30 sand

36 50lb. bags of volclay grout

1100 gallons of water used during grouting and drilling procedures

316 stain steel pipe sections: 12-10.0 FT; 1-2.0 FT; 1-10.0 FT screen with 2.0 FT silttrap

DRAWING NUMBER | CHECKED BY | APPROVED BY | 10-8-92

FERNALD RI/FS

4820

PIEZOMETER INSTALLATION SHEET

PROJECT NAME RCRA Phase I
PROJECT NO. 602.04.27
BORING NO. 3398
PIEZOMETER NO. 3398

FIELD ENG./GEO. Michael Worley DATE 10-7-92
CHECKED BY _____ DATE _____
DATE OF INSTALLATION 10-7-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID water FROM 0.0 FT. TO 100.0 FT.
FLUID _____ FROM — TO —

TYPE OF BIT Hammer Percussion Bit
CASING SIZE (S) USED:
SIZE 10.0 in ID FROM 0.0 FT TO ~~74~~ 150.0 FT
SIZE _____ FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in. ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.020 in.
TOTAL PERFORATED AREA 10.0 FT.

RISER PIPE MATERIAL 316 Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in.
LENGTH OF PIPE SECTIONS 12-10 FT, 1-2 FT.
JOINING METHOD Screw type - flush joint threaded

PRELIMINARY

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in.

OTHER PROTECTION Hinged locking cover with pad lock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE ( )		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
Volclay GROUT / ~~SLURRY~~ CEMENT 10-7-92	TOP 1.0	BOTTOM 118.0	TOP	BOTTOM
BENTONITE PELLETS	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND - 4/30	TOP 118.0	BOTTOM 132.0	TOP	BOTTOM
GRAVEL - NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 120.0	BOTTOM 130.0	TOP	BOTTOM
PIEZOMETER TIP	132.0			
BOTTOM OF BOREHOLE	150.0			
GWL AFTER INSTALLATION	62.9 FT. (TOP OF RISER)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cement placed from 0.0 to 1.0 FT to hold protective cover in place.

411

4820

B-3398

Customer Number 103195

MATERIAL: _____ SAMPLE NUMBER: D0930-034

DETERMINATION: Particle Size METHOD: Sieve Analysis

Sample weight: 190.12

Sieve Number	Weight Retained, g	% Retained	Cumulative % Retained	Grain Size, 1/1000 inch
10	37.64	19.6	19.6	78.7
20	19.9	10.5	30.0	33.5
40	46.57	24.2	54.2	16.7
60	43.11	22.4	76.6	9.8
100	27.7	14.4	91.0	5.9
200	9.05	4.7	95.7	3.0
Pan	6.39	3.3	99.0	

PRELIMINARY

$\frac{W_2 \times 100\%}{W_1} = R$ | $\frac{\text{Original - Duplicate}}{\text{Average}} \times 100\% = RPD$

Analyzed by:	Checked by:	Date analyzed:
J Kilpatrick		10-1-92

Grain Size 40% Retained _____ .001 inch

50% _____

90% _____

10 X 10 PER INCH

MADE IN U. S. A.

Grain Size 1/1000 inch 920930-034

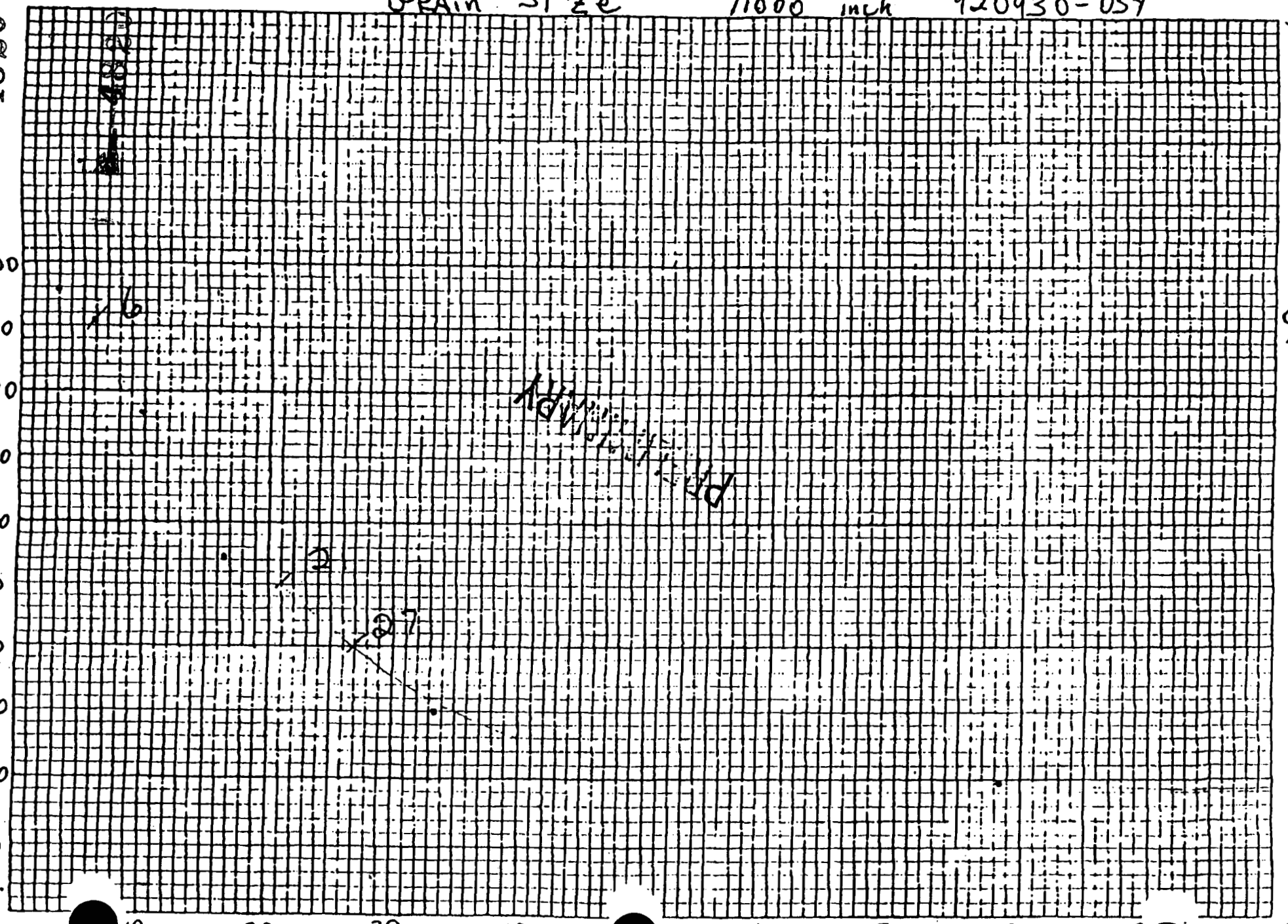
4820

4/3

%

100
90
80
70
60
50
40
30
20
10

10 20 30 40 60 70 80 90 100



4820

Well #3398 Geologist: Michael Werley 10-1-92

Retained values

90% = .006

50% = .021

40% = .027

$\frac{.027}{.006} = 4.5$ 4.5 > 3 use a factor of 4

4 X .021 = .084

.084 most closely fits the coarse grain sand and .020 screen size.

PRELIMINARY

4820

Monitoring Well 4398

Location #12

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 4398	COORDINATES:	DATE 10-9-92
ELEVATION:	GWL: Depth 60.7 ft Date/Time 11-3-92/0900	DATE STARTED: 10-9-92
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 11-3-92
DRILLING METHODS: Cable Tool		PAGE 1 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0				* For soil characterization and classification from 0.0 – 160.0 Feet, refer to boring # 3398.			
10							
20							
30							
40							
50							
60							
70							
80							
90							
100							
110							
120							
130							
140							
150							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speedstar

Driller: Joe Barile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { HNU = 0 ppm
β/γ = 30 cpm
α = 0 cpm

Samples collected per ASTM standard Penetration Test
* Colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 6002.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4398	COORDINATES:	DATE 10-16-92	
ELEVATION:	GWL: Depth 60.7 ft Date/Time 11-3-92/0900	DATE STARTED: 10-9-92	
ENGINEER/GEOLOGIST: Ken Marion + Michael Werlen	Depth Date/Time	DATE COMPLETED: 11-3-92	
DRILLING METHODS: Cable Tool		PAGE 2 of 6	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
151	1600 103203 10-16-92	28 50/.4	13	Very dense (2.5Y, 5/4) light olive brown well graded coarse sand, trace Cobble size gravel, wet	SW ~~GW~~ 10-16-92	N/A	Hnu = 0 ppm βγ = 30 cpm
152				* For soil characterization before 150.0 ft. see boring # 3398.			
153							
154							
155							
156	~~103206~~ K.M. 10-21-92	N/A	N/A	Note: The driller incorrectly read the measuring tape and mistakenly drilled through this sample interval	N/A	N/A	Hnu = N/A ppm βγ = N/A cpm α = N/A cpm K.M. 10-21-92
157							
158							
159							
160							
161	1615 103205 10-21-92	55 50/.4	9	Very dense (2.5Y, 5/4) light olive brown poorly graded course sand with trace gravel, wet	SP	N/A	Hnu = 0 ppm βγ = 30 cpm α = 0 cpm
162							
163							
164							
165							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Driller: Joe Bavile
Rick Pierce

* Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { Hnu = 0 ppm, βγ = 30 cpm, α = 0 cpm

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 6002.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 4398	COORDINATES:	DATE 10-21-92	
ELEVATION:	GWL: Depth 60.7 Ft. Date/Time 11-3-92/0900	DATE STARTED: 10-9-92	
ENGINEER/GEOLOGIST: Ken Marion + Michael Worley	Depth Date/Time	DATE COMPLETED: 11-3-92	
DRILLING METHODS: Cable Tool		PAGE 3 OF 6	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
165	1705	11		Very dense (2.5Y, 5/4) light olive brown poorly graded course sand, wet			
166	103206 10-21-92	22 48	18		SP	N/A	Hnu = 0 ppm Bγ = 30 cpm α = 0 cpm
167				* Samples from 170.0 to 181.5 FT. were used for screen sieve analysis. - Sample # 103207			
168							
169							
170							
171	1040 10-23-92 ~~103207~~ MW 103207 10-22-92	50 / .3	4 ~~18~~ MW 10-22-92	SAA - trace gravel	SP	N/A	Hnu = 0 ppm Bγ = 30 cpm α = 0 cpm
172							
173							
174							
175							
176	1440 10-23-92 ~~103210~~ ~~MW 103207~~ 10-22-92	19 40 50	13 ~~18~~ MW 10-22-92	SAA - fine sand	SP	N/A	Hnu = 0 ppm Bγ = 30 cpm α = 0 cpm
177							
178							
179							
180							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Driller: Joe Barile
Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background { Hnu = 0 ppm, Bγ = 30 cpm, α = 0 cpm

Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

RI/FS

VISUAL CLASSIFICATION OF SOILS

4820

PROJECT NUMBER: 1602.04.27	PROJECT NAME: RCRA Phase I	
BORING NUMBER: 4398	COORDINATES:	DATE 10-22-92
ELEVATION:	GWL: Depth 60.7FT Date/Time 11-3-92/0900	DATE STARTED: 10-9-92
ENGINEER/GEOLOGIST: Michael Werley	Depth Date/Time	DATE COMPLETED: 11-3-92
DRILLING METHODS: Cable Tool		PAGE 4 OF 6

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (tsf)	REMARKS
181	1640 10-23-92 103211 MW 10-23-92 10-23-92	10 20 30	18	Dense (2.5Y, 5/4) light olive brown poorly graded medium sand, wet	SP	N/A	Hnu = 0 ppm βγ = 30 cpm α = 0 cpm
182				Continuous sampling will resume at 185.0 ~~feet~~ to 195.0 ft. through the well screened interval.			
183							
184							
185							
186	0910 103212 10-23-92	50/.5	6 ~~+3~~ MW 10-23-92	Very dense (2.5Y, 5/4) light olive brown poorly graded fine sand, trace gravel, trace crystalline limestone	SP wet	N/A	Hnu = 0 ppm βγ = 30 cpm α = 0 cpm
187	0945 103213 10-23-92	50/.5	6 ~~+8~~ MW 10-23-92	Top 9 in. - SAA, Very Dense Bottom 9 in. - ~~SAA~~ - (2.5Y, N6/) gray well graded coarse gravely sand, trace crystalline limestone, wet	SP SW ~~GW~~	N/A N/A	Hnu = 0 ppm βγ = 30 cpm α = 0 cpm
188							
189	1025 MW 10-23-92 103214 10-23-92	14 50/.4	5	Very dense (2.5Y 5/2) grayish brown coarse gravely sand, wet ~~NOTE: Sample used for screen sieve.~~	SW ~~GW~~	N/A	Hnu = 0 ppm βγ = 30 cpm α = 0 cpm
190	1100 MW 10-23-92 103214 10-23-92	70 75 100/.1	5	SAA	SW ~~GW~~	N/A	Hnu = 0 ppm βγ = cpm α = cpm
191				Bottom of sampling at 191.0 FT.			
192				Bedrock encountered at 191.0 Feet. End of boring			
193				Bottom of boring at 191.0 FT. (Actual screened interval will be adjusted accordingly.)			
194							
195							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: 72 Speed star

Driller: Joe Barile, Rick Pierce

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

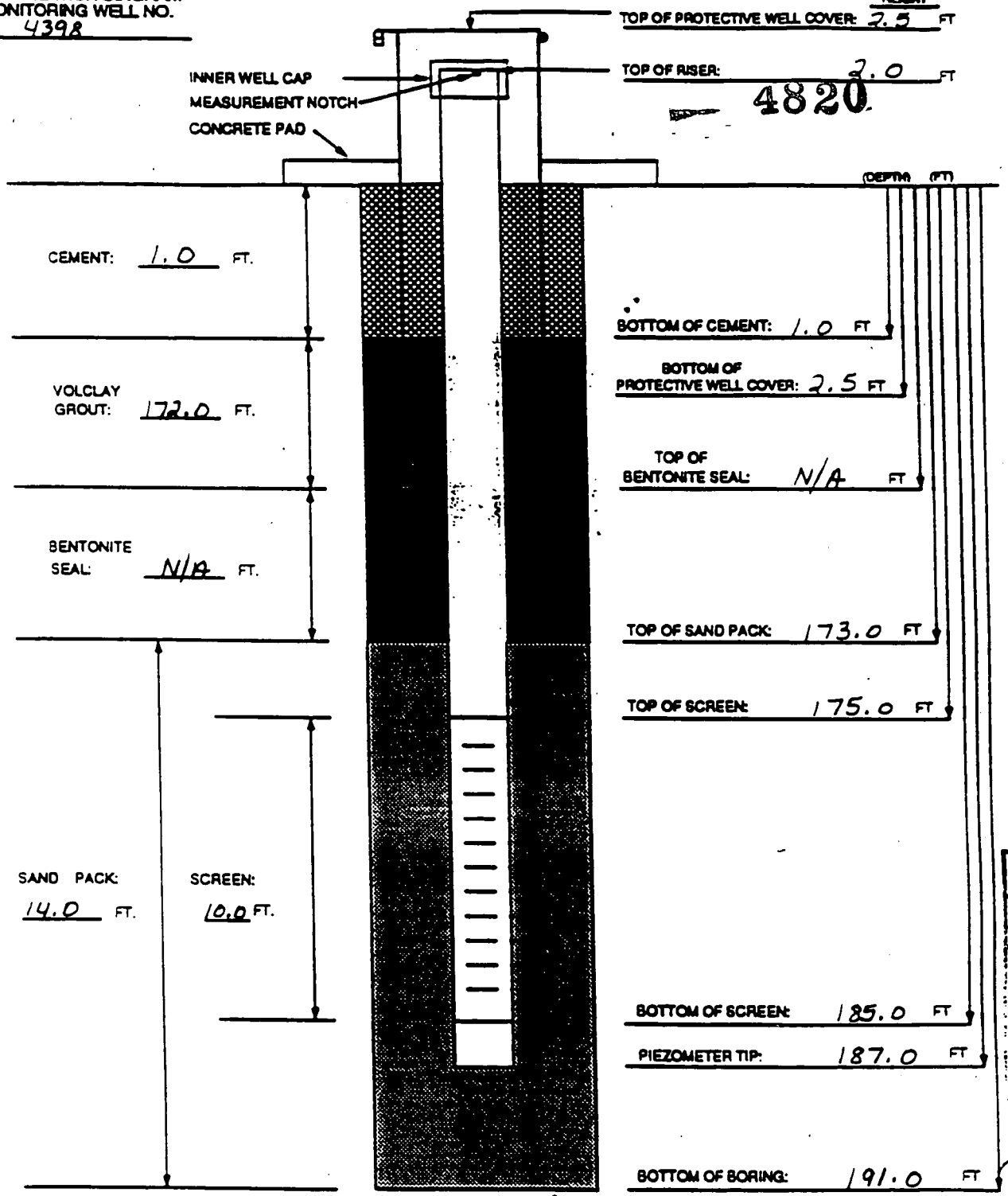
Background { Hnu = 0 ppm, βγ = 30 cpm, α = 0 cpm

* Samples collected per ASTM Standard Penetration Test
* All colors identified by the Munsell Color Chart

4/9

FERNALD RI/FS
INSTALLATION DIAGRAM
MONITORING WELL NO. 4398

INSTALLATION DATE: 11-3-92



	HEIGHT	
TOP OF PROTECTIVE WELL COVER:	2.5	FT
TOP OF RISER:	2.0	FT
BOTTOM OF CEMENT:	1.0	FT
BOTTOM OF PROTECTIVE WELL COVER:	2.5	FT
TOP OF BENTONITE SEAL:	N/A	FT
TOP OF SAND PACK:	173.0	FT
TOP OF SCREEN:	175.0	FT
BOTTOM OF SCREEN:	185.0	FT
PIEZOMETER TIP:	187.0	FT
BOTTOM OF BORING:	191.0	FT

21

MATERIALS USED (15 bags)
SAND TYPE AND QUANTITY: 10/20 ≈ 750 lbs.
BENTONITE PELLETS (5-GALLON BUCKETS): NONE USED
BAGS OF VOLCLAY GROUT: 46 - 50 lbs. bags
AMOUNT OF CEMENT: 40 lbs. - ½ bag
AMOUNT OF WATER USED: 2,300 gallons
OTHER: 2 water drums, 26 soil drums
TASK: RCRA Phase I

NOTES:
1) RISER PIPE IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 4.0 IN. ID. 316 STAINLESS STEEL PIPE WITH 0.010 IN. SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH AND DATE 6.07 FT
5) TOP OF CASING IS SECURED WITH STAINLESS STEEL CAP.
6) PARENTHESIS INDICATE DEPTH B GROUND LEVEL.
7) WELL CASING HAS A PROTECTIVE COVER WITH PADLOCK.

GEOLOGIST/ENGINEER: Michael Worley

ASI FORM 0157 REV. (0)

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

4820

PROJECT NAME RCRA Phase I
PROJECT NO. 602.04.27
BORING NO. 4398
PIEZOMETER NO. 4398

FIELD ENG./GEO. Michael Worley DATE 11-3
CHECKED BY C. Drew DATE 12/02
DATE OF INSTALLATION 11-3-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool
DRILLING FLUID (S) USED:
FLUID Water FROM 0.0 FT TO 190.0 FT
FLUID N/A FROM — TO —

TYPE OF BIT Hammer Percussion B
CASING SIZE (S) USED:
SIZE 10.0 in. ID FROM 0.0 FT TO 190.0
SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well
DIAMETER OF PERFORATED SECTION 4.0 in ID
PERFORATION TYPE:
SLOTS ☒ HOLES ☐ SCREEN ☐
AVERAGE SIZE OF PERFORATIONS 0.010 in.
TOTAL PERFORATED AREA 10.0 FT

RISER PIPE MATERIAL 316 Stainless St
RISER PIPE DIAMETERS:
O.D. 4 3/8 in. I.D. 4.0 in
LENGTH OF PIPE SECTIONS 1-2 FT, 1-3 FT, 17
JOINING METHOD Screw type - flus joint threaded.

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT
PROTECTIVE PIPE O.D. 10 3/4 in

OTHER PROTECTION Hinged locking cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft.)		ELEVATION ( )	
TOP OF RISER PIPE	CORRECTED ~~2.5~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0 FT	BOTTOM 1.0 FT		
VOLCLAY CEMENT GROUT / ~~SLURRY~~ mw 11-3-92	TOP 1.0 FT	BOTTOM 173.0 FT	TOP	BOTTOM
BENTONITE (NONE USED)	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND 10/20	TOP 173.0 FT	BOTTOM 187.0 FT	TOP	BOTTOM
GRAVEL (NONE USED)	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 175.0 FT	BOTTOM 185.0 FT	TOP	BOTTOM
PIEZOMETER TIP	187.0 FT			
BOTTOM OF BOREHOLE	191.0 FT			
GWL AFTER INSTALLATION	60.7 FT			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cement placed 0.0 to 1.0 FT to hold protective cover in place.

4/31

4820

Monitoring Well 2434

Location #13

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I Perimeter Well Inst.	
BORING NUMBER: 2434	COORDINATES:	DATE 9-10-92
ELEVATION:	GWL: Depth 57.5 TOC Date/Time 9-21-92/0800	DATE STARTED: 9-10-92
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 9-21-92
DRILLING METHODS: Cable Tool		PAGE 1 OF 7

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
1	1300 103127 9-10-92	8 12 18	6	Hard (2.5Y, 6/6) ~~light~~ yellow silty clay with organics, non plastic, dry	ML CL CL	>4.5	HNU = 0 ppm Bγ = 40 cpm
2 3	1340 103128 9-10-92	18 25 38	16	Very dense (2.5Y, 7/6) mottled yellow silty clay, non plastic, dry	ML CL	N/A	HNU = 0 ppm Bγ = 40 ppm
4	1355 103129 9-10-92	35 31 31	16	Very dense (2.5Y, 7/6) mottled yellow silty clay, non plastic, dry	ML CL	N/A	HNU = 1 ppm Bγ = 40 cpm
5 6	1410 103130 9-10-92	29 30 32	12	SAA	CL ML	N/A	HNU = 0 ppm Bγ = 40 cpm
	1420 103131 9-10-92	5 28 35	18	Hard (2.5Y, 5/4) mottled olive brown silty clay with trace coarse sand and gravel, low plasticity, slightly moist	CL	4.0	HNU = 0 ppm Bγ = 40 cpm
8 9	0910 103132 9-14-92	10 16 23	6	Very stiff (2.5Y, 6/4) light yellowish brown silty clay, low plasticity slightly moist	CL	3.0	HNU = 0 ppm Bγ = 40 cpm
10	0920 103133 9-14-92	5 11 18	4	Very stiff mottled (2.5Y, 6/3) light yellowish brown silty clay with trace gravel, low plasticity slightly moist	CL	2.5	HNU = 0 ppm Bγ = 40 cpm
11 12	0940 103134 9-14-92	10 16 23	18	Hard (2.5Y, N5/) gray clay with trace sand and gravel, medium plasticity, slightly moist	CL	4.5	HNU = 0 ppm Bγ = 40 cpm
13	0950 103135 9-14-92	12 18 29	9	SAA	CL	1.5	HNU = 0 ppm Bγ = 40 cpm
14 15	1000 N/A 9-14-92	29 29 15	0	Recovery	N/A	N/A	HNU = N/A ppm Bγ = N/A cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cable Tool

Driller: Joe Barile

Bob Johnson

Samples collected per ASTM Standard Penetration Test

* Colors identified by Munsell Color Chart

SAA - SAME AS ABOVE

NA - NOT APPLICABLE

Background Readings: HNU = 0 ppm, Bγ = 40 cpm

2/23

RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.04.27	PROJECT NAME: RCRA Phase I		
BORING NUMBER: 2434	COORDINATES:	DATE: 9-14-92	
ELEVATION:	GWL: Depth 57.5 FT. TOC Date/Time 9-21-92/0800	DATE STARTED: 9-10-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 9-21-92	
DRILLING METHODS: Cable Tool		PAGE 2 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	1020 103136 9-14-92	6 6 18	11	Stiff (2.5Y, N6/) gray clay, trace gravel, medium plasticity slightly moist	CL	2.0	HNu = 0 ppm Bγ = 40 cpm
17 18	1030 103137 9-14-92	3 7 13	14	SAA - for top 10 in. Bottom 4 in. - Loose (10YR, 5/8) yellowish brown silt, slightly moist	CL/ML	1.75/N/A	HNu = 0 ppm Bγ = 40 cpm
19	1035 N/A 9-14-92	50/4 27/4 26	0	NO RECOVERY	N/A	N/A	HNu = 0 ppm Bγ = 40 cpm
20 21	1045 103138 9-14-92	13 27 26	8	Very dense (10YR, 6/4) light yellowish brown gravely sand, Dry	GP ~~SW~~ 9-14-92	N/A	HNu = 0 ppm Bγ = 40 cpm
22	1315 103139 9-14-92	7 21 26	12	SAA - slightly moist	GP	N/A	HNu = 0 ppm Bγ = 40 cpm
23 24 25				NEXT sample at 25.0 ft interval, then at every 5.0 ft. interval to 50.0 ft.			
26	1340 103140 9-14-92	45 50/.5	9	Very dense (10YR, 6/4) light yellowish brown sand, trace gravel, Dry	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
27 28 29 30							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: CABLE TOOL

Joe Barile

Bob Johnson

Samples Collected per ASTM Standard Penetration Chart

*Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background Readings { HNu = 0 ppm, Bγ = 40 cpm

RI/FS

VISUAL CLASS[redacted]OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: [redacted] - Phase I		
BORING NUMBER: 2434	COORDINATES: [redacted]	DATE 9-14-92	
ELEVATION:	GWL: Depth 57.5 ft Date/Time 9-21-92/0800	DATE STARTED: 9-10-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 9-21-92	
DRILLING METHODS: Cable Tool		PAGE 3 OF 7	

DEPTH (ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	1445 103141 9-14-92	25 40 50	12	~~Very dense~~ ~~Hard~~ (10YR, 5/6) yellowish brown coarse sand, trace gravel, dry 9-20-92	SW	N/A	HNu = 0 ppm Bγ = 40 ppm
32							
33							
34							
35							
36	1600 103142 9-14-92	24 30 32	12	SAA - Top 7 inches 9-20-92 Bottom 5 inches - ~~Hard~~ very dense (10YR, 5/6) yellowish brown well graded fine sand, slightly moist	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
37							
38							
39							
40	0820 103143 9-15-92	16 26 39	15	~~Very dense~~ ~~Hard~~ 9-28-92 (10YR, 5/6) yellowish brown fine sand, trace gravel, slightly moist	SW	N/A	HNu = 0 ppm Bγ = 40 cpm
41							
42							
43							
44							
45							

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cable Tool

Jee Barile

Bob Johnson

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background Readings { HNu = 0 ppm, Bγ = 40 cpm

* Samples collected per ASTM Standard Penetration Chart
* Colors identified by the Munsell Color Chart

Date 2/4/93

Incd CO

425

RI/FS

4820

VISUAL CLASS[redacted] OF SOILS

PROJECT NUMBER. 602.04.27	PROJECT NAME. RCRA Phase I	
BORING NUMBER: 2434	COORDINATES:	DATE 9-15-92
ELEVATION:	GWL: Depth 57.6' Date/Time 9-21-92/0900	DATE STARTED: 9-10-92
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 9-21-92
DRILLING METHODS: Cable Tool		PAGE 4 OF 7

DEPTH (Ft)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 INCHES	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	0930 103144 9-15-92	10 29 50/.4	14	~~Very dense~~ ~~Hard~~ (10YR, 5/4) yellowish brown coarse poorly graded sand, trace gravel, slightly moist	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
47							
48							
49							
50							
51	1020 103145 9-15-92	9 28 49	15	SAA ~~Very dense~~ ~~Hard~~	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
52	1100 103146 9-15-92	46 50/.2	15	~~Very dense~~ ~~Hard~~ (10YR, 5/4) yellowish brown gravely sand, moist	GP	N/A	HNU = 0 ppm Bγ = 40 cpm
53 54	1315 ~~103146~~ 103147 9-15-92	10 12 27	15	SAA - wet ~~Very dense~~ ~~Hard~~	GP	N/A	HNU = 0 ppm Bγ = 40 cpm
55 56	1330 103148 9-15-92	15 42 50	18	(2.5Y, 5/2) grayish brown coarse gravely sand, wet ~~Very dense~~ ~~Hard~~	GP	N/A	HNU = 0 ppm Bγ = 40 cpm
57	1345 103149 9-15-92	22 24 27	18	(2.5Y, 5/2) grayish brown poorly graded sand, trace gravel, wet ~~Very dense~~ ~~Hard~~	SP	N/A	HNU = 0 ppm Bγ = 40 cpm
58 59	1445 103150 9-15-92	24 44 50	15	SAA ~~Very dense~~ ~~Hard~~	SP	N/A	HNU = ~~N/A~~ 0 ppm 9-15-92 Bγ = ~~N/A~~ 40 cpm 9-15-92
60	1510 103151 9-15-92	30 48 50	18	(2.5Y, 5/2) grayish brown well graded sand, trace gravel, wet ~~Very dense~~ ~~Hard~~	SW	N/A	HNU = 0 ppm Bγ = 40 cpm

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cable Tool

: Joe Barile

Bob Johnson

* Samples collected per ASTM Standard Penetration Chart
* Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE
NA - NOT APPLICABLE

Background Readings { HNU = 0 ppm, Bγ = 40 cpm

Date	9/21/92
Initial	RB

426

RI/FS

VISUAL CLASS[redacted] OF SOILS

4820

PROJECT NUMBER: 602.04.27	PROJECT NAME: [redacted] Phase I		
RING NUMBER: 2434	COORDINATES:	DATE 9-15-92	
ELEVATION:	GWL: Depth 67.6 Date/Time 9-21-92/0800	DATE STARTED: 9-10-92	
ENGINEER/GEOLOGIST: Michael Worley	Depth Date/Time	DATE COMPLETED: 9-21-92	
DRILLING METHODS: Cable Tool		PAGE 5 OF 7	

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 1 (IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.5				See page 4 of 7			
61	1530 103152 9-15-92	62 44 47	18	Very dark ~~Hard~~ (2.5Y, 5/2) grayish brown well graded coarse sand, trace gravel, wet	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
62	1650 103153 9-15-92	17 28 37	18	SAA	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
63	1710 103154 9-15-92	24 35 50	18	SAA	SW	N/A	HNU = 0 ppm Bγ = 40 cpm
64							
65				Bottom of sampling 65.0 FT			
66							
67							
68							
69							
70				Bottom of boring 70 FT.			

NOTES:

Drilling Contractor: Pennsylvania Drilling

Drilling Equipment: Cable Tool

Inspector: Joe Barile

Bob Johnson

Samples collected per ASTM Standard Penetration Chart

*Colors identified by the Munsell Color Chart

SAA - SAME AS ABOVE

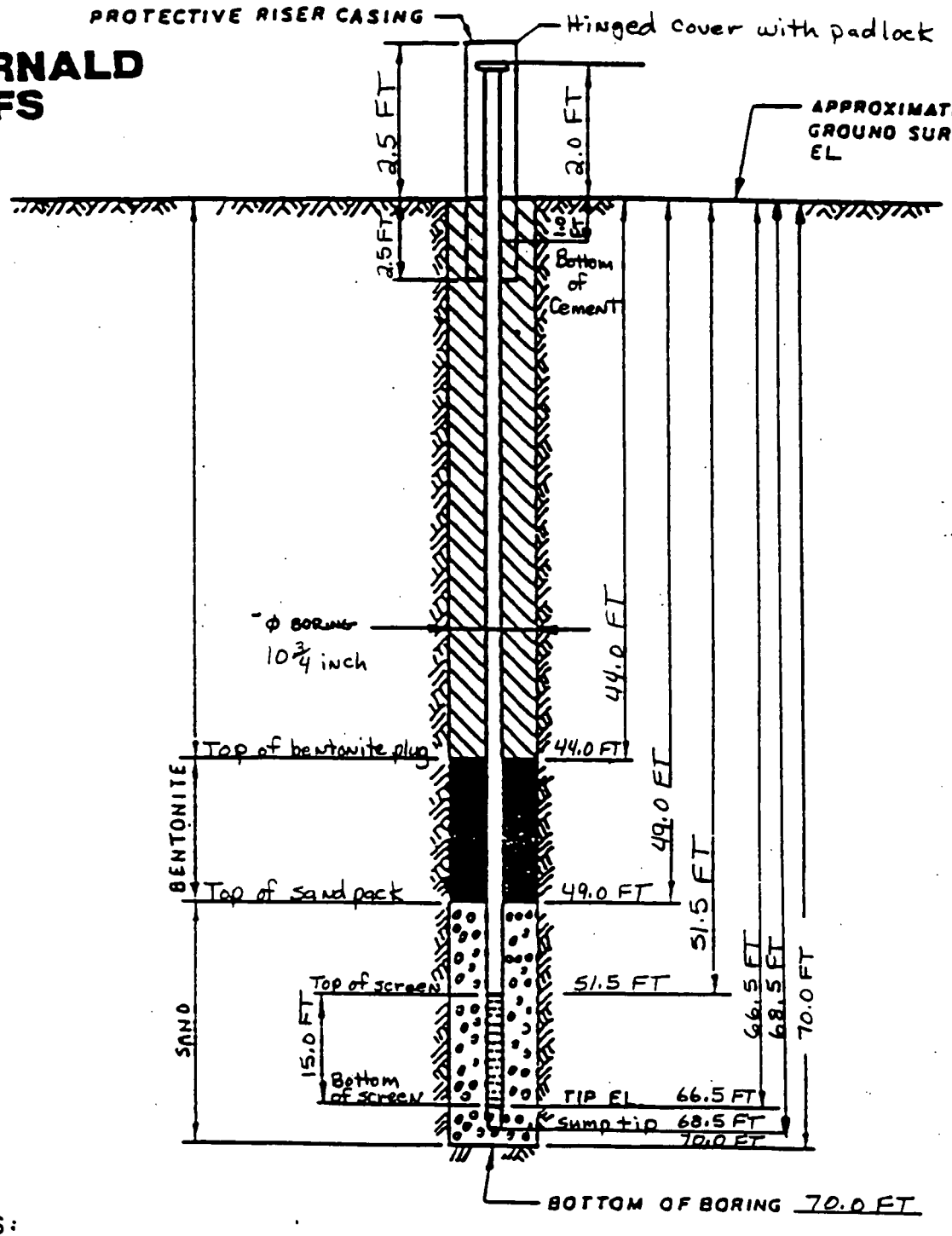
NA - NOT APPLICABLE

Background Readings { HNU = 0 ppm, Bγ = 40 cpm

*Sieve analysis sample collected from 50.0-65.0 FT

4/27

FERNALD RI/FS



NOTES:

1. RISER PIPE IS 4 IN 10 SCHEDULE PIPE, THREADED. FLUSH-JOINTED.
2. SCREEN IS 4 IN 10 316 PIPE CONTINUOUS SLOT SCREEN (0.020 IN. SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED. (with welded silt trap)
4. ELEVATION OF WATER LEVEL 57.5 (Top of riser)
5. WATER LEVEL READING ON 09-21-92

materials used during well installation:

15 80 lb. bags of 10/20 sand
11 50 lb. bags of volclay grout
7 5 gal. buckets of bentonite pellets
500 gallons of water used during grouting and drilling procedures
316 stainless steel pipe sections: 1-1.5 FT; 1-2 FT; 5-10 FT, 1-15 FT screen with 2 FT silt trap

INSTALLATION DETAILS
MONITORING WELL #2434

PREPARED FOR
FMPC RI/FS

DRAWING NUMBER
CHECKED BY
APPROVED BY

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET 4820

PROJECT NAME RCRA Phase I Perimeter Well Installation
FIELD ENG./GEO. Michael Worley DATE 9-21-92
PROJECT NO. 602.04.27
CHECKED BY _____ DATE _____
BORING NO. 2434
PIEZOMETER NO. 2434
DATE OF INSTALLATION 9-21-92

BOREHOLE DRILLING

DRILLING METHOD Cable Tool	TYPE OF BIT Hammer Percussion Bit
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID water FROM 0.0 FT TO 70.0 FT	SIZE 10.0 IN. ID FROM 0.0 FT TO 70.0 FT
FLUID N/A FROM — TO —	SIZE N/A FROM — TO —

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL 316 Stainless steel
DIAMETER OF PERFORATED SECTION 4.0 IN. ID	RISER PIPE DIAMETERS:
PERFORATION TYPE:	O.D. 4 3/8 inch I.D. 4.0 inch
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 1-15 FT, 5-10 FT, 1-2 FT, 1-1
AVERAGE SIZE OF PERFORATIONS 0.020 inch	JOINING METHOD Screw type-flush
TOTAL PERFORATED AREA 15.0 FT	joint threaded

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5.0 FT	OTHER PROTECTION Hinged locking
PROTECTIVE PIPE O.D. 10 3/4 inch	Cover with padlock

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.5~~ 2.0 9-20-92			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:	TOP 0.0	BOTTOM 1.0		
GROUT / ~~SLURRY~~ cement 9-21-92	TOP 1.0	BOTTOM ~~42.0~~ 44.0 9-21-92	TOP	BOTTOM
BENTONITE PELLETS	TOP 44.0	BOTTOM 49.0	TOP	BOTTOM
SAND 10/20	TOP 49.0	BOTTOM ~~68.5~~ 70.0 9-21-92	TOP	BOTTOM
GRAVEL NONE USED	TOP N/A	BOTTOM N/A	TOP	BOTTOM
PERFORATED SECTION	TOP 51.5	BOTTOM 66.5	TOP	BOTTOM
PIEZOMETER TIP	68.5			
BOTTOM OF BOREHOLE	70.0			
GWL AFTER INSTALLATION	57.5 (TOC)			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS Cement placed from 0.0 to ~~0.5~~ 1.0 FT to hold protective cover in place. CG 9-21-92

429

4820

Monitoring Well 3069

Location #13

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS		
BORING NUMBER: 369	COORDINATES:		DATE: 4/5/88
ELEVATION: ~ 574 Ft	GWL: Depth	Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth	Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL			PAGE 1 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0	08739	3 4 6	14	Stiff, Dark Yellowish Brown (10YR 4/6) Silty Clay, trace sand, trace fine gravel, Moist 1.0	CL	1.5	t: 1145 Hnu: 0ppm α: 2cpm γ/β: 60cpm
				Stiff Brownish Yellow (10YR 6/6) Silty Clay, trace sand trace fine gravel, moist 1.5			
2.5	08740	4 13 13	17	Very Stiff, Yellowish Brown (10YR 5/6) Clay, some silt. Moist. 3.0	CL	2.2	t: 1152 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08741	10 11 18	18	Very Stiff, light Yellowish Brown (10YR 6/4) Clay, some silt, trace sand. Moist 4.5	CL	3.0	t: 1158 Hnu: 0ppm α: 2cpm γ/β: 60cpm
5.0	08742	18 23 25	18	Very Stiff, Brownish Yellow (10YR 6/6) Silt, some very fine sand and clay. Moist. 6.5	ML	2.5	t: 1202 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08743	35 30 31	18	Hard, Brown (10YR 5/3). Clay, some silt, trace sand and gravel. Moist 7.5	CL	>4.5	t: 1210 Hnu: 0ppm α: 2cpm γ/β: 60cpm
7.5	08744	5 10 16	16	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand and silt. Moist with Brown (Iron Oxide) stained fracture surfaces.	CL	>4.5	t: 1635 Hnu: 0ppm α: 2cpm γ/β: 60cpm
10.0	08745 08746 08747	8 9 10	14	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand, trace silt. Moist with Brown stained fracture surfaces.	CL	>4.5	t: 1655 Hnu: 0ppm α: 2cpm γ/β: 60cpm
	08748	8 12 18	18	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand, trace silt, moist.	CL	>4.5	t: 1735 Hnu: 0ppm α: 2cpm γ/β: 60cpm
11.5	08749	8 19 25	16	Hard, Gray (7.5YR 5/0) Clay, some fine to coarse gravel, trace sand, trace silt. moist. 13.4	CL	>4.5	t: 0746 4/6/88 Hnu: 0ppm α: 2cpm γ/β: 50cpm
15.0	08750	20 20 29	15	Dense, Yellowish Brown (10YR 5/6) Fine to medium sand, some silt, trace fine gravel, Moist interbedded with sandy silt.	SM/ML	--	t: 0803 Hnu: 0ppm α: 2cpm γ/β: 50cpm

NOTES:

Contractor : Pennsylvania Drilling
Driller : Joe Barile
Helper : Todd Brooks/John Rhodes
Rig : 72 Speedstar

Water Used During Drilling = 800 gallons
Soil Sampling as per ASTM
Color Descriptions as per Munsell
Field Measurements : Hnu, α, γ/β

4/31

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/6/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 2 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
15.0	08751	17 18 13	16	Dense, Yellow Brown (10YR 5/6) fine to coarse sand, trace silt. Moist 16.2	SP		t: 0825 Hau: 0ppm α: 1cpm γ/β: 50cpm
				Hard, Gray (7.5 YR 5/0) Clay with some gravel. Moist.	CL	4.0	
17.5	08752	8 12 13	12	Hard, Gray (7.5 YR 5/0) Clay, trace gravel. Moist. 18.2	CL	>4.5	t: 0840 Hau: 0ppm α: 2cpm γ/β: 50cpm
	08753	31 50/5"	11	Very Stiff, Yellowish Brown (10 YR 5/6) very fine sandy Silt. Moist. 19.7	ML	3.0	t: 0855 Hau: 0ppm α: 2cpm γ/β: 50cpm
20.0	08754	13 17 21	14	Dense, Brownish Yellow (10 YR 6/6) Sand, fining upward, some gravel, trace silt. Moist 21.0	SW		t: 0802 4/7/88 Hau: 0ppm α: 1cpm γ/β: 40cpm
22.5	08755	26 50/5.5"	11	Very Dense, Brownish Yellow (10YR 6/6) Sand fine to coarse, poorly sorted, some fine to coarse gravel, trace silt. Moist	SP		t: 0940 Hau: 0ppm α: 2cpm γ/β: 60cpm
25.0	08756	10 50/5.5"	11	Very Dense, Yellowish Brown (10YR 5/6) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. Moist.	SP		t: 1117 Hau: 0ppm α: 2cpm γ/β: 50cpm
27.5							
30.0							

NOTES:

48 20

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/7/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 3 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
30.0	08757	14 27 36	16	Very dense, Brownish Yellow (10YR 6/6) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. Moist	SP		t = 1155 Hnu = 0ppm α = 2cpm γ/β = 40cpm
32.5							
35.0	08758	27 47 50/5"	16	Very dense, Yellowish Brown (10YR 5/8) fine sand, well sorted, some silt, trace gravel. Moist 35.1	SM		t = 1412 Hnu = 0ppm α = 2cpm γ/β = 60cpm
37.5							
40.0	08759	27 47 46	18	Very dense, Yellowish Brown (10YR 5/8) fine sand, some silt, trace gravel. Moist 41.0	SM		t = 1437 Hnu = 0ppm α = 2cpm γ/β = 60cpm
42.5				Very dense, Brownish Yellow (10YR 6/8) fine sand, some coarse gravel, some silt, Moist.			
45.0							

NOTES:

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/7/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 4 OF 10

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
45	08760	30 50/2"	4	Very Dense, Yellowish Brown (10YR 5/4), Gravelly Sand, poorly sorted, some silt. Moist.	SP		t = 1651 Hau: 0ppm α: 2cpm γ/β = 50cpm
47.5							
50.0	08761	37 28 40	16	Very Dense, Brownish Yellow (10YR 6/6) Sand, poorly sorted, some gravel, trace silt. Moist.	SP		t = 1733 Hau: 0ppm α: 2cpm. γ/β = 40cpm
52.5				53			
55.0	08762	13 21 33	12	Very Dense, Dark Yellowish Brown (10YR 4/6) Sand, fine to medium, some gravel, trace silt. Moist.	SW		t = 0834 4/8/88 Hau: 0ppm α: 2cpm γ/β = 60cpm
57.5				58			
60.0							

NOTES:

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
60.0	08763	18 32 30	15	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, fine to coarse, poorly sorted, trace fine gravel, trace silt. Wet	SP		t: 1135 Hm: 0ppm α: 2cpm β/p: 50cpm
62.5							Blow sand previous to sample.
65.0	08764	50/4"	4	Very Dense, Yellowish Brown (10YR 5/4), Silty Sand with some fine gravel. Wet.	SM		t: 1208 Hm: 0ppm α: 2cpm β/p: 50cpm
67.5							
70.0	08765	37 33 38	17	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, fine to coarse, poorly sorted, trace fine gravel, trace silt. Wet.	SP		t: 1329 Hm: 0ppm α: 2cpm β/p: 50cpm
72.5							
75.0							

NOTES:

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/8/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 6 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
75.0	08766	50/5.5" 50/5"	8	Very Dense, Dark Yellowish Brown (10YR 4/4), Gravelly Sand, poorly sorted, trace silt. Wet.	SP		t: 1515 Hau: 0ppm α: 2cpm γ/β: 40cpm
77.5							
80.0	08767	13 16 21	14	Dense, Dark Yellowish Brown (10YR 4/6) Sand, fine to coarse, poorly sorted, trace gravel, trace silt. Wet.	SP		t: 1558 Hau: 0ppm α: 2cpm γ/β: 50cpm
82.5							
85.0	08768	38 50/5"	10	Very Dense, Yellowish Brown (10YR 3/6), Gravelly Sand, poorly sorted, trace silt. Wet.	SP		t: 1705 Hau: 0ppm α: 2cpm γ/β: 40cpm
87.5							
90.0							

NOTES:

436

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth. Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 7 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
90	38769	11 17 26	16	Dense, Yellowish Brown (10YR 5/4) Sand, poorly sorted, some gravel, trace silt. Wet.	SP		t: 0837 Hau: 0ppm α: 2cpm γ/β: 50cpm
92.5							
95.0	08770	40 50/5"	10	Very Dense, Dark Yellowish Brown (10YR 4/6), Gravelly Sand, poorly sorted fine sand to fine gravel, trace silt. Wet.	SP		t: 1000 Hau: 0ppm α: 2cpm γ/β: 50cpm
97.5							
100.0	08771	8 13 15	8	Medium Dense, Dark Yellowish Brown (10YR 4/6) Gravelly Sand, poorly sorted fine sand to fine gravel, trace silt. Wet.	SP		t: 1050 Hau: 0ppm α: 2cpm γ/β: 50cpm
102.5							
105.0							

NOTES:

402-11-4

VISUAL CLASSIFICATION OF SOILS 4820

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 8 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in.)	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
105	08772	30 50/5"	10	Very Dense, Dark Yellowish Brown (10YR 4/4) Sand, fine to coarse, poorly sorted, trace gravel, trace silt. wet	SP		t: 1301 Hau: 0ppm α: 2ppm β/p: 40ppm
107.5							
110.0	08773	11 13 18	6	Dense, Dark Yellowish Brown (10YR 4/4), Gravelly Sand, fine sand to coarse gravel, poorly sorted, trace silt. wet.	SP		t: 1352 Hau: 0ppm α: 2ppm β/p: 70ppm
112.5							
115.0	08774	22 27 24	15	Very Dense, Dark Yellowish Brown (10YR 4/4), Sand, poorly sorted. Some fine to coarse gravel, trace silt. wet.	SP		t: 1533 Hau: 0ppm α: 2ppm β/p: 50ppm
117.5							
120.0							

NOTES:

438

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/9/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 9 OF 10

DEPTH (Ft.)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 6 in.	RECOVERY (in.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
120	08775	2 9 16	9	Medium Dense, Yellowish Brown (10YR 5/4) Sand, fine to coarse, poorly sorted, some fine gravel, trace silt. wet.	SP		t: 1616 Hnu: 0ppm α: 2cpm β/γ: 60cpm
122.5							
125.0	08776	5 11 17	12	Medium Dense, Gray (7.5 YR 5/0) Sand, fine to coarse, poorly sorted, trace fine gravel. wet.	SP		t: 1725 Hnu: 0ppm α: 2cpm β/γ: 40cpm
127.5							
130.0	08777	6 9 15	6	Medium Dense, Gray (7.5 YR 5/0), Gravelly Sand, fine sand to coarse gravel, poorly sorted, trace silt. wet	SP		t: 0852 4/10/88 Hnu: 0ppm α: 2cpm β/γ: 50cpm
132.5							
135.0							

NOTES:

439

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602.3.2	PROJECT NAME: Fernald RI/FS	
BORING NUMBER: 369	COORDINATES:	DATE: 4/10/88
ELEVATION:	GWL: Depth Date/Time	DATE STARTED: 4/5/88
ENGINEER/GEOLOGIST: DAVIES	Depth Date/Time	DATE COMPLETED: 4/12/88
DRILLING METHODS: CABLE TOOL		PAGE 10 OF 10

DEPTH (Ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6 in)	RECOVERY (in)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
135	08778	25 25 19	16	Dense, Brown (10YR 5/3) Sandy poorly sorted, trace gravel, trace silt. wet.	SP		t: 1035 H_{an}: 0ppm α: 2cpm γ/β: 50cpm
				END OF BORING			
137.5							
140.2							

NOTES:

440

4C2-11

4820

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. DAVIES DATE 4/12/88
PROJECT NO. 6021.3.2 CHECKED BY _____ DATE _____
BORING NO. 369
PIEZOMETER NO. 369 DATE OF INSTALLATION 4/12/88

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL
DRILLING FLUID (S) USED:
FLUID H_2O FROM 0 TO 136.5 Ft
FLUID _____ FROM _____ TO _____

TYPE OF BIT Steel Hammer
CASING SIZE (S) USED:
SIZE 10 in FROM 0 TO 135.0 Ft
SIZE _____ FROM _____ TO _____

PIEZOMETER DESCRIPTION

TYPE Monitoring well
DIAMETER OF PERFORATED SECTION 4 in
PERFORATION TYPE:
SLOTS ☐ HOLES ☐ SCREEN ☒
AVERAGE SIZE OF PERFORATIONS 0.010 in
TOTAL PERFORATED AREA 10 Ft

RISER PIPE MATERIAL Stainless Steel
RISER PIPE DIAMETERS:
O.D. 4 3/8 in I.D. 4.0 in
LENGTH OF PIPE SECTIONS 10, 5, 2 Ft.
JOINING METHOD Screw ~~weld~~ Lock

ROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 Ft
PROTECTIVE PIPE O.D. 10 3/4 in
OTHER PROTECTION Locking cap and padlock

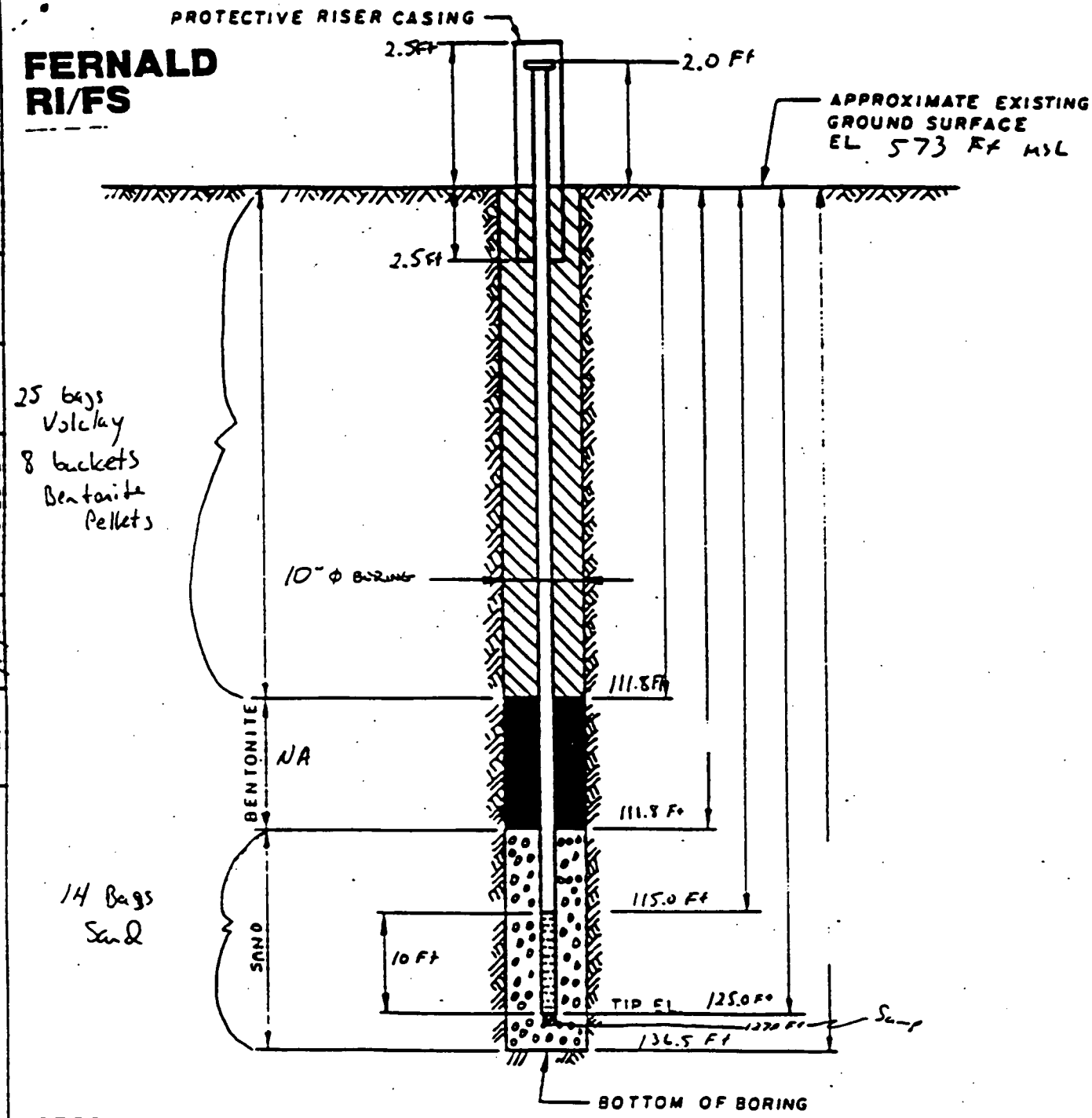
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (Ft)		ELEVATION ( )	
TOP OF RISER PIPE	~~2.0~~ 2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0	BOTTOM 111.8	TOP	BOTTOM
BENTONITE	TOP	BOTTOM	TOP	BOTTOM
SAND	TOP 111.8	BOTTOM 136.5	TOP	BOTTOM
GRAVEL	TOP	BOTTOM	TOP	BOTTOM
PERFORATED SECTION	TOP 115.0	BOTTOM 125.0	TOP	BOTTOM
PIEZOMETER TIP	127.0			
BOTTOM OF BOREHOLE	136.5			
GWL AFTER INSTALLATION	NA			

IS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☑
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☑
REMARKS Natural cavin to 131.0 Ft

441

4820

FERNALD RI/FS



DRAWING NUMBER

CHECKED BY

APPROVED BY

DRAWN BY

NOTES:

1. RISER PIPE IS 4 IN I.D. SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D S.S. PIPE CONTINUOUS SLOT SCREEN (0.0 0 IN. SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

INSTALLATION DETAILS
MONITORING WELL 369

PREPARED FOR

442

482

Monitoring Well 2106

Location #14

FERNALD RI/FS

	Date
Data Entry	2-9-89
4820	
2nd Rev	
Word Copy Verification	

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 6022 3.2	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 2106	COORDINATES:	DATE: 1/25/89, 1/26/89, 1/31/
ELEVATION: ≈ 540.0 FT	GWL: Depth 20.2 FT Date/Time 1/31/89 0900	DATE STARTED: 1-25-8
ENGINEER/GEOLOGIST: TESORIERO	Depth Date/Time	DATE COMPLETED: 1/31/89
DRILLING METHODS: CABLE TOOL		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER 1 N/A	RECOVERY (N/A)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
				SEE BORING 3106 FOR SAMPLE DESCRIPTION			
10							
20							
30							
				BOTTOM OF BORING 2106 = 35 FT			
40							

NOTES:

Total water = 300 gallons for drilling & completion

Ground Water level was from MW 3106, approximately 10 Ft. away from this well. Elevations of the 2 wells are very close to being equal.

FERNALD RI/FS

PIEZOMETER INSTALLATION SHEET

PROJECT NAME Fernald RI/FS FIELD ENG./GEO. S. Battelle DATE 1/31/89
PROJECT NO. 607-3.2 CHECKED BY WAHartel DATE 2-9-89
BORING NO. 210b
PIEZOMETER NO. 210b DATE OF INSTALLATION 1/31/89

BOREHOLE DRILLING

DRILLING METHOD Cable	TYPE OF BIT Hammer
DRILLING FLUID (S) USED:	CASING SIZE (S) USED: WAH 2-9-89
FLUID Water FROM 0 TO 35	SIZE 10 in ID FROM 0 TO 35
FLUID -- FROM -- TO --	SIZE -- FROM -- TO --

PIEZOMETER DESCRIPTION

TYPE Monitoring Well	RISER PIPE MATERIAL Stainless Steel
DIAMETER OF PERFORATED SECTION 4 inch	RISER PIPE DIAMETERS:
PERFORATION TYPE: ID WAH 2-9-89	O.D. 4 3/8 in I.D. 4 in
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 2, 5, 10 ft Secs
AVERAGE SIZE OF PERFORATIONS .010 in	JOINING METHOD ~~flush thread~~ WAH 2-9-89
TOTAL PERFORATED AREA 15 ft	Screw Type, Threaded, Flush Joint

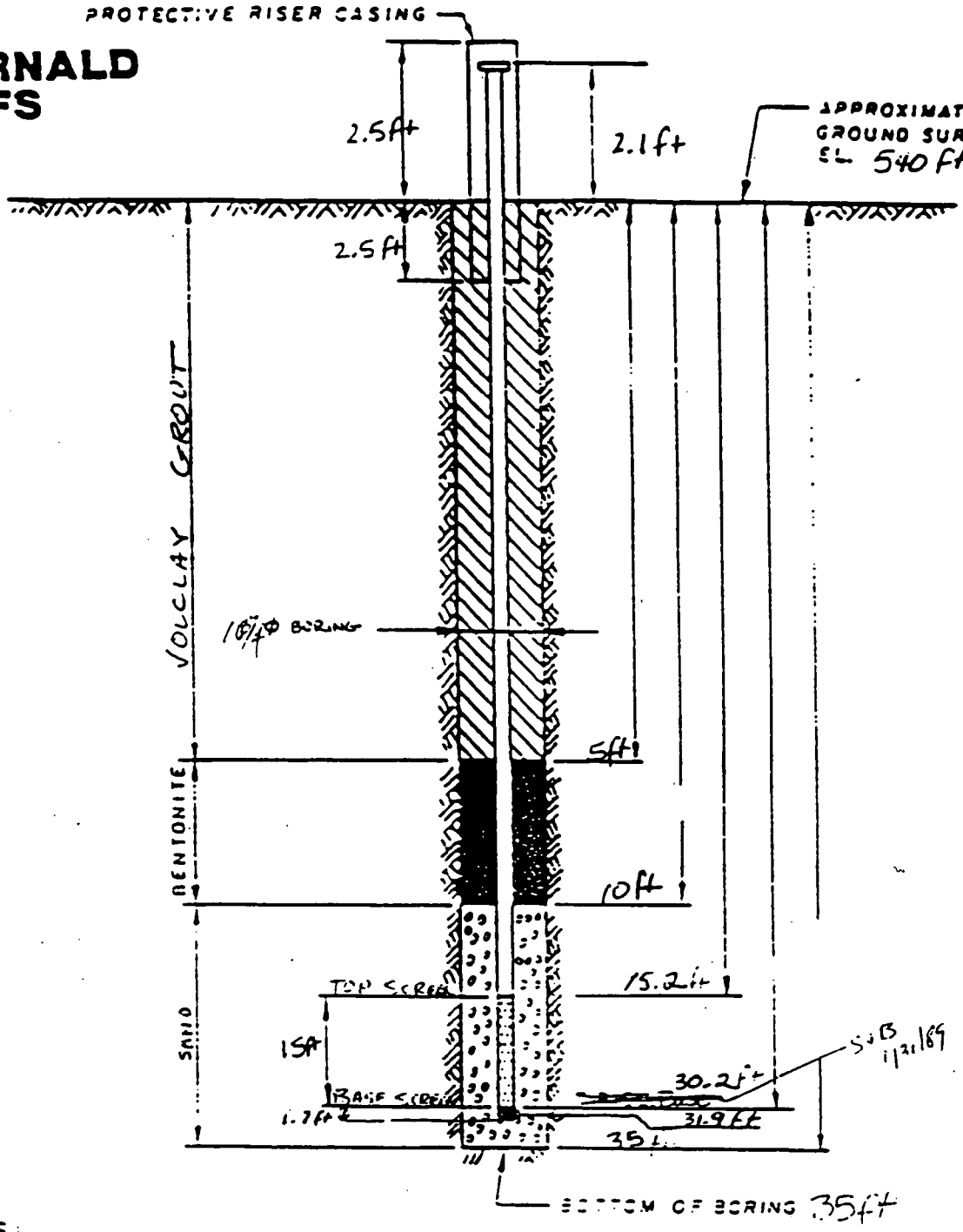
PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 ft	OTHER PROTECTION locking lid w/padlock
PROTECTIVE PIPE O.D. 10.5 in	

ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (ft)		ELEVATION ( )	
TOP OF RISER PIPE	2.1			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	(-2.5) ft			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP Surface	BOTTOM 5ft	TOP	BOTTOM
BENTONITE	TOP 5ft	BOTTOM 10ft	TOP	BOTTOM
(10-20) SAND SE 1/31/89	TOP 10ft	BOTTOM 32ft	TOP	BOTTOM
~~GRAVEL~~ #4-30 Crs Sd.	TOP 32 ft	BOTTOM 35ft	TOP	BOTTOM
PERFORATED SECTION	TOP 15.2ft	BOTTOM 30.2ft	TOP	BOTTOM
PIEZOMETER TIP	31.9 ~~34~~ ft SE 1/31/89			
BOTTOM OF BOREHOLE	35ft			
GWL AFTER INSTALLATION				

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
WAS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒
REMARKS Jim Tescierge observed drilling of boring
Sarah Battelle observed well installation

FERNALD RI/FS



DRAWING NUMBER			
		WDH	2.9.89
CHECKED BY	APPROVED BY		
SJB			
DRAWN BY			

NOTES:

1. RISER PIPE IS 4 IN I.D SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE).
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL 520 ft (20ft)
5. WATER LEVEL READING ON 01-31-89

INSTALLATION DETAILS
MONITORING WELL 2106

PREPARED FOR

15ft screen w/ 1.7' welded silt trap
17.3 ft of blank casing

23 bags of 1020 (80 lbs/sx), 3 Bags of volclay grout
2 bags of 430 (80 lbs/sx), 7 1/2 sx pellets (bentonite)

446

Total water used during [illegible] of completion = 300 gallons

Monitoring Well 3106

Location #14

NALD
FS

4820

VISUAL CLASSIFICATION OF SOILS

NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
NUMBER: 3106	COORDINATES:	DATE: 01-19-89
ON: ~540.0 FT	GWL: Depth 19.6 Date/Time 1-24-89 0800	DATE STARTED: 01-18-89
R/GEOLOGIST: M. SLUSARSKI	Depth 19.8 Date/Time 1-26-89 0840	DATE COMPLETED: 01-25-89
G METHODS: CABLE TOOL		PAGE 1 OF 9

SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
0560 500 01-18	3 5 7	10.0	MEDIUM STIFF, BROWN (10YR 3/2) SILTY CLAY, ROOTLETS, TRACE SAND, DAMP	CL	1.0	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
0561 506 01-18	2 5 7	4.0	MEDIUM STIFF, BROWN (10YR 3/2) SILTY CLAY, TRACE SAND, DAMP	CL	1.0	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
0562 508 01-18	4 7 12	6.0	MEDIUM STIFF, BROWN (10YR 3/2) SILTY CLAY, TRACE SAND, DAMP	CL	1.0	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
[illegible] 01	9 16 22	14.0	STIFF, BROWN (10YR 3/2) SILTY CLAY, TRACE SAND, DAMP	CL	2.0	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
0564 5.6 01-19	23 25 32	19.0	VERY STIFF, BROWN (10YR 4/2) SILTY CLAY, TRACE COARSE GRAVEL (0.5-2.0 IN), DAMP	CL	2.5	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
0565 665 01-19	4 9 12	9.0	VERY STIFF, BROWN (10YR 3/2) SILTY CLAY, WET	CL	2.5	HNU = 0 PPM α = 0 CPM BG = 20-40 CPM
0566 1650 01-19	3 6 7	19.0	VERY STIFF, BROWN (10YR 3/2) SILTY CLAY, WET "BASE OF TILL" 9.5	CL	2.5	HNU = 0 PPM α = 0 CPM BG = 40 CPM
			LOOSE, YELLOW-BROWN (10YR 5/4) POORLY GRADED SAND, DRY	SP	N/A	

[illegible] PARKER
[illegible] 42
[illegible]: JOE PARKER
ASSISTANT: LARRY BOCHI

SAMPLES COLLECTED AS PER ASTM STANDARD PROCEDURE [illegible]
[illegible] IDENTIFIED USING MUNSELL COLOR CHART
BACKGROUND LEVELS: HNU = 0 PPM LEL = 0 PPM LEL
[illegible] SDM α = 0 CPM >20% O.
BG = 20-40 CPM

[illegible] 1640 GALLONS

448

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 3.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3106	COORDINATES:	DATE: 01-19-89
ELEVATION: ~540.0	GWL: Depth 26.0 ft Date/Time 1-19-89 @ 1705	DATE STARTED: 01-18-89
ENGINEER/GEOLOGIST: M. SLUSARSKI	Depth 29.8 ft Date/Time 1-26-89 @ 0750	DATE COMPLETED: 01-21-89
DRILLING METHODS: CABLE TOOL	26.5 FT " 1-21-89 @ [illegible]	PAGE 2 OF 9

24.1 FT 1-22-89 0800
26.0 FT 1-23-89
20.8 FT 1-27-89 0800
1115
19.6 FT. 0800 1-24-89

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
16	10567 1005 01-19	14 13 17	14	MEDIUM DENSE, YELLOW-BROWN (10YR 4/4) WELL GRADED GRAVELLY SAND, GRAVEL RANGING FROM (.25 - .75 in) DRY	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
17							
18							
19							
1-20-89 20							
21	10568 1028 01-19	13 18 19	12	DENSE, YELLOW-BROWN (10YR 4/4) WELL GRADED GRAVELLY SAND, GRAVEL (.25 - .75 in) ~~DRY~~ WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
22							
23							
24							
25							
26	10569 1120 01-19	15 19 17	14	DENSE, YELLOW-BROWN (10YR 4/4) WELL GRADED GRAVELLY SAND, GRAVEL (.25 - .75 in) WET	SW	N/A	HNU = 0 PPM α = 0 CPM Bβ = 40-60 CPM
27							
28							
29							

NOTES:

SDM
DKO JAN 20 1989

449

FERNALD
RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 7.2	PROJECT NAME: FERNALD RI/FS	
BORING NUMBER: 3106	COORDINATES:	DATE: 1-19-89
ELEVATION: ~540.0	GWL: Depth 33.3' Date/Time 1-20-89 1700	DATE STARTED: 01-18-89
ENGINEER/GEOLOGIST: H. Sweeney	Depth Date/Time	DATE COMPLETED: 01-21-89
DRILLING METHODS: CABLE TOOL		PAGE 5 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
31	10570 1140 01-19	17 16 17	14	DENSE, YELLOW-BROWN (10 YR 4/4) WELL GRADED GRAVELLY SAND, GRAVEL (.25-.75 IN) WET	SW	N/A	Hnw = 0 ppm α = 0 cpm Bβ = 20-40 cpm
32							
33							
34							
35	10571 1556 01-19	16 34 22	12	VERY DENSE, BROWN, (10 YR 4/3). POORLY GRADED SAND, TRACE OF FINE GRAVEL (.25-.5 IN) AT 35.5 FT. WET.	SP	N/A	Hnw = 0 ppm α = 0 cpm Bβ = 20-40 cpm
36							
37							
38							
39							
40	10572 1615 01-19	16 18 20	17	DENSE, YELLOW-BROWN (10 YR 4/4). WELL-GRADED SANDY FINE GRAVEL, WET.	GW	N/A	Hnw = 0 ppm α = 0 ppm Bβ = 20-40 cpm
41							
42							
43							
44							

NOTES: * Measured water level at 1700, [illegible]

SDM
OKD JAN 20 1989

450

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 602 TASK 3.2	PROJECT NAME: EMPR RI/FS		DATE: 01-20-89
BORING NUMBER: 3106	COORDINATES:		DATE STARTED: 1-18-89
ELEVATION: ~540.0 FT	GWL: Depth	Date/Time	DATE COMPLETED: 1-21-89
ENGINEER/GEOLOGIST: E. TROLLINGER	Depth	Date/Time	PAGE 4 OF 9
DRILLING METHODS: CABLE TOOL			

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
46	10573 0817 01-20	12 20 26	8	DENSE, DARK BROWN (10YR 3/3), WELL GRADED GRAVELLY SAND, FINE TO COARSE, WET.	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 20 cpm
47							
48							
49							
50	10574 0845 01-20	5 8 13	6	MEDIUM DENSE, BROWN, (10YR 4/3) WELL GRADED SAND, FINE TO COARSE, TRACE OF GRAVEL, WET	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 16-20 cpm
51							
52							
53							
54							
55	10575 1010 01-20	8 21 17	15	DENSE, DARK BROWN, (10YR 3/3), WELL GRADED SAND, TRACE OF GRAVEL (25-.5 in), WET	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 20 cpm
56							
57							
58							
59							

NOTES

SDM

451

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 002 TASK 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3106	COORDINATES:	DATE: 01-20-89	
ELEVATION: ~540.0 FT.	GWL: Depth Date/Time	DATE STARTED: 1-18-89	
ENGINEER/GEOLOGIST: E. TRELLINGER	Depth ~~71.8~~ 71.1 Date/Time ~~1-26-89 1200~~	DATE COMPLETED: 1-21-89	
DRILLING METHODS: CME 75		PAGE 5 OF 9	

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER 6 IN	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
61	10576 1130 01-20	7 11 13	8	MEDIUM DENSE, BROWN (10 YR 4/3), WELL GRADED COARSE SAND, WET.	SW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 20-40 cpm
62							
63							
64							
65	10577 1444 01-20	27 40 50	17	VERY DENSE, YELLOW-BROWN, (10 YR 4/4) SANDY, WELL GRADED GRAVEL; GRAVEL #4-.75 IN, WET	GW	N/A	Hnu = 0 ppm α = 0 cpm βγ = 20-40 cpm
66							
67							
68							
69							
70	10578 1530 01-20	20 40 50/4 in	12	VERY DENSE, BROWN, (10 YR 3/3) POORLY GRADED SAND, SOME GRAVEL (.25-.50 IN) AT 71.0 FT TO 71.5 FT, WET	SP	N/A	Hnu = 0 ppm α = 0 cpm βγ = 20-40 cpm
71							
72							
73							
74							

NOTES

50m

453

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 662 32	PROJECT NAME: FMPC RI/FS	
BORING NUMBER: 3106	COORDINATES:	DATE: 01-20 & 21-89
ELEVATION: 540.0 FT	GWL: Depth Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: E. Trawnyck	Depth Date/Time	DATE COMPLETED: 1-21-89
DRILLING METHODS: Cable Tool		PAGE 6 OF 9

DEPTH (FT.)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN.)	RECOVERY (IN.)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
76	10579 1639 01-20	18 32 38	12	VERY DENSE, BROWN, (10 YR 4/3), SANDY GRAVEL (.25-.50 in) WELL GRADED, WET	GW	N/A	Hmu = 0 ppm α = 0 cpm Bk = 20-30 cpm
77							
78							
79							
80	10580 1640 01-21	5 7 11	6	MEDIUM DENSE, BROWN, (10 YR 4/4) SANDY GRAVEL (0.25-0.5 in) WELL GRADED, WET	GW	N/A	Hmu = 0 ppm α = 0 cpm Bk = 30-40 cpm
81							
82							
83							
84							
85	10581 1641 01-21	14 30 32	14	DENSE, BROWN (10YR, 4/2) SANDY GRAVEL (0.25-0.75) WELL GRADED, WET	GW	N/A	Hmu = 3 ppm α = 0 cpm Bk = 30-40 cpm
86							
87							
88							
89							

NOTES

SDM
GKJ JAN 23 1989

FERNALD RI/FS

4820

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 1.2 TABLE 3.2	PROJECT NAME: FMPC RI/FS		
BORING NUMBER: 3106	COORDINATES:		DATE: 01-21-89
ELEVATION: ~540.0 FT	GWL: Depth	Date/Time	DATE STARTED: 1-18-89
ENGINEER/GEOLOGIST: J. TESORIERO	Depth	Date/Time	DATE COMPLETED: 1-21-89
DRILLING METHODS: CABLE TOOL			PAGE 7 OF 9

DEPTH (FT)	SAMPLE TYPE & NO	BLOWS ON SAMPLER PER (6 IN)	RECOVERY (IN)	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS
91	10582 1145 01-31	12 14 16	6	MEDIUM DENSE, BROWN (10YR, 4/2) WELL GRADED, COARSE SAND WITH SOME GRAVEL (0.25 - 0.75 IN) WET	SW	N/A	HNU = 0 ppm α = 0 cpm βγ = 20-40 cpm
92							
93							
94							
95	10583 1415 01-31	4 4 8	6	MEDIUM DENSE, BROWN (10YR, 4/2), POORLY GRADED, MEDIUM SAND TRACE GRAVEL (0.25 - 0.50 in) WET	SP	N/A	HNU = 3 ppm α = 0 cpm βγ = 20-50 cpm
96							
97							
98							
99							
100	10584 1530 01-34	10 13 10	10	MEDIUM DENSE, BROWN (10YR, 4/2) POORLY GRADED, MEDIUM SAND WET.	SP	N/A	HNU = 0 ppm α = 0 cpm βγ = 30-40 cpm
101							
102							
103							
104				BOTTOM OF BORING 3106 = 105 FT			

NOTES:

SDM

CHKD JAN 23 1989

FERNALD RI/FS

4820

PIEZOMETER INSTALLATION SHEET

PROJECT NAME FMPC RI/FS FIELD ENG./GEO. TESORIERO DATE 1-18-89 - 1-25-89
PROJECT NO. 602 3,2 CHECKED BY [illegible] DATE [illegible]
BORING NO. 3106
PIEZOMETER NO. 3106 DATE OF INSTALLATION 1-18-89 to 1-25-89

BOREHOLE DRILLING

DRILLING METHOD CABLE TOOL	TYPE OF BIT HAMMER
DRILLING FLUID (S) USED:	CASING SIZE (S) USED:
FLUID WATER FROM 0 TO 105 FT	SIZE 10 IN ID FROM 0 TO 105 FT
FLUID ——— FROM ——— TO ———	SIZE ——— FROM ——— TO ———

PIEZOMETER DESCRIPTION

TYPE MONITORING WELL	RISER PIPE MATERIAL STAINLESS STEEL
DIAMETER OF PERFORATED SECTION 4 IN ID	RISER PIPE DIAMETERS: [illegible]
PERFORATION TYPE:	O.D. ~~4 3/8~~ 4 3/8 I.D. 4 IN
SLOTS ☒ HOLES ☐ SCREEN ☐	LENGTH OF PIPE SECTIONS 10 ~~20~~ FT SECTIONS
AVERAGE SIZE OF PERFORATIONS 0.01	JOINING METHOD THREADED FLUSH
TOTAL PERFORATED AREA 10 FT	JOINT

PROTECTION SYSTEM

RISER PROTECTIVE PIPE LENGTH 5 FT	OTHER PROTECTION LOCKING LID
PROTECTIVE PIPE O.D. 10.5 IN	WITH PADLOCK.

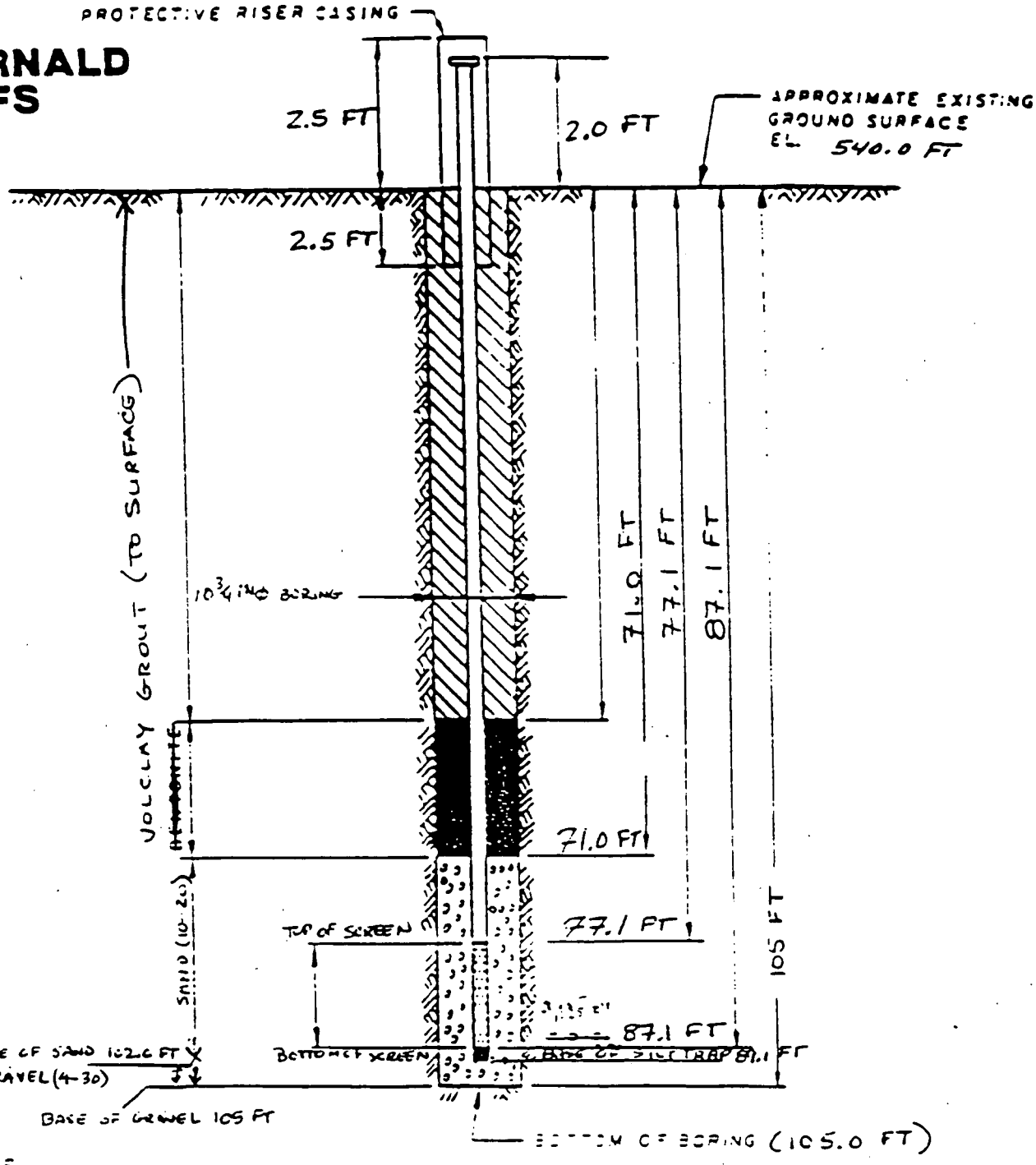
ITEM	DISTANCE ABOVE/BELOW GROUND SURFACE (FT)		ELEVATION ( )	
TOP OF RISER PIPE	2.0			
GROUND SURFACE	0.0			
BOTTOM OF PROTECTIVE PIPE	2.5			
BOREHOLE FILL MATERIALS:				
GROUT/SLURRY	TOP 0.0	BOTTOM 71.0	TOP	BOTTOM
BENTONITE (NONE)	TOP N/A	BOTTOM N/A	TOP	BOTTOM
SAND [illegible]	TOP 71.0	BOTTOM 102.0	TOP	BOTTOM
GRAVEL/[illegible]	TOP 102.0	BOTTOM 105.0	TOP	BOTTOM
PERFORATED SECTION	TOP 77.0	BOTTOM 87.0	TOP	BOTTOM
PIEZOMETER TIP	89.1			
BOTTOM OF BOREHOLE	105.0			
GWL AFTER INSTALLATION	20.2 FT 1/31/89			

WAS THE PIEZOMETER FLUSHED AFTER INSTALLATION? YES ☐ NO ☒
AS A SENSITIVITY TEST PERFORMED ON THE PIEZOMETER? YES ☐ NO ☒

REMARKS

455

FERNALD RI/FS



NOTES

1. RISER PIPE IS 4 IN ID SCHEDULE PIPE, THREADED, FLUSH-JOINTED.
2. SCREEN IS 4 IN I.D SS PIPE CONTINUOUS SLOT SCREEN (0.010 IN SLOT SIZE)
3. LOWER END OF SCREEN IS CAPPED.
4. ELEVATION OF WATER LEVEL
5. WATER LEVEL READING ON

MATERIALS USED

4-30 SAND (80 lb BAGS): 2 BAGS AT BASE OF HOLE
10-20 SAND (50 lb BAGS): 19 BAGS TO 71.0 FT
VOLCLAY GROUT (50 lb BAGS): 32 BAGS TO SURFACE
BENTONITE PELLETS: 1/2 BUCKET AS SEALING MATERIAL AROUND PROTECTIVE CASING

WATER ADDED DURING DRILLING AND COMPLETION: 1040 GALLONS

INSTALLATION DETAILS
MONITORING WELL

PREPARED FOR
BORING 3106

8 - 10 FT SECTIONS OF SS RISER
1 - 10 FT SS SCREEN WITH 2 FT SILT TRAP
0.9 FT OF RISER CUT OFF TOP OF WELL.

DRAWING NUMBER
CHECKED BY
APPROVED BY
DRAWN BY

4820

APPENDIX D

Data Quality Objectives Flowsheet

457

FEMP Routine Groundwater Monitoring Program at the Eastern and Southern Property Boundary:

1. State the problem or the situation to be resolved

   The FEMP is required by RCRA regulations to monitor the groundwater that may be impacted by RCRA regulated HWMUs. In order to meet these requirements and integrate them with current CERCLA activities, the FEMP has proposed an alternate monitoring plan for RCRA monitoring. The alternate monitoring plan includes all of the groundwater activities currently being completed as part of the RI/FS Work Plan and its Addenda, as well as continuing routine sampling at the downgradient property boundary of the FEMP. The situation involves sampling the downgradient boundary monitoring wells to determine if constituents are migrating beyond the boundary of the FEMP.

2. Identify the decisions to be made that affect the situation

   Based on the analytical results from the routine sampling program, CRU5 will evaluate any impacts to groundwater quality at the downgradient boundary of the facility. An unimpacted groundwater quality determination will result in continuing monitoring of the downgradient boundary and reporting of the findings. The determination of impacts on groundwater quality from the FEMP activities will result in continued monitoring and an evaluation of those impacts. The results of the evaluation will be used to formulate a decision to either initiate a removal action or address the contamination through the planned remedial actions to be determined within the normal CERCLA process.

3. Identify inputs that affect the decision

   The primary input will be the levels of constituents found in groundwater samples collected at the downgradient facility boundary. Samples will be collected from the 33 monitoring wells on a quarterly basis. The RI/FS data will be utilized to support the determination of further actions.

4. Define the boundary of the situation

   The area along the eastern and southern property boundary is the focus of this PSP. Thirty-three monitoring wells located along these boundary will be monitored quarterly for a list of site-specific constituents. Final definition of the extent of any potential problem will be determined

by evaluating the analytical results to determine the impacts to groundwater quality. The contamination is presently thought to be within the facility property boundary and therefore will require only continued monitoring.

5. Develop a logic statement that applies to the decision

The analytical results from the groundwater sampling will be compared over time to determine if groundwater quality is being impacted. Based on the analysis of this data, a decision will be made as to whether the groundwater contamination should be addressed in a removal action or through the planned remedial actions within the normal CERCLA process.

6. Establish validation constraints on the uncertainty of the decision

A false positive analytical error not identified during validation would be a groundwater sample analytical result that indicates contamination is present in the groundwater when it is not. The consequences of this type of error would be to develop a plan for addressing the contamination concern when no action is required.

A false negative analytical error not identified during validation would indicate that there is no contamination present or only low levels which do not require remediation. The consequences of this error would be to leave a health risk in place which possibly should be removed.

Either type of error will be avoided with the level of analytical support chosen. The use of quality assurance blanks, rinsates, and spikes along with analytical method and instrument calibration documentation will identify erroneous readings.

To further avoid either error, analytical results will be compared over a period of time (two to four quarters) to identify trends in the data and the presence of possible erroneous readings. These two constraints should make the chance of a false reading minimal, ensuring that an individual analytical error will not significantly impact the overall decision-making process.

7. Optimize a design for obtaining quality data

Analytical level ASL C will be used for the analytical results to support this program. Ten percent of the sampling will be validated to analytical level ASL D. Quarterly monitoring will provide confirmatory sampling data to verify trends in the data. Blanks, rinsates, laboratory documentation, and historical data will be used in the validation of the data to reduce the possibility of false positive or false negative analytical results.